Agenda Item F.1
Situation Summary
March 2012

PLANNING AND NECESSARY ACTIONS FOR THE 2012-2013 PACIFIC WHITING FISHING SEASONS, INCLUDING POTENTIAL IMPACTS FROM THE PACIFIC DAWN LITIGATION

During planning for the March 2012 Council meeting agenda at the November 2011 Council meeting, this agenda item was scheduled to deal with coordination issues associated with the first year implementation of the U.S. - Canada Pacific Whiting (Hake) Treaty and what to expect in 2013, the second year of implementation. There has been a new development in a legal challenge to a Pacific whiting portion of the Groundfish Trawl Catch Share Program, and this agenda item has been expanded to brief the Council on a recent court decision and possible relevance to future Council processes under the Magnuson-Stevens Act. The litigation in question is the case C10-4829-TEH: Pacific Dawn, LLC, et al. v. John Bryson, et al., referred to here as the Pacific Dawn litigation.

U.S. – Canada Pacific Whiting Treaty Implementation

A new stock assessment for Pacific whiting has been done (Agenda Item F.1.a, Attachment 1) and will be reviewed and used for decision-making in the new international whiting treaty process which is fully implemented this year for the first time. The draft assessment in the briefing book is subject to change and won't be final until the Joint Management Committee acts on the assessment during their meeting scheduled for March 14-15, 2012. At that time, international decisions on the coastwide optimum yield (OY) catch level will be made. National Marine Fisheries Service (NMFS) would like to brief the Council on implementation status in the first year of the treaty, and encourages a Council discussion on the appropriate setting of a 2012 U.S. OY for Pacific whiting. Mr. Phil Anderson is the Council representative on the Joint Management Committee, as one of four voting members of the U.S. delegation.

The Council should consider advisory body and public comment before providing guidance on the 2012 U.S. OY for Pacific whiting and other relevant issues.

Pacific Dawn Litigation

On December 22, 2011, District Court Judge Henderson concluded summary judgment in the Pacific Dawn case (Agenda Item F.1.a, Attachment 2). The plaintiffs in this case filed suit challenging the allocation formulas for whiting in the Amendment 20 shore-based individual fishing quota program and the mothership co-op program. While finding for the government ("Defendants") on a number of issues, the court found that "Defendants . . . failed to present a reasonable explanation for relying on the 2003 control date for some purposes but not others" and consequently that "Defendants' failure to consider fishing history beyond 2003 for harvesters and 2004 for processors was arbitrary and capricious." NMFS and General Counsel will provide a briefing to the Council on details of the court decision, remedy being recommended by the defendants and plaintiffs, status of a court response on remedy, status of an appeal decision, and possible repercussions to future Council processes. This briefing will be for informational purposes, as opposed to for Council decision-making, as at the time of the advance Briefing Book deadline final remedy briefs have yet to be filed with the court, with a court decision on remedy also obviously pending, and there is thus no relevant analysis to support Council decision-making.

Given that this is an informational item, it is not appropriate for advisory body or public input to the Council on possible remedial action by the Council such as how to appropriately consider fishing history information beyond 2003 or what alternative fishing history base periods should be analyzed. However, the Council may wish to discuss how it might consider such matters at future Council meetings, a discussion that would conclude under Agenda Item I.3, future agenda and workload planning, on the last day of this Council meeting.

Lastly, as a cross-reference to another matter related to the whiting season in 2013, the Council will be considering an option of changing the primary season opening date for all sectors to May 15, under trawl rationalization trailing actions (Agenda Item F.8).

Council Action:

1. Provide guidance to NMFS on the 2012 U.S. Pacific whiting OY.
2. Receive information regarding the Pacific Dawn litigation and discuss future consideration of possible court ordered remedies.

Reference Materials:

1. Agenda Item F.1.a, Attachment 1: Executive Summary of Status of the Pacific hake (Whiting) stock in U.S. and Canadian Waters in 2012. (*Full Version Available on Briefing Book Website and CD Only*).
2. Agenda Item F.1.a, Attachment 2: Summary judgment in case no. C10-4829-TEH: Pacific Dawn, LLC, et al. v. John Bryson, et al.
3. Agenda Item F.1.d, Public Comments. (*Full Version Available on Briefing Book Website and CD Only*)

Agenda Order:

a. Agenda Item Overview — John DeVore
b. NMFS Briefing — Frank Lockhart
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action:** Council Decisions and Planning as Necessary for Implementation of the 2012-2013 Pacific Whiting Fishing Seasons

PFMC
02/13/12

Agenda Item F.1.a
Attachment 2
March 2012

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

PACIFIC DAWN, LLC, et al.,

Plaintiffs,

v.

JOHN BRYSON, et al.,

Defendants.

NO. C10-4829 TEH

ORDER GRANTING IN PART AND DENYING IN PART PLAINTIFFS' AND DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

This matter came before the Court on December 12, 2011, on the parties' cross-motions for summary judgment. After carefully considering the parties' written and oral arguments, the Court now GRANTS IN PART and DENIES IN PART the motions for the reasons discussed below.

I. BACKGROUND

This case concerns the manner in which Defendants John Bryson, sued in his official capacity as Secretary of Commerce ("Secretary");[1] National Marine Fisheries Service ("NMFS"); and National Oceanic and Atmospheric Administration ("NOAA") regulate the fishing of Pacific whiting off the coasts of Washington, Oregon, and California. The Secretary oversees NOAA, which includes NMFS among its member agencies. Plaintiffs Pacific Dawn LLC, Chellissa LLC, James and Sandra Schones, Da Yang Seafood Inc., and Jessie's Ilwaco Fish Company own three fishing vessels and two processing companies that participate in the Pacific whiting industry.

[1] Bryson is substituted for Defendant Gary Locke pursuant to Federal Rule of Civil Procedure 25(d).

Plaintiffs contend that Defendants violated the Magnuson-Stevens Fishery Conservation and Management Act ("MSA" or "Act"), 16 U.S.C. §§ 1801-84, when they adopted Amendments 20 and 21 to the fishery management plan for Pacific groundfish, which includes Pacific whiting. Amendment 20 created a limited access privilege program through which participants in the trawl sector of the fishery receive permits to harvest a specific portion of the fishery's total allowable catch via individual fishing quotas ("IFQs"). Amendment 21 allocated total allowable catch for certain species in the fishery between the trawl and non-trawl sectors.

Congress enacted the MSA, among other purposes, "to conserve and manage the fishery resources found off the coasts of the United States," "to promote domestic commercial and recreational fishing under sound conservation and management principles," and "to provide for the preparation and implementation, in accordance with national standards, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery." 16 U.S.C. § 1801(b)(1), (3)-(4). The Act created eight regional fishery management councils, including the Pacific Fishery Management Council ("Council") that governs the fishery at issue in this case. 16 U.S.C. § 1852. These councils must develop, and submit to the Secretary for approval, fishery management plans ("FMPs") and "amendments to each such plan that are necessary from time to time (and promptly whenever changes in conservation and management measures in another fishery substantially affect the fishery for which such plan was developed)." 16 U.S.C. § 1852(b), (h)(1). FMPs must comply with ten national standards, 16 U.S.C. § 1851(a), and the MSA also enumerates certain factors that councils must take into account when developing programs that limit access to a fishery. *E.g.*, 16 U.S.C. §§ 1853(b)(6), 1853a.

Of relevance to Plaintiffs' instant claims,[2] NMFS issued regulations implementing Amendment 6 to the FMP for Pacific Groundfish in 1992, to take effect on January 1, 1994.

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[2]The parties are familiar with the facts of this case, and the Court here offers only a brief summary of relevant portions of the extensive administrative record.

Those regulations required federal permits to participate in the limited entry segment of the fishery and established different levels of endorsements, including "A" and "B." 57 Fed. Reg. 32,499, 32,501-03 (July 22, 1992). "A" endorsements were transferable endorsements that were granted to vessels that met specific minimum landing requirements during the qualifying window period of July 11, 1984, through August 1, 1988. *Id.* at 32,501. "B" endorsements were non-transferable and granted to vessels that "landed some groundfish prior to August 1, 1988," but that did not meet the requirements to receive an "A" endorsement. *Id.* "'B' endorsements expire[d] at the end of the 1996 fishing year, by which time vessel owners must have obtained a permit with an 'A' endorsement or have left the limited entry fishery." *Id.* at 32,503.

In 2004, NMFS published an advanced notice of proposed rulemaking announcing that the Council was:

> considering implementing an individual quota (IQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon and California. The trawl IQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits for every 2-month period to a quota system where each quota share could be harvested at any time during an open season. The trawl IQ program would increase fishermen's flexibility in making decisions on when and how much quota to fish. This document announces a control date of November 6, 2003, for the trawl IQ program. The control date for the trawl IQ program is intended to discourage increased fishing effort in the limited entry trawl fishery based on economic speculation while the Pacific Council develops and considers a trawl IQ program.

69 Fed. Reg. 1563 (Jan. 9, 2004).

The Council subsequently decided to allocate IFQs for Pacific whiting to current permit holders based on fishing history associated with such permits from 1994 to 2003 for harvesters, and from 1994 to 2004 for on-shore processors. Fishing history under "B"-endorsed permits was included when determining the total catch for the fishery in each year of the qualifying periods, but it was not included "in calculating any permit's individual qualifying history." Nov. 21, 2011 Joint Supplemental Br. at 3 (ECF Docket No. 47) (parties' jointly agreed description of how "B"-permit history was used in calculating IFQs);

see also 75 Fed. Reg.60,869, 60,956 (Oct. 1, 2010) (setting forth allocation rules). The final rules implementing Amendments 20 and 21 were issued in October and December 2010, and implementation of the IFQ system began on January 1, 2011. 75 Fed. Reg. 60,869; 75 Fed. Reg. 78,344 (Dec. 15, 2010).

The MSA requires that:

> In developing a limited access privilege program to harvest fish a Council or the Secretary shall –
>
> (A) establish procedures to ensure fair and equitable initial allocations, *including consideration of* –
>
> > (i) *current and historical harvests*;
> >
> > (ii) employment in the harvesting and processing sectors;
> >
> > (iii) investments in, and dependence upon, the fishery; and
> >
> > (iv) the current and historical participation of fishing communities.

16 U.S.C. § 1853a(c)(5) (emphasis added). Plaintiffs contend that Defendants violated subsection (i) of this provision – and also failed to base their decisions on "the best scientific information available," as required by National Standard Two, 16 U.S.C. § 1851(2) – in two ways: first, by not considering fishing history for harvesters beyond 2003 and for processors beyond 2004 and, second, by not adequately considering fishing history associated with "B" permits.[3] Plaintiffs argue that their initial IFQs would have been higher had harvests beyond 2003 and 2004 been considered.[4] Plaintiff Pacific Dawn further asserts that it obtained ownership of the fishing history of the Amber Dawn, a vessel that fished under a "B"-endorsed permit from 1994 to 1996, and that this history was not but should have been included when Defendants determined Pacific Dawn's initial IFQ. The parties agree that

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[3]In their papers, Plaintiffs discuss separately the 2003 and 2004 cutoff dates for harvesters and processors, respectively. The Court considers these issues concurrently because they are based on the same legal arguments.

[4]Plaintiff Da Yang Seafood Inc. did not receive an initial IFQ because it had no history prior to the 2004 cut-off date for processors. It contends that it should have received one based on its more recent history.

summary judgment is an appropriate mechanism for resolving Plaintiffs' claims, and their cross-motions for summary judgment are now pending before the Court.

II. LEGAL STANDARD

A court shall set aside regulations adopted under the MSA if they are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A); 16 U.S.C. § 1855(f)(1)(B) (adopting the standards for judicial review under 5 U.S.C. § 706(2)). This is a "highly deferential" standard of review, and an agency's action is presumed to be valid and should be affirmed "if a reasonable basis exists for its decision." *Indep. Acceptance Co. v. California*, 204 F.3d 1247, 1251 (9th Cir. 2000) (internal quotation marks and citation omitted). A reviewing court's "only task is to determine whether the Secretary has considered the relevant factors and articulated a rational connection between the facts found and the choices made." *Midwater Trawlers Coop. v. Dep't of Commerce*, 282 F.3d 710, 716 (9th Cir. 2002). The court "cannot substitute [its] judgment of what might be a better regulatory scheme . . . if the Secretary's reasons for adopting it were not arbitrary and capricious." *Alliance Against IFQs v. Brown*, 84 F.3d 343, 345 (9th Cir. 1996).

"[S]ummary judgment is an appropriate mechanism for deciding the legal question of whether the agency could reasonably have found the facts as it did." *Occidental Eng'g Co. v. INS*, 753 F.2d 766, 770 (9th Cir. 1985). Review is generally "limited to the administrative record on which the agency based the challenged decision." *Fence Creek Cattle Co. v. U.S. Forest Serv.*, 602 F.3d 1125, 1131 (9th Cir. 2010). The Ninth Circuit allows expansion of the record only "in four narrowly construed circumstances: (1) supplementation is necessary to determine if the agency has considered all factors and explained its decision; (2) the agency relied on documents not in the record; (3) supplementation is needed to explain technical terms or complex subjects; or (4) plaintiffs have shown bad faith on the part of the agency." *Id.* In this case, neither party has asked the Court to supplement the administrative record.

III. DISCUSSION

As an initial matter, Defendants correctly argue that the Act's use of the word "consideration" does not mandate a particular outcome. *See e.g., Pac. Coast Fed'n of Fishermen's Ass'ns v. Locke*, Case No. C10-4790 CRB, 2011 WL 3443533 (N.D. Cal. Aug. 5, 2011), at *5-7. However, unlike the plaintiffs in *Pacific Coast Federation*, Plaintiffs here challenge not simply the end result, but also whether Defendants considered the required statutory factors in reaching that result. The MSA unambiguously requires that Defendants consider certain factors, including "current and historical harvests." 16 U.S.C. § 1853a(c)(5)(A)(i). As explained above, Defendants must have "considered the relevant factors and articulated a rational connection between the facts found and the choices made." *Midwater Trawlers Coop.*, 282 F.3d at 716.

A. <u>Consideration of fishing history beyond 2003 and 2004</u>

Plaintiffs first argue that Defendants improperly failed to consider "current" harvests when, in 2010, they based initial IFQs on fishing histories through 2003 for harvesters and 2004 for processors. Defendants assert that they adequately considered current harvests by allocating quota shares to current permit owners rather than to individuals or vessels that may have participated in the fishery in the past. However, the statute requires consideration of current harvests, not current permits, and considering historical harvests of current permits is distinguishable from considering current harvests themselves. Defendants have cited no authority to the contrary.

Defendants' main argument on this issue is that they reasonably based the end of the qualifying period on the previously published 2003 control date. Plaintiffs raise several challenges to the validity of that control date, none of which have merit. First, Plaintiffs assert that the 2003 date reflected only a political statement or compromise, but they cite no evidence for this assertion.[5] Thus, this case is distinguishable from *Hadaja, Inc. v. Evans*, in which the regional council "urged the industry groups to reach a compromise," and the

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[5]As noted below, there is evidence in the record, however, that the extension of the qualifying period for processors to 2004 was the result of compromise.

"limited access scheme was adopted directly from the compromise reached." 263 F. Supp. 2d 346, 350, 354 (D.R.I. 2003). Plaintiffs also argue that a proposed control date is only valid if it is adopted as a formal regulation. However, Plaintiffs cite no authority to support that conclusion, and the Third Circuit recently rejected that argument, concluding that the government need not go through formal rule promulgation procedures before setting a control date; instead, the court held that publication of a proposed control date in the Federal Register was sufficient. *Gen. Category Scallop Fishermen v. Sec'y of Commerce*, 635 F.3d 106, 113 (3d Cir. 2011). Finally, Plaintiffs argue that an interim amendment to the FMP – Amendment 15 – superseded the control date, but they cite no authority to rebut Defendants' conclusion in the record, in response to a comment to the proposed regulation, that:

> Nowhere does Amendment 15 address the 2003 control date or purport to change the qualifying period for the Groundfish trawl program. Amendment 15 was a limited interim action for the non-Tribal whiting fishery issued in anticipation of the trawl rationalization that in no way attempted to address matters beyond its limited scope. Moreover, the Council has explicitly stated that vessels that qualified for whiting fishery participation under Amendment 15 were not guaranteed future participation or inclusion in the Pacific whiting fishery under the provisions of Amendment 20.

B22:638 (June 2010 Final Environmental Impact Statement prepared by the Council and NMFS) (citation omitted).[6] In light of all of the above, the Court finds that the proposed control date was procedurally valid and was not subsequently invalidated by Amendment 15.

Defendants explain that they chose to base the qualifying period on the announced control date because using a later date would "reward those who disregarded the control date announcement, create perceptions of inequity, and encourage fishermen to ignore such dates in the future, negatively affecting the Council's ability to credibly use control dates." B22:A-151; *see also* B22:A-146 ("The allocation period that would most likely minimize dislocation and the attendant costs would be the few years just prior to the initial allocation.

[6]The Court adopts the parties' system of citation to the administrative record. Thus, the quoted language appears at page 638 of document B22. Pagination denoted with an asterisk refers to page numbers in the document's PDF format rather than pagination identified on the document itself.

That period is not used, in part, because of issues related to the need to establish credible control dates to effectively manage the fishery while deliberations on new LE [limited entry] programs are underway."). A similar rationale was upheld by the Ninth Circuit in *Alliance Against IFQs v. Brown*. In that case, the relevant statute required that "present participation in the fishery" be "take[n] into account."[5] 84 F.3d at 346 (quoting 16 U.S.C. § 1853(b)(6)(A)). The government allocated quota shares in 1993 to owners or lessees of vessels that made legal landings of halibut or sablefish during the years 1988 to 1990. *Id.* at 345-46. The Ninth Circuit found that the most persuasive reason for a 1990 cutoff date "was that if participation in the fishery while the rule was under consideration had been considered, then people would have fished and invested in boats in order to obtain quota shares, even though that would have exacerbated overcapacity and made no economic sense independently of the regulatory benefit." *Id.* at 346. The court ultimately concluded that the three-year period between the end of the cutoff period and promulgation of the regulations was not arbitrary or capricious:

> Congress left the Secretary some room for the exercise of discretion, by not defining "present participation," and by listing it as only one of many factors which the Council and the Secretary must "take into account." While the "participation" that the Council actually considered was admittedly in the "past" judged from the time when the final regulations were promulgated, it was roughly "present" with the time when the regulations were first proposed: The Council began its process on this plan in 1990, and considered participation in 1988, 1989, and 1990. The process required to issue a regulation necessarily caused substantial delay. The process of review, publication, public comments, review of public comments, and so forth, had to take a substantial amount of time, *see* 16 U.S.C. § 1854(a), and the environmental impact review also was lengthy, as it typically is, *see* 42 U.S.C. § 4332(2)(C). "Present" cannot therefore prudently be contemporaneous with the promulgation of the final regulations.

[5] Plaintiffs assert that Congress intended the word "current" to refer to more recent events than "present," but they cite no authority for that position. Moreover, their moving papers rely on a dictionary definition of "current" expressed in terms of "present." Pls.' Mot. at 9 (defining "current" as "presently elapsing, occurring in or existing at the present time; most recent") (quoting Merriam-Webster Unabridged Dictionary (2010)).

> We further believe that the Secretary had a good reason for disregarding participation in the fishery during this lengthy process, because the alternative would encourage the speculative over-investment and overfishing which the regulatory scheme was meant to restrain. Under the regulations, eligibility for quota shares depends on fishing during the years 1988, 1989, and 1990. Whatever years are used necessarily recede into the distant past. Even in 2005, assuming the regulatory scheme lasts that long, the quota shares will be based on fishing prior to 1991. Future generations of fishermen will continue to be governed by these pre-1991 allocations. Had the Secretary extended the 1990 cutoff, the incentive to pour money and time into the fishery in order to get a bigger quota share, for those who could afford a long term speculation, would have been enormous.
>
> Thus, while the length of time between the end of the participation period considered and the promulgation of the rule *pushed the limits of reasonableness*, we are unable to characterize use of a 1988 through 1990 period as so far from "present participation" when the regulation was promulgated in 1993 as to be "arbitrary or capricious."

Id. at 347-48 (emphasis added) (citations omitted).

Alliance Against IFQs would clearly support upholding the regulations at issue in this case had they been promulgated in 2006 rather than 2010. The same "good reason" that supported the cutoff date in that case applies equally here: the desire to curb speculation while the regulations were under review. *Id.* at 347. Plaintiffs counter that there is no evidence of rampant speculation in the whiting industry that would undermine conservation and management efforts, and a control date was therefore unnecessary, but it could very well be that the announcement of a control date is what curbed any such speculation.

However, if three years between the end of a qualifying period and promulgation of a regulation "pushe[s] the limits of reasonableness," *Alliance Against IFQs*, 84 F.3d at 348, then the six- and seven-year periods in this case arguably fall beyond those limits. While "current" cannot "prudently be contemporaneous with the promulgation of the final regulations," it may be that a 2003 cutoff date is "so far" from "current" harvests when the regulation was promulgated in 2010 as to be arbitrary or capricious. *Id.* at 347-48. At oral argument, Defendants asserted that this case was more factually complex than *Alliance Against IFQs* – for example, because more species were at issue and Congress passed amendments to the MSA while the regulations were under consideration – and that a longer period of time to develop the regulations was therefore reasonable. The parties did not brief this issue, and it may be that the increased factual complexity would, indeed, render the delays in this case reasonable.

The Court need not and does not decide this question because an independent basis exists for rejecting the regulations in this case: Even if it was conceptually reasonable for Defendants to have relied on a 2003 control date when promulgating regulations in 2010, the manner in which they did so here was not rational. As Defendants correctly observe, the record demonstrates that harvests up to 2006 were considered for some purposes. At first glance, this would appear to support Defendants because it indicates that they considered harvests more recent than 2003. However, it actually undermines Defendants' position because Defendants fail to explain why it was rational to rely on the control date for some purposes but not others. For example, Defendants considered harvests from 2003 to 2006 when examining species considered to be overfished. *E.g.*, D45:*64-68 (Aug. 3, 2010 Decision Memorandum from NOAA Regional Administrator William W. Stelle, Jr. to NOAA Assistant Administrator for Fisheries Eric C. Schwaab). They justified going beyond the 2003 control date as follows:

> The ratios could not be calculated without using information from the West Coast Groundfish Observer Program. This program was not fully operational unti1 2003, so use of earlier years would not have been practicable. In addition, the Rockfish Conservation Areas (RCAs) were first created in 2003. Fishing operations were greatly affected by the creation of the RCAs, which will remain in place for the foreseeable future. The Council considered it important to recognize the changes caused by the RCAs, that choosing earlier years would not have done so, and that an estimate of likely patterns of activity should be based on a period of time when the RCAs were in place. The Council also considered using later years, but rejected this approach because the years 2003-2006 reasonably reflected recent fishing patterns, while not diverging too far from the target species allocation period of 1994-2003.

D45:*66. While the development of the RCAs provides a rational basis for departing from the 2003 control date in allocating QS for overfished species, it is questionable that Defendants considered whether the chosen qualifying period "reasonably reflected recent fishing patterns" for these species when they do not appear to have undertaken the same analysis for Pacific whiting. For instance, the distribution of whiting among Washington, Oregon, and California appears to have shifted significantly after 2003, with Washington's share moving from 29% in 2003 to 50% in 2008, but Defendants have not cited to any portion of the record where they considered whether the IFQ allocations based on history through 2003 and 2004 "reasonably reflected" these more recent fishing patterns. *See* M379:6, 8 (July 9, 2010 comments on proposed rule prepared for Plaintiff Pacific Dawn by Steve Hughes).

Defendants also looked at more recent harvests when considering whether new entrants would be prejudiced. B22:A-216. They concluded that:

> With respect to whiting, five new buyers have entered the fishery since 2004 (the end of the whiting QS [quota share] allocation period for processors), but these buyers have purchased nearly 3 percent of the shoreside whiting landings and about 9 percent of the landings in California (which are much smaller than for Oregon and Washington, Table A-76). With the possible exception of California, it does not appear that there are many post-2004 entrants with significant amounts of landings that will not receive an initial allocation of whiting QS under the IFQ program.

Id. Defendants make no argument as to why it was rational for them to exclude these new entrants, particularly the ones that had "significant amounts of landings that will not receive an initial allocation of whiting QS under the IFQ program." There does not appear to be any evidence, for example, that the new entrants engaged in speculation when they entered the market after the announced 2003 control date.

Most problematic is Defendants' explanation of why the qualifying period for processors was extended to 2004. Defendants did not rely on the 2003 control date for processors "because keeping the date at 2003 was viewed to disadvantage a processor that was present as a participant during the window period but had increased its share of the processing substantially since the close of the original allocation period (2003)." B22:A-214. Thus, the extension to 2004 was made to benefit a single processor, which begs the question of why that particular processor should benefit – notwithstanding an earlier control date – when others should not. This appears to be a quintessential case of arbitrariness. Moreover, the record unequivocally states that the extension of the period to 2004 for harvesters was the result of "a compromise arrived at during industry negotiations," B22:A-146, thus undermining any argument that Defendants' decision-making was free from political compromise.

While Defendants correctly argue that they have broad discretion to make decisions, and that no particular outcome is required by the MSA, they have failed to present a reasonable explanation for relying on the 2003 control date for some purposes but not others. Consequently, the Court finds that Defendants' failure to consider fishing history beyond 2003 for harvesters and 2004 for processors was arbitrary and capricious. Plaintiffs' motion for summary judgment is GRANTED on this issue, and Defendants' motion is DENIED.

B. Consideration of "B"-permit history

Plaintiffs next argue that Defendants violated the MSA by failing to give adequate consideration to fishing history conducted under "B" permits. The parties agree that "B"-permit history was not credited to any current permit holder when determining qualifying history for purposes of allocating initial IFQs. Defendants explain that such history was excluded because they followed a policy of having fishing history follow the permit – i.e., they allocated shares to owners of current permits to "ensure[] that the allocation will go to those that currently own assets in the fishery," B22:A-119, and based such allocations on the catch history associated with each given permit, not the catch history of any particular vessel.

Given the decision to base IFQs on fishing history associated with current permits – a decision that Plaintiffs do not challenge – it was not arbitrary or capricious for Defendants to exclude "B"-permit history when calculating qualifying fishing history. While Plaintiff Pacific Dawn may well have entered into an agreement to purchase the fishing history of the Amber Dawn, the "B" permit under which the Amber Dawn fished expired in 1996. Contrary to Plaintiffs' assertions, the record is clear that "B" permits were not transferable and were no longer valid after 1996. *E.g.*, 57 Fed. Reg. 32,499, 32,501 ("A 'B' endorsement allows the vessel to participate in the limited entry fishery through 1996, when all 'B' endorsements will expire."); *id.* at 32,503 ("The non-transferable 'B' endorsement provides short-term access to the fishery. . . . 'B' endorsements expire at the end of the 1996 fishing year, by which time vessel owners must have obtained a permit with an 'A' endorsement or have left the limited entry fishery."). Plaintiffs have failed to establish that the history of the Amber Dawn when it fished under a "B" permit is associated with any current permit, and it was therefore reasonable for Defendants not to have credited such history when it allocated initial IFQs. Accordingly, Defendants' motion for summary judgment is GRANTED on this issue, and Plaintiffs' motion is DENIED.

C. <u>Remedy</u>

Having found for Plaintiffs on one issue, the Court must now determine an appropriate remedy. Plaintiffs ask that the regulations be set aside and the matter be remanded to NOAA, but Defendants request an opportunity to file additional briefs on an appropriate remedy. In their reply, Plaintiffs failed to offer any reason why such briefing would be unnecessary and instead merely repeated their conclusory request that the regulations be set aside and that NOAA be ordered to revise the regulations in compliance with the MSA. Although the parties could – and should – have included more discussion on an appropriate remedy in their papers, they did not. The Court therefore finds it prudent to consider supplemental briefing before granting any relief.

IV. CONCLUSION

As discussed above, Plaintiffs' and Defendants' motions for summary judgment are both GRANTED IN PART and DENIED IN PART. Plaintiffs prevail on the issue of whether Defendants violated the MSA by basing initial IFQ allocations on fishing history only through 2003 for harvesters and 2004 for processors. Defendants prevail on the issue of whether they adequately considered fishing history conducted under "B" permits.

The parties shall submit supplemental briefing on an appropriate remedy. They shall file simultaneous briefs on or before **January 30, 2012,** and simultaneous reply briefs on or before **February 13, 2012.** The matter will then be deemed submitted on the papers unless the Court subsequently orders oral argument. Alternatively, if the parties wish to appeal this order before litigating an appropriate remedy, the Court will consider a motion to make the requisite findings for an interlocutory appeal under 28 U.S.C. § 1292.

IT IS SO ORDERED.

Dated: 12/22/11

THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

PACIFIC DAWN, LLC, et al.,

Plaintiffs,

v.

JOHN BRYSON, et al.,

Defendants.

NO. C10-4829 TEH

ORDER ON REMEDY

On December 22, 2011, this Court granted in part and denied in part Plaintiffs' motion for summary judgment. The Court found that Defendants' failure to consider history beyond 2003 for harvesters and 2004 for processors when setting initial fishing quotas ("IFQs") for Pacific whiting was arbitrary and capricious. The Court ordered supplemental briefing on remedy because the parties' summary judgment papers failed to address that issue adequately. Having carefully considered the parties' supplemental briefs, the Court finds it appropriate, for the reasons discussed below, to remand the regulations for reconsideration prior to the start of the fishing season that begins on April 1, 2013.

DISCUSSION

The parties agree that the regulations at issue should be remanded to Defendants for further consideration consistent with the Court's summary judgment ruling. However, they disagree on a deadline for adopting new regulations and whether the current regulations should be vacated pending remand.

Plaintiffs assert that Defendants can and should adopt new regulations prior to the start of the 2012 fishing season for Pacific whiting, which they contend begins on May 15, 2012. Their initial supplemental brief also suggested that the existing regulations remain in place unless Defendants fail to implement new regulations prior to December 1, 2012.

Plaintiffs altered their position in their supplemental reply, in which they request either that the existing regulations be vacated if Defendants fail to implement revised regulations prior to May 15, 2012, or that they be vacated indefinitely pending the implementation of revised regulations.

Defendants, by contrast, contend that it would be impossible for them to implement new regulations by the start of the 2012 Pacific whiting fishing season, which they assert begins on April 1, 2012, but state that new regulations can be in place by the start of the 2013 fishing season on April 1, 2013. Defendants further argue that this Court should not vacate the existing regulations while the matter is under review.

Time for Implementing New Regulations

The start of the Pacific whiting fishing season is governed by regulation. It begins on May 15 of each year for the catcher/processor and mothership sectors, but as early as April 1 for the shorebased IFQ program, depending on geographical latitude. 50 C.F.R. § 660.131(b)(2)(iii). Thus, Defendants are correct that the fishing season begins as early as April 1, and not on May 15, as Plaintiffs assert.

Defendants also presented evidence that it would be unworkable to change quota share amounts once the fishing season has begun:

> Each owner of a whiting quota share permit receives two distributions of whiting quota pounds. The first limited distribution of 2012 whiting quota pounds occurred on December 29, 2011, based on the lower range of potential whiting harvest amounts. The final whiting harvest amount is known by March 25. Once the final harvest amount is known, another distribution of whiting quota pounds occurs so that the total quota pounds issued for that year is equal to the permit owner's whiting quota share multiplied by that year's whiting shorebased trawl allocation. . . . Once the quota pounds are distributed to quota share accounts, the quota pounds can be sold, transferred, or leased to other participants in the shorebased IFQ fishery. Any change in initial quota share amounts that occurs during 2012 after the primary shorebased whiting fishery begins could be virtually impossible to implement. For example, if a permit owner's whiting quota share were reduced mid-season, the permit owner's corresponding whiting quota pounds would need to be reduced. However, if the quota share permit owner has already transferred quota pounds based on private business agreements, NMFS [the National Marine Fisheries Service] lacks

> the ability to determine who currently owns the quota pounds attributable to different quota share accounts, and also lacks the ability to determine if quota pounds already fished are attributable to a specific quota share account. Simply put, once quota pounds are issued and quota pound trading or fishing occurs, taking back quota pounds to adjust for changes in quota share amounts is impracticable mid-season.

Lockhart Decl. ¶ 12. The Court finds this evidence persuasive, especially in the absence of any contrary evidence or argument by Plaintiffs that changing quotas mid-season is feasible. The question for the Court is therefore whether it should order implementation of new regulations prior to April 1, 2012, or April 1, 2013.

Plaintiffs have presented no authority for ordering the implementation of revised regulations in less than two months, or even in three months if Plaintiffs' asserted start date were assumed to be true, and the Court finds such a timetable to be unreasonable. Indeed, Plaintiffs' initial supplemental brief appears to recognize that it may not be feasible to implement regulations by May 15, 2012, since it requested vacatur of existing regulations only if revised regulations were not in place by December 1, 2012. In addition, the primary case relied on by Plaintiffs in their supplemental reply brief ordered a one-year deadline on remand – far longer than the three months Plaintiffs request here. *See Natural Res. Def. Council v. Locke*, Case No. C01-0421 JL (N.D. Cal.), Apr. 29, 2010 Order on Remedy (Ex. 3 to Pls.' Suppl. Reply Br.).

Plaintiffs appear to assume that Defendants need only perform simple mathematical calculations using existing historical catch data before they can implement new regulations. While that is one option open to Defendants, it is not the only one. For example, Defendants might also want to consider whether it is "appropriate to increase the number of worst years that any individual may drop (from two in the current formula to some higher number); earlier years in the allocation period might be removed to maintain a consistent length for the allocation period; or a different method for weighting the years might be appropriate." Second Lockhart Decl. ¶ 13. Put simply, Plaintiffs are not entitled to have Defendants adopt their requested methodology, nor is it the Court's role to dictate to Defendants how the regulations should be revised. As the Supreme Court has explained:

> If the record before the agency does not support the agency action, if the agency has not considered all relevant factors, or if the reviewing court simply cannot evaluate the challenged agency action on the basis of the record before it, the proper course, except in rare circumstances, is to remand to the agency for additional investigation or explanation. The reviewing court is not generally empowered to conduct a *de novo* inquiry into the matter being reviewed and to reach its own conclusions based on such an inquiry.

Fla. Power & Light Co. v. Lorion, 470 U.S. 729, 744 (1985); *see also Midwater Trawlers Coop. v. Dep't of Commerce*, 282 F.3d 710, 721 (9th Cir. 2002) (remanding to NMFS "to either promulgate a new allocation consistent with the law and based on the best available science, or to provide further justification for the current allocation that conforms to the requirements of the Magnuson-Stevens Act and the Treaty of Neah Bay," rather than remanding with specific instructions on how to determine a new allocation). Plaintiffs have not persuaded the Court that this case presents "rare circumstances" in which a specific remand order would be appropriate, and Plaintiffs themselves appear to recognize the impropriety of a specific remand order, noting that an order on timing "is all that plaintiffs seek here." Pls.' Suppl. Reply at 7 n.5.

In light of all of the above, the Court finds it appropriate to remand the affected regulations for reconsideration in light of the Court's summary judgment ruling, with revised regulations to be implemented no later than April 1, 2013. Plaintiffs argue that Defendants may adopt emergency regulations by statute, 16 U.S.C. § 1855(c), but the Court agrees with Defendants that it would be improper to order Defendants to exercise their discretionary power to adopt emergency regulations – although, on remand, Defendants should consider whether use of this mechanism is appropriate.

<u>Whether Existing Regulations Should Be Vacated Pending Remand</u>

When determining whether to vacate regulations pending remand, courts consider several factors, including "the seriousness of the [regulations'] deficiencies (and thus the extent of doubt whether the agency chose correctly) and the disruptive consequences of an interim change that may itself be changed," *Allied-Signal, Inc. v. U.S. Nuclear Regulatory Comm'n*, 988 F.2d 146, 150-51 (D.C. Cir. 1993) (internal quotation marks and citation omitted), as well as "the purposes of the substantive statute under which the agency was acting" and "potential prejudice to those who will be affected by maintaining the status quo," *Natural Res. Def. Council v. U.S. Dep't of Interior*, 275 F. Supp. 2d 1136, 1144 (C.D. Cal. 2002).

Plaintiffs initially agreed that vacatur need not be ordered as long as new regulations were implemented by December 1, 2012. *See, e.g.*, Pls.' Suppl. Br. at 5 ("[E]quity supports a finding that the existing IFQ Regulations should be preserved pending remand."). As discussed above, the Court finds it would be unworkable to change allocations in the middle of a season. Thus, based on Plaintiffs' initial agreement that the regulations need not be vacated before December 1, 2012, it would be appropriate to leave the existing regulations in place through the start of the 2013 fishing season on April 1, 2013.

Plaintiffs changed their position in their supplemental reply brief and now argue that vacatur is necessary pending remand unless Defendants implement new regulations prior to May 15, 2012. However, they have presented no evidence of changed circumstances that would warrant a change in position from their opening supplemental brief, filed just two weeks earlier.

Moreover, the Court finds the balance of factors in this case to weigh against vacatur. Plaintiffs argue that they will be harmed economically if the existing regulations are left in place, but their assertions of harm are exaggerated, as well as imprecise as to the amount of their projected harm. Plaintiffs begin with the incorrect premise that the existing regulations will remain in place for an additional two years when, in fact, the Court has ordered the regulations to be revised by the start of the 2013 fishing season, leaving the regulations in place for only one additional year. In addition, while Plaintiffs might well gain quota share after Defendants have revised the regulations, this outcome is not guaranteed. Plaintiffs have also failed to present evidence that they would benefit economically from a fishing season in which overall harvest was limited but no individual quotas existed, which would be the effect of vacatur. It could be, for example, that other participants would increase their catch beyond their existing individual quotas and do so more quickly than Plaintiffs, thereby diminishing the amount of catch available to Plaintiffs before the overall harvest limit were reached.

As Plaintiffs acknowledge, leaving existing regulations in place will benefit some fishery participants while harming others. Marchand Decl. ¶ 5. However, the magnitude of such benefits and harms remains unknown because it is uncertain how Defendants will revise the regulations on remand. Additionally, Plaintiffs have offered no evidence to rebut Defendants' evidence that vacatur would lead to significant disruptions in the fishery. For example:

> No shorebased processors would receive individual whiting quota, which would result in lost revenue and less flexibility to adapt to the changes in the groundfish fishery expected under the trawl rationalization program. Whiting processors may also have [to] revisit any contracts that they have entered into with fishers, while vessels involved with the coop may have to revisit decisions on whether to remain in Alaska to fish Pollock or come down to fish Pacific whiting. In addition, fishing strategies, business plans, capital investments, and other aspects of the whiting fishery that are currently being implemented based on the expectation that whiting will be managed with IFQs and coop programs, would all be affected if the existing regulations were vacated.

Lockhart Decl. ¶ 14. Vacatur would also cause disruption in the management of the fishery by NMFS and, due to the "highly variable behavior" that would result if no individual quotas were in place, could result either in "closing the fishery too early, resulting in millions of dollars of lost revenue to struggling coastal communities, or too late, with potential conservation costs to the affected stocks." *Id.* ¶ 15. After balancing relevant factors, the Court therefore finds it appropriate to leave the existing regulations in place pending remand. If Defendants fail to adopt revised regulations prior to the start of the 2013 fishing season, the Court may re-visit this determination.

CONCLUSION

For the reasons set forth above, the Court now remands the regulations affected by its December 22, 2011 summary judgment ruling for further consideration consistent with that ruling, the Magnuson-Stevens Fishery Conservation and Management Act, and all other governing law. Defendants shall implement revised regulations before the 2013 Pacific whiting fishing season begins on April 1, 2013. In the interim, the existing regulations shall remain in effect. The Court shall retain jurisdiction over Defendants' actions on remand.

The Clerk shall enter judgment and close the file administratively. However, until the revised regulations have been implemented, Defendants shall file status reports with this Court every three months, beginning on April 1, 2012. The Court may schedule a hearing to consider whether interim remedies are appropriate if it becomes apparent that Defendants are not acting as expeditiously as possible and do not appear to be on track to meet the April 1, 2013 deadline ordered by this Court.

IT IS SO ORDERED.

Dated: 02/21/12

THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

action as compared to the no action alternative are positive.

The proposed action is almost certain to result in greater revenue from skate landings. Based on recent landing information, the skate fishery is able to land close to the full amount of skates allowable under the quotas. The estimated potential revenue from the sale of skates under the proposed catch limits is approximately $9.8 million per year, compared to $5.8 million if this action were not implemented. However, vessels that participate in the skate fishery derive most (an average of 96 percent) of their revenues from other fisheries (e.g., groundfish, monkfish). In fishing year 2010, the average total revenue (from all species combined) for the 601 vessels that landed skates was $234,389, of which an average of $17,042 was derived from skates. Therefore alterations to catch limits of other species would be expected to result in greater impacts on total fishing revenues than would alterations in skate catch limits. The proportion of revenue derived from skates may change over time, as skate prices have begun increasing in recent years, and more vessels have been deriving a greater proportion of their income from skates.

Dated: February 15, 2012.

Alan D. Risenhoover,

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

List of Subjects in 50 CFR Part 648

Fisheries, Fishing, Reporting and recordkeeping.

For the reasons set out in the preamble, 50 CFR part 648 is proposed to be amended as follows:

PART 648—FISHERIES OF THE NORTHEASTERN UNITED STATES

1. The authority citation for part 648 continues to read as follows:

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

2. In § 648.322, revise paragraph (b) introductory text, (b)(1) and (c)(4) to read as follows:

§ 648.322 Skate allocation, possession, and landing provisions.

* * * * *

(b) *Skate wing possession and landing limits.* A vessel or operator of a vessel that has been issued a valid Federal skate permit under this part, and fishes under an Atlantic sea scallop, NE multispecies, or monkfish DAS as specified at §§ 648.53, 648.82, and 648.92, respectively, unless otherwise exempted under § 648.80 or paragraph (c) of this section, may fish for, possess, and/or land up to the allowable trip limits specified as follows:

(1) Up to 2,200 lb (998 kg) of skate wings (4,994 lb (2,265 kg) whole weight) per trip from May 1 through August 31, and 3,600 lb (1,633 kg) of skate wings (8,172 lb (3,707 kg) whole weight) per trip from September 1 through April 30, except for a vessel fishing on a declared NE multispecies Category B DAS described under § 648.85(b), which is limited to no more than 220 lb (100 kg) of skate wings (500 lb (227 kg) whole weight) per trip (or any prorated combination of skate wings and whole skates based on the conversion factor for wing weight to whole weight of 2.27—for example, 100 lb (45.4 kg) of skate wings X 2.27 = 227 lb (103.1 kg) of whole skates).

* * * * *

(c) * * *

(4) The vessel owner or operator possesses or lands no more than 25,000 lb (11,340 kg) of only whole skates less than 23 inches (58.42 cm) total length, and does not possess or land any skate wings or whole skates greater than 23 inches (58.42 cm) total length.

* * * * *

[FR Doc. 2012–4111 Filed 2–21–12; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 120207106–2105–01]

RIN 0648–BB85

Magnuson-Stevens Act Provisions; Fisheries Off West Coast States; Pacific Coast Groundfish Fishery; 2012 Tribal Fishery for Pacific Whiting

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 for the 2012 Pacific whiting fishery under the authority of the Pacific Coast Groundfish Fishery Management Plan (FMP), the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and the Pacific Whiting Act of 2006. This proposed rule would establish a tribal allocation of 17.5 percent of the U.S. total allowable catch (TAC) for 2012.

The regulations proposed by this action would also establish a process for reapportionment of unused tribal allocation of Pacific whiting to the non-tribal fisheries.

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on March 23, 2012.

ADDRESSES: You may submit comments, identified by RIN 0648–BB85 by any of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal, at *http://www.regulations.gov*. To submit comments via the e-Rulemaking Portal, first click the ''submit a comment'' icon, then enter (RIN Number) in the keyword search. Locate the document you wish to comment on from the resulting list and click on the ''Submit a Comment'' icon on the right of that line.
- *Fax:* 206–526–6736, Attn: Kevin C. Duffy.
- *Mail:* William W. Stelle, Jr., Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070, Attn: Kevin C. Duffy.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments (if submitting comments via the Federal Rulemaking portal, enter ''N/A'' in the relevant required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Kevin C. Duffy (Northwest Region, NMFS), phone: 206–526–4743, fax: 206–526–6736 and email: *kevin.duffy@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Electronic Access

This proposed rule is accessible via the Internet at the Office of the Federal Register's Web site at *http://www.gpo.gov/fdsys/search/home.action.* Background information and documents are available at the Pacific Fishery Management Council's Web site at *http://www.pcouncil.org/.*

Background

The regulations at 50 CFR 660.50(d) establish the process by which the tribes with treaty fishing rights in the area covered by the Pacific Coast Groundfish Fishery Management Plan (FMP) request new allocations or regulations specific to the tribes, in writing, during the biennial harvest specifications and management measures process. The regulations state that ''the Secretary will develop tribal allocations and regulations under this paragraph in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.'' These procedures employed by NOAA in implementing tribal treaty rights under the FMP, in place since May 31, 1996, were designed to provide a framework process by which NOAA Fisheries can accommodate tribal treaty rights by setting aside appropriate amounts of fish in conjunction with the Pacific Fishery Management Council (Council) process for determining harvest specifications and management measures. The Council's groundfish fisheries require a high degree of coordination among the tribal, state, and federal co-managers in order to rebuild overfished species and prevent overfishing, while allowing fishermen opportunities to sustainably harvest over 90 species of groundfish managed under the FMP.

Since 1996, NMFS has been allocating a portion of the U.S. TAC (called Optimum Yield (OY) or Annual Catch Limit (ACL) prior to 2012) of Pacific whiting to the tribal fishery following the process established in 50 CFR 660.50(d). The tribal allocation is subtracted from the U.S. Pacific whiting TAC before allocation to the non-tribal sectors.

To date, only the Makah Tribe has prosecuted a tribal fishery for Pacific whiting. The Makah Tribe has annually harvested a whiting allocation every year since 1996 using midwater trawl gear. Since 1999, the tribal allocation has been made in consideration of their participation in the fishery. In 2008 the Quileute Tribe and Quinault Indian Nation expressed an interest in commencing participation in the whiting fishery. Tribal allocations for 2009–2011 were based on discussions with all three tribes regarding their intent for those fishing years. The table below provides a history of U.S. OYs/ ACLs and the annual tribal allocation in metric tons (mt).

Year	U.S. OY (mt)	Tribal allocation (mt)
2000	232,000	32,500
2001	190,400	27,500
2002	129,600	22,680
2003	148,200	25,000
2004	250,000	32,500
2005	269,069	35,000
2006	269,069	32,500
2007	242,591	35,000
2008	269,545	35,000
2009	135,939	50,000
2010	193,935	49,939
2011	290,903	66,908

Prior to publication of the regulations for the 2011–2012 harvest specification biennial cycle, all three tribes mentioned above indicated their intent to participate at some point during this biennium. The Quinault Nation indicated that they were interested in entering the fishery in 2011, and both the Quileute and Makah Tribes indicated they intended to fish in both 2011 and 2012. Only the Makah tribe participated in the fishery in 2011. Based on exchanges with the tribes during November 2011, and again in January 2012, it appears that only the Makah tribe will participate in the Pacific whiting fishery in 2012.

Since 2008, NMFS and the co-managers, including the States of Washington and Oregon, as well as the Treaty tribes, have been involved in a process designed to determine the long-term tribal allocation for Pacific whiting. At the September 2008 Council meeting, NOAA, the states and the Quinault, Quileute, and Makah tribes met and agreed on a process in which NOAA would provide to the tribes and states of Washington and Oregon a summary of the current scientific information regarding whiting, receive comment on the information and possible analyses that might be undertaken, and then prepare analyses of the information to be used by the co-managers (affected tribes, affected states, and NMFS) in developing a tribal allocation for use in 2010 and beyond. The goal was agreement among the co-managers on a long-term tribal allocation for incorporation into the Council's planning process for the 2010 season. An additional purpose was to provide the tribes the time and information to develop an inter-tribal allocation or other necessary management agreement. In 2009, NMFS shared a preliminary report summarizing scientific information available on the migration and distribution of Pacific whiting on the west coast. The co-managers met in 2009 and discussed this preliminary information.

In 2010, NMFS finalized the report summarizing scientific information available on the migration and distribution of Pacific whiting on the west coast. In addition, NMFS responded in writing to requests from the tribes for clarifications on the paper and requests for additional information. NMFS also met with each of the tribes in the fall of 2010 to discuss the report and to discuss a process for negotiation of the long-term tribal allocation of Pacific whiting.

In 2011, NMFS again met individually with the Makah, Quileute, and Quinault tribes to discuss these matters. Due to the detailed nature of the evaluation of the scientific information, and the need to negotiate a long-term tribal allocation following completion of the evaluation, the process is continuing and will not be completed prior to the 2012 Pacific whiting fishery; thus the tribal allocation of whiting for 2012 will not reflect a negotiated long-term tribal allocation. Instead, it is an interim allocation not intended to set precedent for future allocations.

Tribal Allocation for 2012

It is necessary to propose a range for the tribal allocation, rather than a specific allocation amount, because the specific allocation depends on the amount of the coastwide TAC (United States plus Canada) and corresponding U.S. TAC for 2012 (73.88% of the coastwide TAC). The Joint Management Committee (JMC), which is established pursuant to the _ Agreement between the Government of the United States of America and the Government of Canada on Pacific Hake/Whiting _ (the Agreement), is anticipated to recommend the coastwide and corresponding U.S./Canada TACs no later than March 25, 2012.

In the final Environmental Impact Statement (FEIS) addressing the groundfish fishery for the 2011 and 2012 harvest specifications and management measures, a range of 50 to 150 percent of the 2010 coastwide harvest level was analyzed.

The Council adopted a coastwide Overfishing Limit (OFL) of 973,700 mt for 2011 fisheries using the model-averaged results as recommended by the Council's Scientific and Statistical Committee (SSC). The Council recommended a coastwide harvest level of 393,751 mt for 2011 fisheries. Consistent with the terms of the Agreement, the U.S. allocation of the coastwide harvest level is 73.88 percent, which equated to 290,903 mt for 2011.

In order for the public to have an understanding of the potential tribal whiting allocation in 2012, NMFS is using the range of potential TACs analyzed in the 2011 FEIS to project a range of potential tribal allocations for 2012. Application of this range for 2011 resulted in a potential U.S. TAC of between 96,969 mt and 290,903 mt.

As described above, based on exchanges with the tribes during November 2011, and more recently in January, 2012, it appears that only the Makah tribe will participate in the Pacific whiting fishery in 2012, and they have requested 17.5% of the U.S. TAC. Application of this percentage to the range of U.S. TACs results in a tribal allocation of between 16,970 and 50,908 mt for 2012. NMFS believes that the current scientific information regarding the distribution and abundance of the coastal Pacific whiting stock suggests that 17.5 percent of the U.S. TAC is within the range of the tribal treaty right to Pacific whiting.

As described earlier, NOAA Fisheries proposes this rule as an interim allocation for the 2012 tribal Pacific whiting fishery. As with past allocations, this proposed rule is not intended to establish any precedent for future whiting seasons or for the long-term tribal allocation of whiting.

The proposed rule would be implemented under authority of Section 305(d) of the Magnuson-Stevens Act, which gives the Secretary responsibility to ''carry out any fishery management plan or amendment approved or prepared by him, in accordance with the provisions of this Act.'' With this proposed rule, NMFS, acting on behalf of the Secretary, would ensure that the FMP is implemented in a manner consistent with treaty rights of four Northwest tribes to fish in their ''usual and accustomed grounds and stations'' in common with non-tribal citizens. *United States* v. *Washington,* 384 F. Supp. 313 (W.D. 1974).

Reapportionment of Pacific Whiting

NMFS proposes to reinstate its regulatory authority to reapportion whiting from the tribal allocation to the non-tribal fishery when the tribes participating in the fishery will not take the entire tribal allocation during the fishing year. From 1997 through 2010, 50 CFR 660.323(c) provided authority to NMFS to undertake such reapportionment. For 2011, the regulatory provisions regarding reapportionment of tribal whiting allocation to the non-tribal fishery were eliminated when regulations implementing Amendment 21 were adopted in support of the trawl rationalization program. Revisions to the groundfish regulations at § 660.55 defined how ''off the top'' set-asides for all species, including the tribal allocation of Pacific whiting, would be dealt with. The new provisions did not allow flexibility to return the ''off the top'' set asides, including those for Pacific whiting, to other sectors of the fishery. Following implementation of the catch share program, the Council had additional discussions about reapportionment of the tribal allocation of Pacific whiting. The Council recommended that NMFS reinstate reapportionment provisions in order to promote full utilization of the Pacific whiting resource. NMFS is taking action at this time to reinstate similar reapportionment provisions, recognizing that modifications are needed to fit within the new regulatory structure implemented for the IFQ fishery.

By September 15 of the fishing year, the Regional Administrator will consider, based on discussions with tribal representatives, the tribal harvests to date and catch projections for the remainder of the year relative to the tribal allocation as specified at § 660.50 of Pacific whiting. That portion of the tribal allocation the Regional Administrator determines will not be used by the end of the fishing year may be made available for harvest by the other sectors of the trawl fishery, on September 15 or as soon as practicable thereafter. Based on the same factors described above, the Regional Administrator may reapportion whiting again at a later date to ensure full utilization of the resource. Any reapportionment of Pacific whiting from the tribal to the non-tribal sectors will be distributed in a manner consistent with the initial allocation of Pacific whiting among the non-tribal sectors, with 34 percent to the catcher-processor sector, 24 percent to the mothership sector, and 42 percent to the shorebased sector.

Current regulations at 50 CFR 660.140(d)(3)(ii)(B)(3) require that all Quota Pounds (QP) or Individual Bycatch Quota (IBQ) pounds from a Quota Share (QS) account must be transferred to one or more vessel accounts by September 1 of each year. This effectively closes QS accounts for the year.

If the Regional Administrator makes a decision to reapportion Pacific whiting from the tribal to the non-tribal fishery after September 1 in any year, the following actions will be taken.

NMFS will credit QS accounts with additional Pacific whiting quota pounds proportionally, based on the whiting QS percent for a particular QS permit owner and the amount of the sector reapportionment. The QS account transfer function will be reactivated by NMFS for a period of 30 days to allow permit holders to transfer only Pacific whiting QP to vessel accounts. After 30 days, the transfer function in QS accounts will again be deactivated. If an additional reapportionment of Pacific whiting occurs, the same procedures will be followed.

Classification

NMFS has preliminarily determined that the management measures for the 2012 Pacific whiting tribal fishery are consistent with the national standards of the Magnuson-Stevens Act and other applicable laws. NMFS, in making the final determination, will take into account the data, views, and comments received during the comment period.

The Office of Management and Budget has determined that this proposed rule is not significant for purposes of Executive Order 12866.

An IRFA was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A summary of the analysis follows. A copy of this analysis is available from NMFS (see **ADDRESSES**).

Under the RFA, the term ''small entities'' includes small businesses, small organizations, and small governmental jurisdictions. The SBA has established size criteria for all different industry sectors in the US, including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts less than $4.0 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. A wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons at all its affiliated operations worldwide. For marinas and charter/party boats, a small business is a business with annual receipts less than $7.0 million. For nonprofit organizations, the RFA defines a small organization as any nonprofit enterprise that is independently owned and operated and is not dominant in its field. The RFA defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000.

Over the past five years (2007 to 2011), the total whiting fishery (tribal and non-tribal) has averaged landings of 197,000 mt annually, worth $36 million in terms of ex-vessel revenues. As the U.S. OY/ACL has been highly variable during this time, so have landings. During this period, landings have ranged from 121,000 mt (2009) to 248,000 mt (2008). Landings for 2011 are estimated to be about 197,000 mt. Ex-vessel revenues have also varied. Annual ex-vessel revenues have ranged from $14 million (2009) to $58 million (2008). Ex-vessel revenues in 2011 were about $46 million. As landings have varied, so have prices. These prices are largely determined by the world market for groundfish as most of the whiting harvested is exported. Ex-vessel prices have ranged from $116 per mt (2009) to $236 per mt (2008). Average ex-vessel price for whiting in 2011 was $232 per mt. Note that the use of ex-vessel values does not take into account the wholesale or export value of the fishery or the costs of harvesting and processing whiting into a finished product. NMFS does not have sufficient information to make a complete assessment of these values.

The Pacific whiting fishery harvests almost exclusively Pacific whiting. While bycatch of other species occurs, the fishery is constrained by bycatch limits on key overfished species. This is a high-volume fishery with low ex-vessel prices per pound. This fishery has seasonal aspects based on the distribution of whiting off the west coast. The whiting fishery has four components. The shorebased fishery delivers their catch to processing facilities on land. Most of these vessels also deliver other groundfish species to shorebased plants. This fishery is managed under an individual fishing quota system. In the mothership sector, catcher vessels deliver to floating processors called motherships. This fishery is managed under a single mothership co-op—the Whiting Mothership Cooperative. The catcher-processor fleet consists of vessels that both catch the fish and process it aboard. This fishery is also managed under a co-op—the Pacific Whiting Conservation Cooperative.

The fourth component of the fishery is the tribal fishery. Since 1996, there has been a tribal allocation of the U.S. whiting TAC. There are three tribes associated with the whiting fishery: Makah, Quileute, and Quinault.

There are two key features of this rule making: establishing the 2012 interim tribal allocation and reinstatement of regulatory authority to reapportion whiting from the tribal to the non-tribal fishery. The alternatives are ‘‘No-Action’’ vs. the ‘‘Proposed Action’’. The proposed allocation, based on discussions with the tribes is for NMFS to allocate 17.5 percent of the U.S. total allowable catch for 2012. NMFS did not consider a broader range of alternatives to the proposed allocation. The tribal allocation is based primarily on the requests of the tribes. These requests reflect the level of participation in the fishery that will allow them to exercise their treaty right to fish for whiting. Consideration of amounts lower than the tribal requests is not appropriate in this instance. As a matter of policy, NMFS has historically supported the harvest levels requested by the tribes. Based on the information available to NMFS, the tribal request is within their tribal treaty rights, and the participating tribe has historically shown an ability to harvest the amount of whiting requested. A higher allocation would be, arguably, within the scope of the treaty right. However, a higher allocation would unnecessarily limit the non-tribal fishery. A no action alternative was considered, but the regulatory framework provides for a tribal allocation on an annual basis only. Therefore, no action would result in no allocation of Pacific whiting to the tribal sector in 2012, which would be inconsistent with NMFS' responsibility to manage the fishery consistent with the tribes' treaty rights. Given that there is a tribal request for allocation in 2012, this alternative received no further consideration.

There are two alternatives associated with reinstating the authority to reapportion unused Pacific whiting from the tribal fishery to the non-tribal fishery. The ‘‘No-Action’’ alternative is the authority not reinstated. The ‘‘Proposed’’ Alternative would be to reinstate the authority.

NMFS has reviewed analyses of fish ticket data and limited entry permit data, available employment data provided by processors, information on Tribal fleets, and industry responses to a 2010 survey on ownership and has developed the following estimates for the whiting fishery. There are four affected components of this fishery-Shorebased whiting, mothership whiting, catcher-processor, and tribal. In the shorebased whiting fishery, quota shares of whiting were allocated to 138 entities including ten shoreside processing companies. These entities can fish the quota pounds associated with their quota shares, transfer their quota pounds to other to fish, or choose not to fish their quota pounds. Whiting is landed as bycatch in other fisheries or as a target catch in the whiting fishery. To analyze the number of participants primarily affected by this rule making, targeted whiting trips are defined as landings that contained 5,000 pounds or more of whiting. During 2011, 62 vessels landed a total of about 200 million pounds of whiting. Of these vessels, only 26 vessels had landings greater than 5,000 pounds. Thirteen of these 26 vessels are ‘‘small'' entities. These 26 vessels delivered their catch to 10 processing companies. These 10 processing companies, either through ownership or affiliation, can be organized into to 6 entities. Four of these 6 entities are ‘‘small'' entities. There are 37 limited entry permits that have mothership whiting catch history assignments. During 2011, these 37 permits pooled their whiting catch history assignments into a single mothership fishery co-op. Approximately half of these vessels are ‘‘small'' entities. Vessels in the mothership co-op deliver their catch to mothership processors. There are 6 mothership processing companies; three or which are ‘‘small'' entities. The catcher-processor fleet has ten limited entry permits and 10 vessels, owned by three companies. These three companies are considered ‘‘large'' companies mainly because of their operations off Alaska. The tribal fleet is comprised of 5 vessels considered to be ‘‘small'' entities, while the 3 tribal governments, based on population sizes, are considered ‘‘small'' entities.

The expected effect of the ‘‘Proposed'' alternative relative to the ‘‘No Action'' alternative is to allow unharvested tribal allocations of whiting to be fished by the non-tribal fleets, benefitting both large and small entities. With the implementation of Amendments 20 and 21, the ability to reapportion whiting from tribal to the non-tribal fishery was eliminated for 2011. Pending markets, available bycatch, and the ability of tribal fleets to develop the capacity to harvest the tribal allocation there may be uncaught whiting in the tribal fishery because there is no regulatory mechanism to transfer uncaught whiting to the non-tribal fishery. For 2010, the tribes were initially allocated 49,939 mt. As tribal harvests were projected to be about 16,000 mt, in September 2010 and October 2010, NMFS reapportioned a total of 16,000 mt of whiting from the tribal allocation to the non-tribal shorebased, mothership, and catcher processor sectors. Unlike 2010, for 2011, NMFS was not authorized to reapportion unharvested tribal whiting to the non-tribal sectors. Tribal harvests as of October 7, 2011 were about 19 percent of the 66,908 mt allocation indicating that about 54,000 tons of the tribal allocation would go unfished. This rulemaking would reinstate the regulatory authority to reapportion whiting from the tribal to the non-tribal fishery. If NMFS was authorized in 2011 to reapportion half or more of the 54,000 mt unfished tribal allocation, the ex-vessel revenues could have increased by as much as $6.0 million.

This proposed rule would directly regulate which entities can harvest whiting. This rule would allocate fish between tribal harvesters (harvest vessels are small entities, tribes are small jurisdictions) to non-tribal harvesters (a mixture of small and large businesses). Tribal fisheries are a mixture of activities that are similar to the activities that non-tribal fisheries undertake. Tribal harvests are delivered to both shoreside plants and motherships for processing. These processing facilities also process fish harvested by non-tribal fisheries.

NMFS believes this proposed rule would not adversely affect small entities and is likely to be beneficial to both small and large entities as it allows unharvested tribal fish to be harvested by non-tribal harvesters. Nonetheless, NMFS has prepared this IRFA and is requesting comments on this conclusion.

There are no reporting, recordkeeping or other compliance requirements in the proposed rule.

No Federal rules have been identified that duplicate, overlap, or conflict with this action.

NMFS issued Biological Opinions 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 Pacific Coast groundfish FMP fisheries 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). These biological opinions have concluded that implementation of the FMP for the Pacific Coast groundfish fishery was 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.

NMFS issued a Supplemental Biological Opinion on March 11, 2006 concluding that neither the higher observed bycatch of Chinook in the 2005 whiting fishery nor new data regarding salmon bycatch in the groundfish bottom trawl fishery required a reconsideration of its prior ''no jeopardy'' conclusion. NMFS also reaffirmed its prior determination that implementation of the Groundfish PCGFMP is not likely to jeopardize the continued existence of any of the affected ESUs. Lower Columbia River coho (70 FR 37160, June 28, 2005) and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead.

NMFS has reinitiated consultation on the fishery to address newly listed species including Pacific eulachon and green sturgeon, and other non-salmonid listed species (marine mammals, sea birds, and turtles). NMFS will be completing a consultation on listed marine species for the 2012 groundfish fishery by the end of January 2012, and expects that consultation on seabirds will be completed prior to late summer of 2012. Further, NMFS has concluded that take of any marine species that will be covered by the opinion to be issued in early 2012 is very unlikely to occur prior to completion of that opinion, and that take of listed seabirds is unlikely to occur in 2012. Marine Mammal Protection Act (MMPA)

Impacts resulting from fishing activities proposed in this rule are discussed in the FEIS for the 2011–12 groundfish fishery specifications and management measures. As discussed above, NMFS does not anticipate incidental take of ESA-listed marine mammals prior to the completion of the 2012 ESA consultation covering these species. NMFS expects to complete the process leading to any necessary authorization of incidental taking under MMPA section 101(a)(5)(E) concurrent with the 2012 biological opinion.

Pursuant to Executive Order 13175, this proposed rule was developed after meaningful consultation and collaboration with tribal officials from the area covered by the FMP. Consistent with the Magnuson-Stevens Act at 16 U.S.C. 1852(b)(5), one of the voting members of the Pacific Council is a representative of an Indian tribe with federally recognized fishing rights from the area of the Council's jurisdiction. In addition, NMFS has coordinated specifically with the tribes interested in the whiting fishery regarding the issues addressed by this rule.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, Indian fisheries.

Dated: February 16, 2012.

Alan D. Risenhoover,

Acting Deputy Assistant Administrator for Regulatory Programs, 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

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

Authority: 16 U.S.C. 1801 *et seq.* and 16 U.S.C. 773 *et seq.*

2. In § 660.50, paragraph (f)(4) is revised to read as follows:

§ 660.50 Pacific Coast treaty Indian fisheries.

* * * * *

(f) * * *

(4) *Pacific whiting.* The tribal allocation for 2012 will be 17.5 percent of the U.S. TAC.

* * * * *

3. In § 660.60 paragraphs (d)(1)(iv),and (v) are revised and paragraphs(d)(1)(vi) and(d)(2) are added to read as follows:

§ 660.60 Specifications and management measures.

* * * * *

(d) * * *

(1) * * *

(iv) Reapportionment of the unused portion of the tribal allocation of Pacific whiting to the IFQ, mothership and catcher processor Pacific whiting fisheries.

(v) Implement the Ocean Salmon Conservation Zone, described at § 660.131(c)(3), when NMFS projects the Pacific whiting fishery may take in excess of 11,000 Chinook within a calendar year.

(vi) Implement Pacific Whiting Bycatch Reduction Areas, described at § 660.131(c)(4) Subpart D, when NMFS projects a sector-specific bycatch limit will be reached before the sector's whiting allocation.

(2) Automatic actions are effective when actual notice is sent by NMFS. Actual notice to fishers and processors

will be by email, Internet (*www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Whiting-Management/index.cfm*), phone, fax, letter, or press release. Allocation reapportionments will be followed by publication in the **Federal Register**, in which public comment will be sought for a reasonable period of time thereafter.

4. In § 660.131 a new paragraph (h) is added to read as follows:

§ 660.131 Pacific whiting fishery management measures.

* * * * *

(h) Reapportionment of Pacific Whiting.(1) By September 15 of the fishing year, the Regional Administrator will, based on discussions with representatives of the tribes participating in the Pacific whiting fishery for that fishing year, consider the tribal harvests to date and catch projections for the remainder of the year relative to the tribal allocation as specified at § 660.50 of Pacific whiting. That portion of the tribal allocation that the Regional Administrator determines will not be used by the end of the fishing year may be reapportioned to the other sectors of the trawl fishery in proportion to their initial allocations, on September 15 or as soon as practicable thereafter. Subsequent reapportionments may be made based on subsequent determinations by the Regional Administrator based on the factors described above in order to ensure full utilization of the resource.

(2) The reapportionment of surplus whiting will be made effective immediately by actual notice under the automatic action authority provided at 660.60 (d)(1).

(3) Estimates of the portion of the tribal allocation that will not be used by the end of the fishing year will be based on the best information available to the Regional Administrator.

5. In § 660.140 paragraph (d)(1)(ii) and (d)(3)(ii)(B)(*3*) are revised to read as follows:

§ 660.140 Shorebased IFQ program.

* * * * *

(d) * * *

(1) * * *

(ii) Annual QP and IBQ pound allocations. QP and IBQ pounds will be deposited into QS accounts annually. QS permit owners will be notified of QP deposits via the IFQ Web site and their QS account. QP and IBQ pounds will be issued to the nearest whole pound using standard rounding rules (*i.e.* , decimal amounts less than 0.5 round down and 0.5 and greater round up), except that in the first year of the Shorebased IFQ Program, issuance of QP for overfished species greater than zero but less than one pound will be rounded up to one pound. Rounding rules may affect distribution of the entire shorebased trawl allocation. NMFS will distribute such allocations to the maximum extent practicable, not to exceed the total allocation. QS permit owners must transfer their QP and IBQ pounds from their QS account to a vessel account in order for those QP and IBQ pounds to be fished. QP and IBQ pounds must be transferred in whole pounds (*i.e.* , no fraction of a QP or IBQ pound can be transferred). All QP and IBQ pounds in a QS account must be transferred to a vessel account by September 1 of each year in order to be fished, unless there is a reapportionment of Pacific whiting consistent with §§ 660.131(h) and 660.140(d)(3).

* * * * *

(3) * * *

(ii) * * *

(B) * * *

(*3*) *Transfer of QP or IBQ pounds from a QS account to a vessel account.* QP or IBQ pounds must be transferred in whole pounds (*i.e.* no fraction of a QP can be transferred). QP or IBQ pounds must be transferred to a vessel account in order to be used. Transfers of QP or IBQ pounds from a QS account to a vessel account are subject to vessel accumulation limits and NMFS' approval. Once QP or IBQ pounds are transferred from a QS account to a vessel account (accepted by the transferee/vessel owner), they cannot be transferred back to a QS account and may only be transferred to another vessel account. QP or IBQ pounds may not be transferred from one QS account to another QS account. All QP or IBQ pounds from a QS account must be transferred to one or more vessel accounts by September 1 each year. If the Regional Administrator makes a decision to reapportion Pacific whiting from the tribal to the non-tribal fishery after September 1 in any year, the following actions will be taken.

(*i*) NMFS will credit QS accounts with additional Pacific whiting QP proportionally, based on the whiting QS percent for a particular QS permit owner and the amount of the sector reapportionment of whiting.

(*ii*) The QS account transfer function will be reactivated by NMFS for a period of 30 days from the date that QS accounts are credited with additional Pacific whiting QP to allow permit holders to transfer only Pacific whiting QP to vessel accounts.

(*iii*) After 30 days, the transfer function in QS accounts will again be inactivated.

* * * * *

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Joint U.S.-Canada Scientific Review Group Report

Watertown Hotel
Seattle, Washington
February 21-24, 2012

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Introduction

Under the authority of the Canada/US Pacific Hake/Whiting Treaty ("The Treaty"), the Scientific Review Group (SRG) met in Seattle, Washington, 21 to 24 February, 2012, to review a draft stock assessment document prepared by the Canada/US Joint Technical Committee (JTC). With ratification of "the Treaty" by both parties, the SRG has attempted to operate fully in accordance with "the Treaty." The SRG bases its interim terms of reference on the language of the US-Canada Pacific Hake/Whiting Agreement and on the Pacific Fishery Management Council's Stock Assessment and Review (STAR) terms of reference, which have been used for Pacific hake for over ten years. The SRG was comprised of two US and two Canadian members; two additional SRG members are yet to be designated by Joint Management Committee (JMC) based on recommendations from the Advisory Panel (AP). The SRG will revisit its terms of reference before 2013 and submit proposed revisions to the JMC for approval.

The meeting convened at 9AM Tuesday, February 21, 2012, with a welcome from Dr. Jim Hastie (NWFSC, FRAM Division) followed by a round of introductions. Dr. Richard Methot (meeting chair) then reviewed the agenda, SRG interim Terms of Reference and clarified the role of the SRG advisors.

Summary Conclusions

1. The US-Canada acoustic trawl survey estimated the biomass of hake to be 521,000 mt in summer 2011. The stock was dominated by three-year old fish from the 2008 yearclass, and nearly all these fish were in U.S. waters, thus only 7% of the overall estimate of biomass was in Canadian waters at the time of the survey. Later in the year a larger fraction of the stock may have moved into Canadian waters, however the Canadian fleet was still unable to harvest its full allocation. The SRG examined several technical aspects of the survey and found it to be conducted with acceptable protocols and standardization.
2. The assessment modeling was conducted using the Stock Synthesis (SS) model, and sensitivity analyses were conducted with the Canadian Catch-Age Model (CCAM). Both models give nearly identical results when similarly configured. The SRG applauds the substantial work done by the joint assessment team over the past few years to explore alternative modeling software and assessment scenarios of various complexities. The current approach, which implements a relatively simple base case in the SS model and sensitivity runs in CCAM model, is pragmatic and parsimonious. The approach resulted in a base-case assessment model whose sensitivities were thoroughly examined. While SS and CCAM are

quite similar, their structure is different enough that a small measure of model-specification uncertainty was among the issues examined.

3. The 2011 survey estimate of stock biomass is considerably lower than the 2009 survey estimate, which results in a lower estimate of terminal stock abundance from the 2012 assessment, along with correspondingly higher estimates of recent exploitation rates. Given realistic rates of hake population growth and decline, it is highly unlikely that the population state has shifted as much as the survey estimates. The current assessment is in closer agreement with the 2011 survey estimate than with the 2009 survey estimate. The shift in perceived stock status from one assessment to the next reflects the inherent variability of a biennial acoustic survey, the major data source defining hake abundance changes over time.
4. The estimate of spawning stock abundance at the start of 2012 is at 33% of the unfished equilibrium level, which is near the long-term average expected when fishing at the default harvest rate but below the management target of 40% of the unfished equilibrium level. The stock is expected to stay near this level for the next two years as the 2008 yearclass grows and is supplemented by additional yearclasses. However, estimates of yearclass abundance for 2008 and beyond are very uncertain, and until cohorts are fully recruited to the fishery and observed for several years we do not have a good understanding of their true magnitude.
5. Although the stock is estimated to be near its target level, this situation is tenuous because of the dominance by a single yearclass. Harvesting at less than the default level in 2012 would reduce the risk of stock and fishery declines in the future.
6. Two major research recommendations are to increase the survey frequency to annual and to conduct a management strategy evaluation (MSE). An annual survey would resolve yearclass abundance more quickly and provide more stable assessment advice over time. Initiating an annual survey immediately (i.e., adding an additional full survey in 2012) is expected to provide immediate improvements to the 2013 stock assessment by helping resolve the discrepancy between the 2009 and 2011 acoustic estimates of biomass and improving precision of 2013 assessment estimates. It was noted by the acoustics team however that conducting a full-scale survey in 2012 would replace currently planned research into the development of more efficient survey methods that could provide a more cost-effective means of achieving an annual survey on an ongoing basis. Thus, while a 2012 survey would help better inform management in 2013, research into increased survey efficiency / precision could help better inform management in the long-term. Even if increased shiptime can be made available in 2012, experienced staff will be a limiting factor, so a trade-off between these short-term and long-term benefits will be necessary. The MSE

would provide a framework to test the performance of the current default harvest policy against alternative policies while taking into account the degree of recruitment fluctuations, the frequency and uncertainty of surveys, and other relevant factors.

Discussion on Acoustic/Trawl Survey

Dr. Dezhang Chu opened the meeting with a detailed presentation of the acoustic/trawl survey design, acoustic calibration technique, target verification trawl selection process, echogram scoring methodology, and biomass estimation using kriging. Since 1995 the survey has consistently covered between 35.5° and 55° N latitude, and 50 to 1500m depth along the Pacific coast of the U.S. and Canada between June and September each survey year. Prior to 2001 the survey was triennial, since then it has been biennial. Transects are mostly parallel to lines of latitude, spaced 10 Nmi apart and are assigned a random starting location in the south at the beginning of each survey. The vessels employed generally operate 15 hours a day from sunrise to sunset using 18, 38, 70, 120, and 200kHz, (only 38, 120 on Canadian vessel) transducers; 38 kHz is used for biomass estimation. Mid-water trawls are used to collect species composition information to aid in classification of the acoustic backscatter and to collect biological samples on the size and age composition of the hake targets being assessed. Trawl sampling is opportunistic and usually accounts for about 1/3 of each day's operational time. A third-wire real time scanning sonar is used to assure that catches are small enough to be manageable.

The acoustic calibration technique was discussed; the acoustic team reported that calibrations are performed in sheltered waters prior to each survey using either a standard target 38.1 mm tungsten carbide sphere or 64 mm copper sphere. The SRG asked how stable the calibrations were over time for a single vessel and how much difference there was between vessels. The acoustics team presented a plot of calibration values that showed a spread of approximately 0.5 dB for the Miller Freeman over the last two years, but less than 0.2 dB within the most recent survey (Figure 1). The consensus was that it was unlikely that drift in calibration was a significant source of variation in the acoustic estimate of biomass. They also reported that preliminary inter-vessel calibrations had been attempted, but that due to operational requirements this work is incomplete.

Dr Chu described the methods used to integrate (add up) backscatter (sound reflections from hake) over the survey frame. This starts with having two acousticians agree on and draw regions around hake targets on echograms. Thus, the method relies on the abilities and experience of individual acousticians at identifying hake, but this is supplemented with information on the frequency responses of sound reflection from different species, as seen on the echograms for the higher frequencies transducers, and the composition of nearby target-verification tows. Several sources of potential bias or error were discussed, including use of an inaccurate target-strength relationship, misclassification of acoustic regions based on species proportions, and missed biomass due to higher than normal dispersion of hake. The team reported that they have been using the target strength relationship defined by Traynor (1996) and had confirmed this relationship in situ using the Drop Acoustic Array (DAISY). The team also reported that, of the several hundred hake regions identified during the 2011 survey, only five had been classed as containing mixed species; hence misclassification due to species misidentification was deemed a negligible source of bias for the 2011 survey.

Dr Chu continued with a description of the geostatistical approach (termed kriging) to biomass and variance estimation. Kriging can accommodate irregular survey transects and better account for patchy fish distribution than the methods used previously. The input data are a set of half Nmi biomass density values. The kriged estimates are interpolated to a 2.5 nmi grid coast wide. The kriged map is interpolating the expected density across the range of the survey, so that expected density is smoother across space than the variability among the original observations. It was noted that data were much patchier in 2011 than any other year, with much shorter spatial autocorrelation, meaning that hake schools, when encountered, were smaller. Once the grid of biomass density and variance is calculated, biomass in each cell is partitioned by length, sex and age (based on target-verification tows) to generate a composite biomass estimate for hake greater than age two. (Age one fish are excluded from the biomass estimate because of the survey's poor selectivity for this age class.) The kriging method is superior to that used previously in that it accounts for spatial autocorrelation and generates an estimate of the sampling error associated with interpolation. The approach does not account for other sources of uncertainty such as target strength, target classification, and survey extent relative to stock distribution.

The SRG asked the survey team what the implication of missed low density hake abundance might be. The team responded by producing a swept volume estimate of hake assuming the trawl catch per unit effort in tows classified as having no hake represented the background density of dispersed hake coastwide. This density was applied to areas with low or no hake, assuming this low density layer was 200 m thick, which resulted in an estimate equal to 1.4% of entire biomass index for 2011 or 7,685.4mt. Given the low estimate of this difference and the uncertainties in the survey estimate, the SRG concluded that any cryptic biomass attributable to low background densities of hake was likely negligible. The SRG recognizes that the fishery may at times fish in areas containing lower hake densities, but the bulk of the hake population is found in the large aggregations measured by the survey.

Discussion on 2011 Coastwide Acoustic Survey Result

Dr. Rebecca Thomas presented an overview of the 2011 acoustic survey. Survey activities began on June 26th aboard the NOAA Ship *BELL M. SHIMADA* and concluded on September 10th aboard the CCGS *W.E. RICKER*. Eighty transects were completed; modifications from previous years surveys included adding three additional transect at the southern extent of the survey frame to investigate the distribution of one year old fish, the re-orientation of transects off Vancouver island to make them perpendicular to the continental slope, and skipping several transects in northern BC due to time constraints.

The survey's initial estimate of biomass that was used in the draft stock assessment presented to the SRG was 553,991 mt, but this was revised downward to 521,476 mt on February 20, 2012 (the day before the meeting) to correct erroneous inclusion of age-1 hake in one transect. Approximately 92% of hake biomass was observed in US waters.

Acoustic team explanation for revision:

> One region of Age-1 hake was included in the hake biomass due to a data processing error from a change in transect numbering. The additional transects that were added to the survey to cover the Southern extent of the Age-1 hake were initially assigned negative transect numbers since they were further South than transect 1 of the designed survey. This caused a problem for the historical method of calculation in the Oracle database which is unable to process negative transect numbers. These transects were renamed 0.3, 0.5, and 0.7. In the EchoPro software, transects are selected for use in the biomass calculations in several lines of the program and in one of the lines one transect with Age-1 hake was not deselected and therefore Age-1 hake were used in the biomass calculation. We discovered the biomass error when producing our presentations for the SRG panel and Dr. Chu recalculated the biomass which resulted in a biomass of 521,476 mt with a CV 0.1018 which is a 6% decrease from the biomass used in the draft assessment.

Most biomass was observed north of Monterey, except age one fish which were found further south, with large aggregations seen around 41° N. The SHIMADA completed a few transects off northern Vancouver Island when the RICKER skipped ahead to survey pre-planned transects in an area where the fleet had been finding fish. During these transects the SHIMADA did encounter hake where the RICKER had not been seeing fish, bringing into question the comparability of the two vessel's sounders. This question was resolved when backscatter plots were examined and it was determined that the RICKER had observed hake in the transects immediately north and south of the schools identified by the SHIMADA.

When all target-verification trawls are lumped, approximately 80% of the catch by weight was hake, except off La Perouse Bank, off the southwest Vancouver Island, and in

Dixon Entrance where both walleye pollock and Pacific ocean perch were caught in significant quantities in tows that did not contain hake.

As is typical, larger and older fish were encountered as the survey progressed northward, but an atypical number of age one were encountered mostly in the south and with some scattered to the north. The 2008 year class (age 3 fish) dominated the catches. The acoustic age composition was 62% age 3s, 22% age 2s, 3-4% each of age 4, 5 and 6, with a few age 12 – 19 fish still present.

Mandated marine mammal avoidance protocols resulted in the loss of 10 opportunities to complete a target verification tow between transects 6 and 10 near Monterey. This was a transitioning area between age 1 and older hake, with approximately 14% of the biomass in transects 6-10 being age 1 fish. The missed sampling did increase uncertainty in the age proportions for these fish, but the worst case scenario (all fish assumed age 2+) would have resulted in a 15% increase in adult hake biomass coastwide. The actual impact is likely much smaller, and it could be in the other direction.

The implications of fish growth during the survey were considered. For the youngest fish (ages 1-3) there could be significant growth over the course of the survey; this is, however, confounded with larger fish at age being found further north, making it difficult to account for. The SRG concluded that any bias due to growth would be minor, compared to the variation in survey biomass estimates from year to year.

Likewise, the implications were considered of surveying a stock of fish that is migrating northward while the survey also tracks south to north, e.g. a Doppler effect. This could potentially result in seeing the same schools of hake more than once during the survey, which would lead to an inflation of the biomass estimate; however, the acoustic team responded that the survey moves fast enough for this not to be a concern. The SRG was satisfied with this response.

Discussion on US Pacific Hake (aka Whiting) Fishery

US fleets had an aggregate allocation of 290,000 tonnes, divided amongst the catcher processor (~120,000 tonnes), shore based (~100,000 tonnes), and tribal (~60,000 tonnes) fleets. The fleets caught 230,425 tonnes (79% of target), the shortfall being mainly due to uncaught tribal allocation. At-sea catches peaked in the spring and late fall (May/June, Nov/Dec) due largely to vessels leaving to participate in the Alaskan walleye pollock fishery midsummer, but also due in part to the lower bycatch rates achieved in the spring and fall. The shore based fleet displays the opposite pattern, with a slow start in the spring and peak landings in mid-summer.

Catcher processors fished predominantly in the north in spring, and by October/November/December their fishing moved further south (mainly Oregon), reversing the pattern of some previous years. This was the first year of fully rationalized fishery, consequently the mother ships worked as a co-op to optimize catch and reduce bycatch.

Catch from catcher processors was largely composed of three year olds (60% overall). The shore based catch was even more dominated by three years olds, which accounted for ~ 80% of the catch. This reflects the importance of the 2008 yearclass to this fishery and stock.

Discussion on Canadian Fishery

The Canadian fleet had an allocation in 2011 of 102,848 tonnes, plus carry over from the previous year, resulting in a Canadian TAC of ~109,000 tonnes. The total catch was 55,630 tonnes, with 9,720 tonnes of that being caught by the joint venture fleet. The shore side and at sea processor fisheries continued well into December, the JV fishery concluded on September 21st. Fishing was reported to be sporadic, aggregations were small and readily dispersed when fished, movements onto traditional fishing grounds appeared to be tidally driven with a cyclic ebb and flow of fish moving in from offshore. Approximately 30% of this year's catch was achieved by catcher processors with a significant proportion (~15-20%) coming from deep water areas not covered by survey. The fishery was dominated by 4 and 5 year olds, with a few 12s still showing up. Smaller three year old fish were not present in the Canadian zone in any numbers until August along the Canada/US border.

Discussion on Data for Assessment

Dr. Ian Stewart presented an overview of the data sources used as input for both the Stock Synthesis (SS) and Canadian Catch-Age Model (CCAM) assessment models. Both assessment models were fit to (i) fishery catch (1966 – 2011), (ii) commercial fishery age frequencies (1975 – 2011), (iii) the relative biomass index from the acoustic survey (1995 – 2011), and (iv) acoustic survey age frequencies (1995 – 2011). Other externally-derived inputs to the model included a maturity schedule, ageing error adjusted for a strong cohort effect, and a matrix of empirically-derived weight-at-ages between 1975 and 2011.

The biomass estimate series from the acoustic surveys is used as an abundance index, rather than as estimates of absolute abundance, in this assessment. Thus, a catchability coefficient (scaling coefficient) is estimated by the assessment model; this coefficient is assumed constant over time.

Limitations of relying on the acoustic survey biomass index to inform the abundance patterns of the stock were discussed, including the small number of survey observations available (only 8 data points between 1995 and 2011) and high variability between consecutive observations in some cases. Both age and climatic factors affect how far north hake migrate in any given year, but the relative contributions of these two factors are impossible to estimate from the 8 existing data points. The combination of highly variable recruitment and highly uncertain surveys give the assessment model insufficient information to resolve the magnitude of new yearclasses until they have been observed for several years in the fishery and in the survey.

The SRG considered whether updating the maturity schedule for Pacific hake should be a high research priority. The current schedule was derived in the 1990's, and the stock has undergone substantial changes in growth since that time. Updating the maturity schedule would not necessarily improve the clarity of the stock recruitment relationship within the assessment model; however, it may have a substantial effect of the calculation of reference points and current spawning biomass. It was noted that while changing reference points based on short-term temporal fluctuations in maturity schedules could have the undesirable effect of introducing higher variability into catches, such changes may be warranted if longer-term evolutionary trends were occurring. For this reason, further research into current maturity schedules for Pacific hake were endorsed as a high research priority. The issue of how often to update reference points for Pacific hake was identified as a potential research question for an MSE analysis.

Discussion on Stock Assessment Analyses

Dr. Stewart presented an overview of the assessment modelling efforts in 2012. Two independent statistical catch-at-age modelling tools were used to assess current stock status and make forecasts for future stock status: (1) the Stock Synthesis model (SS), which has been used for several hake assessments in recent years, and (2) a new Canadian Catch at Age model (CCAM). Extensive work was undertaken by the JTC in 2011 and 2012 to resolve differences between the SS and CCAM models, with the result that both models now are producing similar results. The JTC decided to use the SS model for the base case scenario for the assessment and the CCAM model to explore sensitivity scenarios. The rationale for using a single base case model rather than two side-by-side base cases, as was done in 2011, was that a single model does an adequate job of capturing perceived stock status through time and allows for more emphasis to be placed on communicating uncertainty, both within the base case model and between alternative model structures.

The base case SS model was much more parsimonious than some of the assessment models used for hake in recent years. A total of 80 parameters are estimated, including the unfished equilibrium recruitment level, spawner-recruitment steepness, natural mortality, survey catchability, an additional standard error term for the acoustic survey to represent process error, non-parametric fishery and survey selectivity parameters for each age up to age 6 (constant over all years), and 66 recruitment deviations. The model was fully Bayesian, and showed good convergence properties. While there was some confounding between equilibrium recruitment and natural mortality, this behaviour is to be expected for these types of models with limited contrast over time in the data.

The CCAM model was used to evaluate the sensitivity of the base case model results to structural uncertainty. While SS and CCAM are functionally similar, there are some differences including: (i) CCAM uses a multivariate logistic likelihood function to model catch-at-age residuals rather than a multinomial likelihood function, (ii) the partitioning of process and observation error differs, (iii) inclusion of an informative prior on survey catchability in CCAM, and (iv) the use of parametric selectivity functions in CCAM. Despite these differences, the models achieved very similar results.

The rationale for excluding time-varying selectivity was raised by the SRG. It was noted by the JTC that more complicated selectivity structures have been considered in past assessments, including dome-shaped selectivity and several forms of time-varying selectivity, but that those models were criticized as being overparameterized, requiring subjective decisions, and not robust enough to inform decision-making. The SRG concluded that while the assumption of constant selectivity over time was a simplifying assumption relative to the complexity of the actual fishery, it was a reasonable one and added stability to the model. The SRG also concluded that research effort would be more usefully directed at developing an MSE that could explore consequences of incorrectly specified selectivity than at exploring, once again, more complex selectivity scenarios in the assessment model.

A bridging analysis between the 2011 and 2012 assessments showed that the lower of biomass estimates in 2012 compared to 2011 were largely due to the 2011 acoustic survey index, which estimates the lowest relative biomass since the start of the time series in 1995.

None of the SS and CCAM model runs presented in the draft assessment document were able to fit both the 2009 and 2011 survey biomass index values. Several hypotheses about factors that could have produced such divergent indices were discussed, including bias in the 2009 index due to the presence of Humboldt squid and time-varying natural mortality or selectivity. A concern was raised that the strong yearclass signal the model is fitting in the age data may be impeding its ability to fit the survey data. To explore how much of each of the data components contributes to the objective function, the SRG requested two additional model runs be conducted by the JTC to see if the model could be forced to fit both the 2009 and 2011 data points: (i) turn off the iterative reweighting of age comps and reduce weights on the age data significantly, and (ii) increase the weighting on the survey index. In these sensitivity runs, the model was still unable to fit both the 2009 and 2011 data points; basically, the assessment model cannot match the 2009 survey biomass index without estimating yearclass abundances that would persist into 2011 and cause a mismatch to the lower 2011 survey index. The SRG concluded that the biological dynamics of hake are not consistent with both the 2009 and 2011 index values.

The approach taken by the JTC this year, in which two modeling platforms (SS and CCAM) were parameterized in the same way in order to test their ability to produce similar assessment results, was a useful exercise because it provided additional validation of the base case. It was noted by the SRG however that future assessments do not necessarily need to follow this approach of multiple base case models; it should be left up to the JTC whether such model validation should be conducted in any given year. One option brought forward was that a second modeling platform such as CCAM be applied to the data in future years for quality assurance, but that results from the alternative model be summarized only briefly in the assessment document.

Discussion on Harvest Advice

During the review, the JTC presented results from the base case assessment model with the corrected 2012 acoustic survey biomass index presented by the acoustics team on the first day of the SRG meeting. The updated base model has a median level for current spawning stock biomass at 33% of its unfished level, and a harvest for 2012 of 252,000 mt based on the default harvest policy. The SRG requested that all results for the base case model, as well as all of the harvest decision tables presented in the executive summary of the assessment document, be revised in the final version submitted to the JMC to include the updated 2011 index. The SRG did not think any purpose would be served by requiring revision of the additional sensitivity analyses in the assessment document, given that a description of the small discrepancy between the 2011 index value used in the base case and that used in the sensitivity analyses was included in the final assessment report. The SRG concurs that the decision tables presented in the JTC report adequately represent the available harvest from the default harvest policy and from potential alternative levels of catch for 2012-2014. The SRG made several recommendations to the JTC for clarity in terminology to be used when reporting the harvest advice to the JMC.

A Canadian SRG member put forward a request that had been received from a Canadian groundfish manager to have a status quo harvest option (i.e., same as 2011 quota) added to the decision tables. The JTC agreed to make this change by replacing the 250,000 mt catch option with last year's quota in the existing decision tables.

A JMC member from Canada asked that an additional limit reference point be included that was relevant to fishery decision-making under Canadian domestic fisheries policy. In addition, it was noted that an alternative form of decision table that showed the probability of the stock being above specific biomass or fishing intensity levels in each of the next 3 years for each harvest option could be an effective means of communicating uncertainty to the JMC. In response to these suggestions, the SRG requested that an additional decision table be added to the assessment document for the base case model only. The following five projection statistics were identified for inclusion in the additional table, all of which would be conditioned on the same set of 2012 harvest values considered in the existing decision table:

1. What is probability of B_{2013} above B_{2012}
2. What is probability of B_{2013} above 40% of B_0
3. What is probability of B_{2013} above 25% of B_0
4. What is probability of B_{2013} above 10% of B_0
5. What is probability that the fishing intensity in 2012 exceeds the fishing intensity target?

SRG Research Recommendations

This section is a compilation of research recommendations, many of which have been mentioned in earlier sections. Where we support them, we have incorporated recommendations of the JTC.

Highest- priority recommendations

- Increase frequency of acoustic survey to annual. The acoustic survey provides the most important data series for estimating biomass dynamics in the stock. However, the survey's impact on the assessment is delayed by being conducted only in odd years. That limitation is especially pertinent because the stock and fishery rely on intermittent high recruitment, and such recruitment is detected by the acoustic survey when fish reach age 2 or 3, (up to three years after recruitment), by which time they are part of the fishery. The SRG recommends that the survey be conducted annually, which would improve management's ability to react to both strong and weak recruitments. It would also reduce the period of uncertainty following survey values (e.g., 2009) that when modeled does not appear compatible with other information. .

- The SRG recognizes that initiating an annual survey immediately (i.e., adding an additional full survey in 2012) would provide immediate improvements in the precision of the assessment, which would in turn improve the information available for management decisions in the next few years. Given that fishery data alone has proved unsuccessful at informing the scale of current abundance in the past, a 2012 survey point could be the only way to resolve the magnitude of the 2008 year class prior to decision-making in 2013.
- In response to this recommendation, the acoustics team expressed concerns that implementing a full scale survey in 2012 would come at the expense of other work planned by the survey team in 2012. In particular, the survey team plans to conduct additional work on target strength in 2012, which will help improve the accuracy of future surveys, and to conduct work designed to provide for a joint survey of hake and sardine, which will provide a more cost-effective means of achieving an annual survey on an ongoing basis. The SRG believes that an attempt to do a limited hake survey plus the long-term work is not advisable because a limited hake survey (e.g. fewer transects) would produce results that are even more uncertain than those from a full survey. The SRG agreed with the acoustics team that conducting a survey in 2012 would only be beneficial if resources were available for a full-scale survey in both Canadian and US waters.
- The SRG concluded that while a 2012 survey would help better inform management in 2013, research into increased survey efficiency / precision could help better inform management in the long-term. In the absence of increased resource allocation to the 2012 survey, a trade-off between these short-term and long-term benefits will be necessary, especially due to the limited number of experienced personnel available..

- Management strategy evaluation (MSE). The SRG recommends that a management strategy evaluation framework be developed for this fishery. Such a framework would allow the JTC to provide better guidance to the JMC on how different forms of management (i.e., the combination of data collection, stock assessment, and harvest decision rules) affect trade-offs between potential management objectives, among them magnitude and stability of yield. In addition, an MSE can elucidate which management strategies are more or less robust to unavoidable biological and assessment uncertainties, which are considerable in a fishery that relies on periodic large recruitments. Conducting an MSE will require a significant commitment of resources by the JTC, and the SRG considers it a high priority.

  - In simulating the acoustic survey in an MSE, we recommend that observation errors be drawn from a mixture distribution, rather from a single statistical distribution. The mixture would have a minority of observations drawn from a distribution with considerably wider tails (larger variance) than the majority. This recommendation stems from the observation that in this assessment (and in others the panel is familiar with), the majority of survey biomass index values were fit quite well, and a minority fit quite poorly.

Other recommendations

- Inter-vessel calibrations. The SRG notes that calibration of acoustics gear is performed regularly on vessels conducting the survey; however, potential differences among vessels have not yet been quantified fully. We recommend periodic inter-vessel calibrations. Based on comments from experts, the SRG believes that about 10% of the survey budget might be needed for such work. This is an important aspect of quality control in this assessment.

- Age-1 or -0 index development. Because the current acoustic survey does not develop an index of fish below age 2, a large recruitment (when it occurs) cannot be confirmed for several years, especially given surveys only in odd years. An index of abundance of young (age-0 and/or age-1) hake could speed reaction of stock assessments to high recruitment events. Preliminary research has been done on the potential of obtaining an index from the acoustic survey. The SRG recommends that research be carried forward.

- Life-history data improvements. Present information on maturity at age is from a single study in the 1990s. A new study of maturity at age is in progress, which the SRG strongly supports. The SRG recommends regular collection and analysis of life-history data such as growth, fecundity, and maturity at age, rather than relying on static values from the literature.

- Survey extent. Based on comments from an industry participant, the SRG recommends that the survey team explore the seaward extent of hake distribution, particularly at the northern end of the range, and that some portion of the survey be extended seaward if warranted. The commenter stated that substantial hake catches have been made over the last 5 years seaward of acoustic transects in Canadian waters. The SRG was unable to evaluate this situation, because data are protected by privacy regulations.

- Survey variance. The SRG recommends that research be continued on more complete estimation of variance in the acoustic survey. We refer to estimation from survey characteristics, independent of the stock-assessment model. Current variance estimates are a product of the kriging procedure and thus reflect only statistical sampling error, but the SRG believes (and assessment results confirm) that other physical and biological processes contribute the majority of variance. It was noted that AFSC scientists have been working on a similar problem, and that discussions and collaboration would be useful.

  In connection with the preceding recommendations, the SRG acknowledges that additional data collection and analysis will require significant additional resources from both nations, a commitment that seems to be warranted, given the importance of this stock to both nations.

  The SRG also notes that statistical and simulation studies could be useful, in many cases, in choosing or refining the most fruitful approaches to data improvement.

- The SRG recommends that use of commercial vessels in acoustic or biological sampling be explored as one way to expand sampling. This might include scientific analysis of echo data collected by commercial vessels in the course of fishing.

- Target characterization and verification. The SRG recommends that, as part of statistical studies to evaluate improved sampling options, that an increasing the number of target-verification tows and conducting target-strength research be considered. This could reduce uncertainty in assigning species and demographic characteristics to acoustic signals. Potentially, this could be done in collaboration with industry.

- Exploration of separability assumption in the assessment model; i.e., the assumption that selectivity is constant over time. The SRG recommends that, as a sensitivity analysis, the JTC examine the effects of relaxing the separability assumption in the assessment model. This could be done by fitting a simple tuned catch-age model (e.g., ADAPT) to the catch-at-age data and survey index. Observing that such a model could not improve the survey fit would further confirm that the 2009 and 2011 survey estimates are incompatible with each other.

Editorial Suggestions

The SRG recommends some changes to terminology used in the assessment report, with the aim of making the report more easily understandable to those less familiar with local terminology. In particular, two concepts should be expressed more clearly:

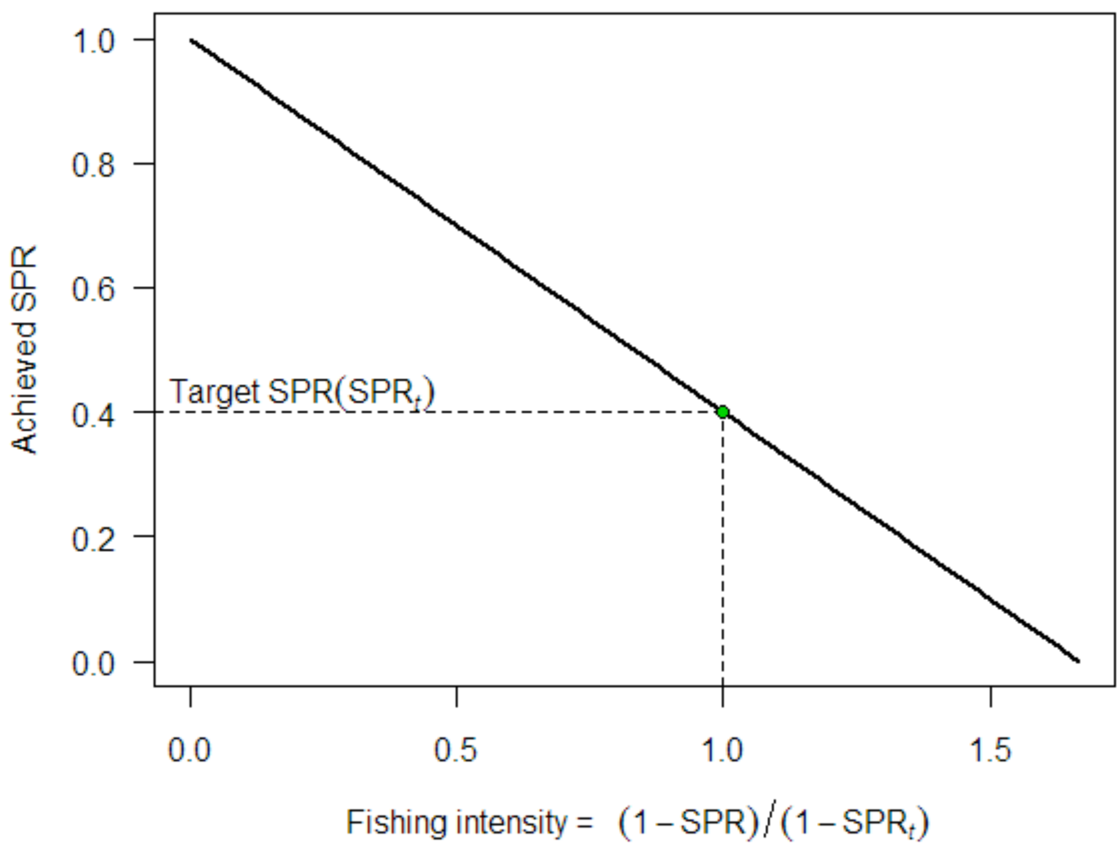
- Fishing intensity. This term is used in several places, and it should be used wherever it appropriate (instead of SPR) to describe the ratio,

  FI=((1-SPR))/((1-SPRt)),

  where SPRt is the target SPR.

It could be called "Fishing intensity based on SPR" if that seems better to the JTC. The use of "SPR" is a poor choice, because that acronym already carries two other meanings in the fishery literature (spawning per recruit and spawning potential ratio).

A diagram such as this one might help non-specialists interpret values of fishing intensity better:



- Depletion. This term is used idiosyncratically in some assessments in this region, in that the quantity labeled "depletion" is proportional to female spawning stock; i.e., higher "depletion" means more fish. This term should be supplemented by a term that more accurately explains, in English, what is meant; i.e., female spawning biomass relative to its average equilibrium value in an unfished stock. The SRG recommends that alternative, plain English terminology be used in the future.

SRG Recommendations on Harvest Advice

As a review group the SRG endorses the base case model recommended by the Joint Technical Committee with minor revision, updated harvest projections are is provided in the JTC decision tables.

1. The median estimate of the stock's current status (female spawning stock) is 33% of its average unfished equilibrium level. While this is substantially below the estimates in the 2011 assessment, it is very close to the average level expected while fishing long-term at the default harvest policy. However, the current stock biomass is dominated by a single yearclass, born in 2008.

   a. Footnote: The average biomass level expected from fishing at F40%, which is a per recruit calculation, is less than the target biomass level of B40% because the spawner-recruitment relationship causes a decline in mean recruitment level as the spawning biomass is reduced to the 30-40% range;

2. The estimate of the stock's recent exploitation rate is slightly above the exploitation rate corresponding to the target SPR of F40%. The increased estimate of exploitation rate, compared to the 2011 assessment, is principally due to the current assessment estimating lower biomass, corresponding to higher-than-intended exploitation rates, over the past few years.

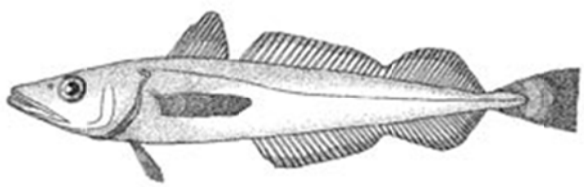
3. These estimates of current stock status and recent exploitation rates are highly uncertain.
   a. Estimated abundance of the 2008 yearclass, which currently dominates the stock, is highly uncertain. Because of this uncertainty, the spawning stock abundance in 2012 has a 25% chance of being lower than 22 % of the unfished level, and 25% chance of being higher than 51% of the unfished level. The range of this uncertainty is well-documented by the JTC.
   b. The uncertainty in the assessment is largely driven by two things. One is the large year-to-year fluctuation in recruitment of hake. This natural process can be monitored by current and improved surveys, but not controlled. The other contributor is performance of the acoustic survey, which in some years seems to not track the stock's abundance as expected. Despite extensive discussions with the JTC, the acoustic survey team, and industry members at the SRG meeting, the source of these acoustic survey differences remains elusive. The combination of high recruitment fluctuation, high survey uncertainty, and biennial surveys means that the assessment model cannot resolve the magnitude of new yearclasses until they have been observed for several years in the fishery and survey.
   c. In particular, the 2009 survey estimated high hake biomass, dominated by the 2005 and 2006 yearclasses. Then the 2011 survey produced a much lower biomass estimate, dominated by only the three-year-old 2008 yearclass. The current assessment cannot match the 2009 survey biomass index without estimating yearclass abundances that would persist into 2011 and cause a mismatch to the lower 2011 survey index. That is why the SRG concluded that the 2009 and 2011 survey estimates are incompatible with one another. The hindsight from future assessments could provide estimates of stock status in 2012 much different than the current estimate. Such uncertainty is not unexpected, given hake biology and current survey frequency.

d. If the acoustic survey could be conducted annually, the assessment model should more quickly estimate the abundance of incoming yearclasses and provide more stable results over time. We expect that the recommended management strategy evaluation (MSE) could quantify the degree of improvement to be expected.

4. The current default harvest policy, F40% with a down-ramp in F when biomass is below B40%, does not explicitly consider fluctuating age structure and the degree of uncertainty in each year's assessment advice. Thus, a modified harvest policy may be more suitable for this stock.

5. The fact that the stock is dominated by one young yearclass creates substantial risk to the stock's spawning potential if the TAC is calculated from median estimates, and the magnitude of this yearclass is subsequently found to be smaller than the median estimate (i.e., the true magnitude is toward the lower end of its range of estimated uncertainty in 2012). Large changes in estimates have occurred in the past. For example, the 2012 result is in the lower 2.5% of estimates forecast from the 2011 assessment. The SRG emphasizes that the stock's capacity to generate large yearclasses which support a sustainable fishery is likely to be lower at low stock sizes. Therefore, the JMC may want to consider a more conservative management strategy while the stock continues to be supported by only one yearclass.

Status of the Pacific hake (Whiting) stock in U.S. and Canadian Waters in 2012



International Joint Technical Committee for Pacific hake

Final Document
2/29/2012

This document reports the collaborative efforts of the official U.S. and Canadian JTC members, as well as one previous assessment participant. The jointly-appointed 5th member has not yet been identified.

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Executive Summary

Stock

This assessment reports the status of the coastal Pacific hake (or Pacific whiting, *Merluccius productus*) resource off the west coast of the United States and Canada. This stock exhibits seasonal migratory behavior, ranging from offshore and generally southern waters during the winter spawning season to coastal areas between northern California and northern British Columbia during the spring, summer and fall when the fishery is conducted. In years with warmer water temperatures the stock tends to move farther North during the summer and older hake tend to migrate farther than younger fish in all years. Separate, and much smaller, populations of hake occurring in the major inlets of the northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California, are not included in this analysis.

Catches

Coast-wide fishery landings of Pacific hake averaged 222 thousand mt from 1966 to 2011, with a low of 90 thousand mt in 1980 and a peak of 363 thousand mt in 2005. Prior to 1966 the total removals were negligible relative to the modern fishery. The fishery in U.S. waters has averaged 166 thousand mt, or 74.7% of the average total landings over the time series, with the catch from Canadian waters averaging 56 thousand mt. During the first 25 years of the fishery, the majority of the removals were from foreign or joint-venture fisheries. In this stock assessment, the terms catch and landings are used interchangeably; estimates of discard within the target fishery are included, but discarding of Pacific hake in non-target fisheries is not. Discard from all fisheries is estimated to be less than 1% of landings and therefore is likely to be negligible with regard to the population dynamics.

Recent coast-wide landings from 2007-2011 have been above the long term average, at 261 thousand mt. Landings between 2001 and 2008 were predominantly comprised of fish from the very large 1999 year class, with the cumulative removal from that cohort exceeding 1.2 million mt. In 2008, the fishery began harvesting considerable numbers of the then emergent 2005 year class. Catches in 2009 were again dominated by the 2005 year class with some contribution from an emergent 2006 year class and relatively small numbers of the 1999 cohort. The 2010 fishery encountered very large numbers of two-year old hake from the 2008 year-class, while continuing to see substantial numbers from the 2005 and 2006 year-classes. In 2011, U.S. fisheries caught mostly 3-year old fish from the 2008 year class, while the Canadian fisheries encountered older fish from the 2005 and 2006 year classes more frequently than the U.S. fisheries.

Since implementation of the Magnuson-Stevens Fishery Conservation and Management Act in the U.S. and the declaration of a 200 mile fishery conservation zone in Canada in the late 1970s, annual quotas have been the primary management tool used to limit the catch of Pacific hake in both zones by foreign and domestic fisheries. During the 1990s, however, disagreement between the U.S. and Canada on the division of the total catch led to quota overruns; 1991-1992 quotas summed to 128% of the limit and overruns averaged 114% from 1991-1999. Since 2001, total catches have been below coast-wide fishery limits. The current treaty between the United States and Canada, establishes U.S. and Canadian shares of the coast-wide allowable biological catch at 73.88% and 26.12%, respectively, and this distribution has been adhered to since ratification of the Joint Treaty. From 2009 to 2011 much of the U.S. tribal allocation remained uncaught and Canadian catches have also been well below the limit.

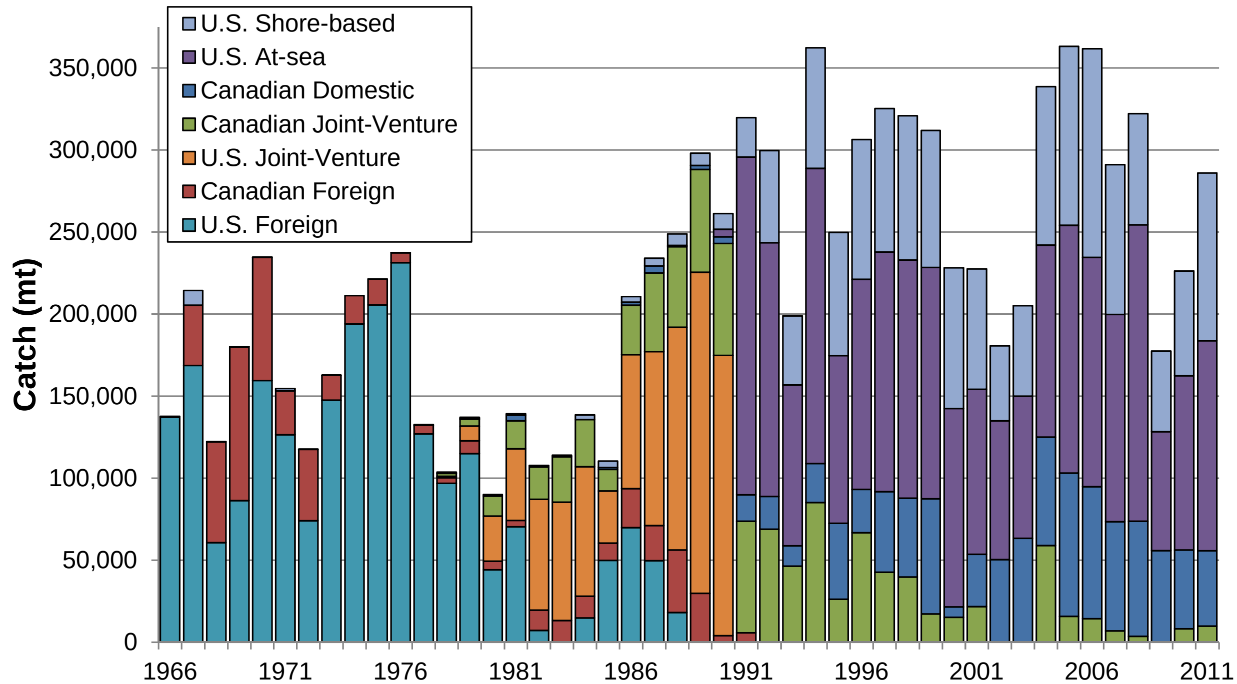

Figure a. Total Pacific hake catch used in the assessment by sector, 1966-2011. Tribal catches are included.

Table a. Recent commercial fishery catch (1000s mt). Tribal catches are included where applicable.

Year	US at-sea	US shore-based	US total	Canadian joint-venture	Canadian domestic	Canadian total	Total
2002	85	46	130	0	50	50	181
2003	87	55	142	0	63	63	205
2004	117	97	214	59	66	125	339
2005	151	109	260	16	87	103	363
2006	140	127	267	14	80	95	362
2007	126	91	218	7	67	73	291
2008	181	68	248	4	70	74	322
2009	72	49	122	0	56	56	177
2010	106	64	170	8	48	56	217
2011	128	102	230	10	46	56	286

Data and assessment

Following the 2010 assessment, nearly all of the data sources available for Pacific hake were reconstructed and thoroughly re-evaluated for 2011 from the original observations using consistent, and in some cases improved methods. These improved data streams have been updated for 2012 with the addition of new age distributions from the 2011 fishery and acoustic survey, as well as the 2011 acoustic survey biomass index.

This assessment reports a single base-case model representing the collective work of the Joint Technical Committee (JTC). The assessment depends primarily upon the acoustic survey biomass index (1995, 1998, 2001, 2003, 2005, 2007, 2009 and 2011) for information on the scale of the current hake stock. The 2011 index value is the lowest in the time-series. The aggregate fishery age-composition data (1975-2011) and the age-composition data from the acoustic survey contribute to the assessment model's ability to resolve strong and weak cohorts. Both sources show a strong 2008 cohort, but differ somewhat in the relative magnitude of the weaker 2005 and 2006 cohorts.

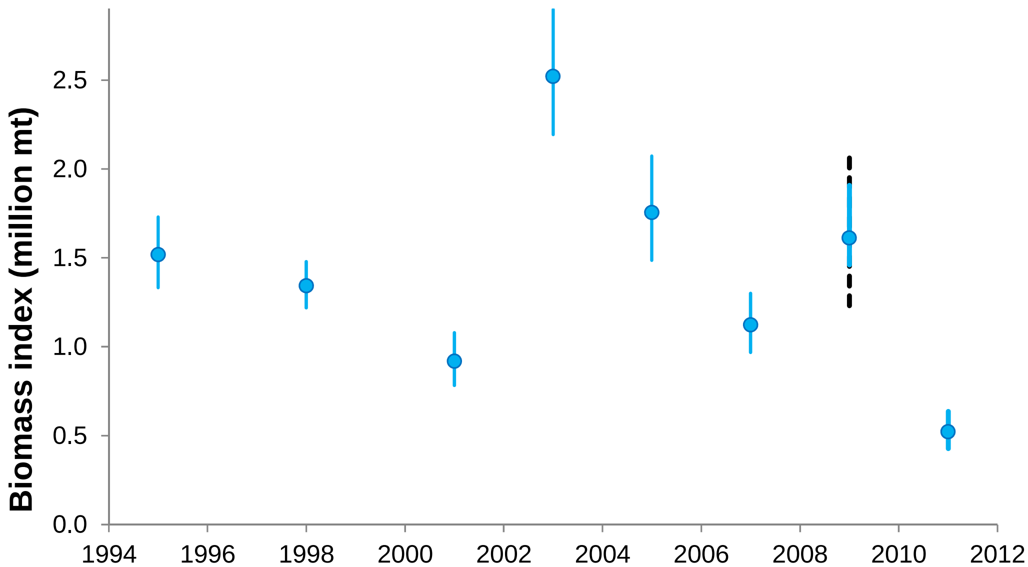

Figure b. Acoustic survey biomass indices (millions of metric tons). Approximate 95% confidence intervals are based on only sampling variability (1995-2007, 2011) in addition to squid/hake apportionment uncertainty (2009).

The assessment is fully Bayesian, with the base-case model incorporating prior information on two key parameters (natural mortality, *M*, and steepness of the stock-recruit relationship, *h*) and integrating over estimation and parameter uncertainty to provide results that can be probabilistically interpreted. Our exploration of uncertainty is not limited to parameter uncertainty (See Unresolved problems and major uncertainties section below).

Stock biomass

The base-case stock assessment model indicates that the Pacific hake female spawning biomass was well below the average unfished equilibrium in the 1960s and 1970s. The stock is estimated to have increased rapidly after two or more large recruitments in the early 1980s, and then declined rapidly after a peak in the mid- to late 1980s to a low in 2000. This long period of decline was followed by a brief increase to a peak in 2003 (median estimate of 1.29 million mt in the SS model) as the exceptionally large 1999 year class matured. The stock is then estimated to have declined with the aging 1999 year class to a time-series low of 0.38 million mt in 2009. This recent decline is much more extreme than that estimated in the 2011 assessment. The current median posterior spawning biomass is estimated to be 32.6% of the average unfished equilibrium level (SB_0). However, this estimate is quite uncertain, with 95% posterior credibility intervals ranging from historical lows to above the average unfished equilibrium levels. The estimate of 2012 is 0.62 million mt, much smaller than the two estimates in the 2011 assessment (1.87, and 2.18 million mt). This change is largely driven by the very low 2011 acoustic survey biomass index.

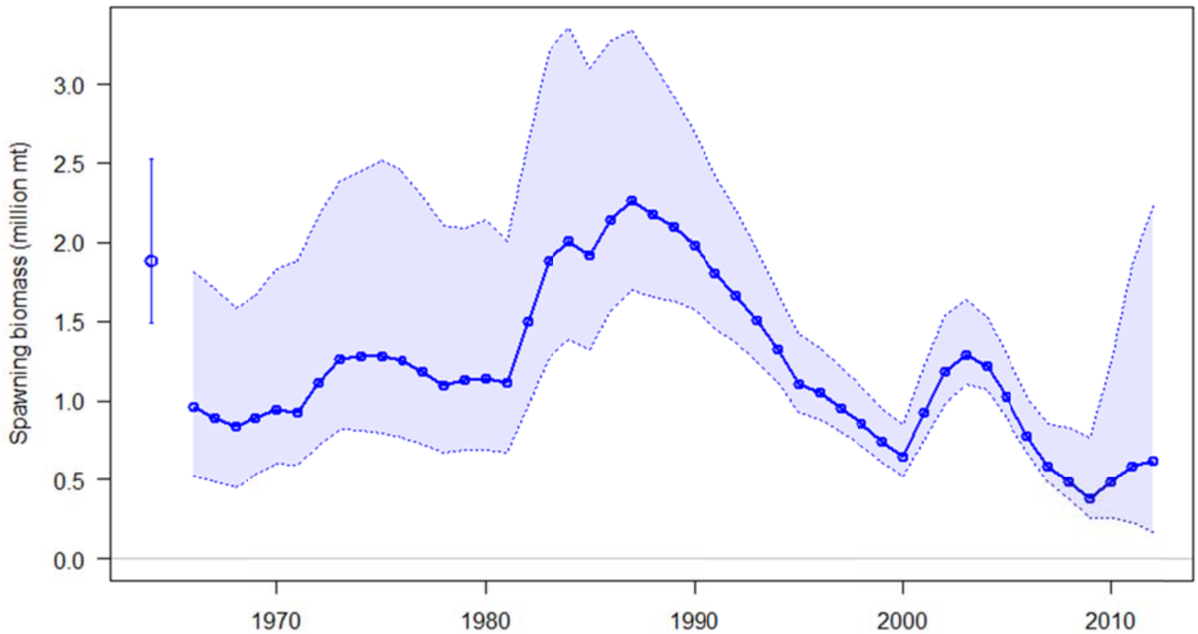

Figure c. Estimated female spawning biomass time-series with 95% posterior credibility intervals.

Table b. Recent trend in estimated Pacific hake female spawning biomass (million mt) and depletion level.

	Spawning biomass (mt)			Depletion		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2003	1.100	1.288	1.638	53.3%	68.8%	86.7%
2004	1.064	1.219	1.525	50.9%	65.1%	81.7%
2005	0.892	1.020	1.292	42.9%	54.7%	68.4%
2006	0.670	0.774	1.022	32.6%	41.6%	52.7%
2007	0.482	0.580	0.855	23.8%	31.3%	41.5%
2008	0.379	0.491	0.828	19.2%	26.4%	40.0%
2009	0.261	0.384	0.769	13.5%	20.4%	36.4%
2010	0.261	0.483	1.237	13.9%	25.4%	57.9%
2011	0.231	0.588	1.857	12.8%	31.3%	86.6%
2012	0.169	0.616	2.228	9.4%	32.6%	102.2%

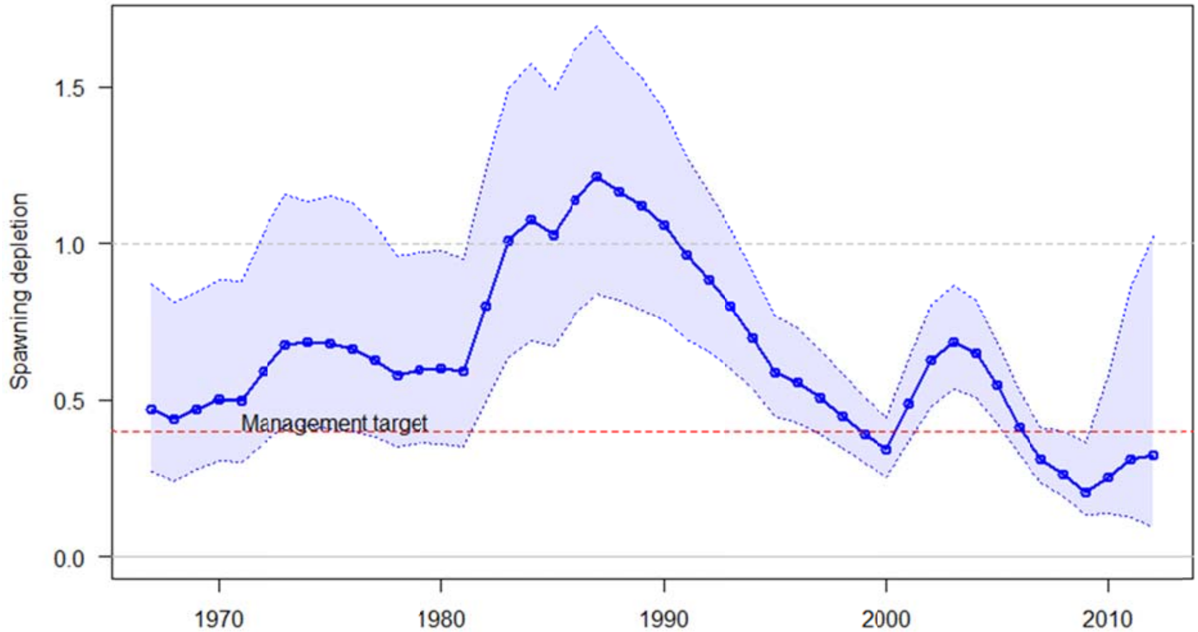

Figure d. Time-series of estimated spawning depletion through 2012 with 95% posterior credibility intervals.

Recruitment

Estimates of historical Pacific hake recruitment indicate very large year classes in 1980, 1984, 1999, and 2008. The strength of the 2008 cohort is estimated to be large (5.2 billion age-0 fish), although not nearly as large as was estimated in the 2010 stock assessment (16.2 billion). The U.S. fishery and acoustic age compositions both show the 2008 year class comprised a very large proportion of the observations in 2010 and 2011. Uncertainty in estimated recruitments is substantial, especially for 2008, as indicated by the broad posterior intervals.

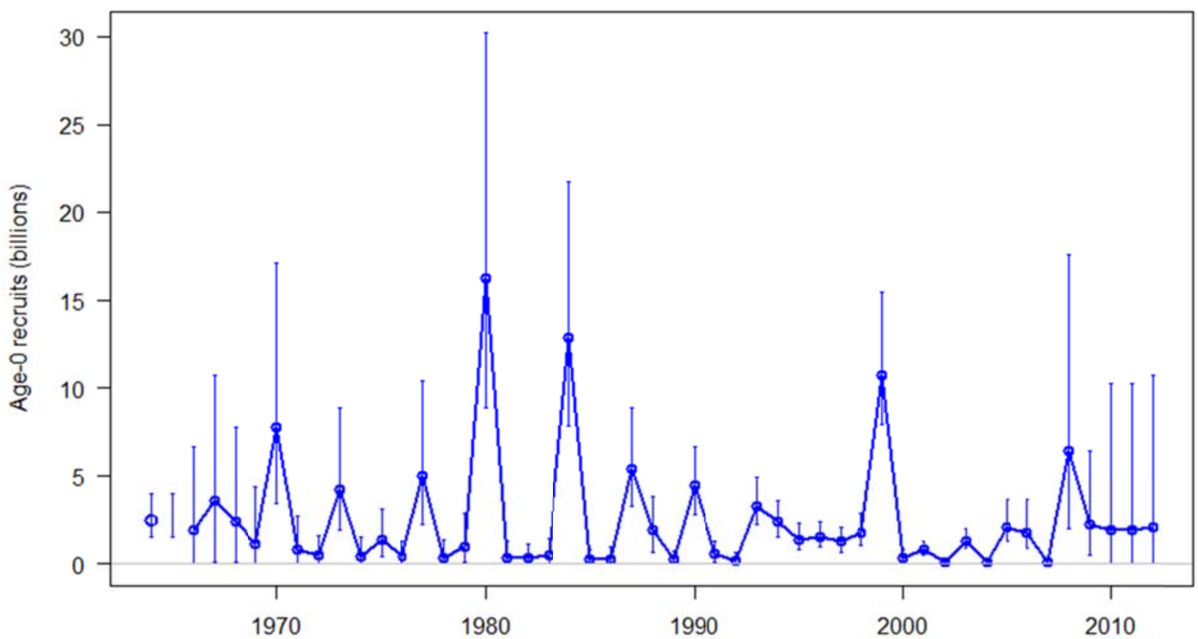

Figure e. Estimated Pacific hake recruitment time-series with 95% posterior credibility intervals (billions of age-0).

Table c. Recent trend in Pacific hake recruitment (billions of age-0).

Year	2.5th percentile	Median	97.5th percentile
2003	0.870	1.266	2.019
2004	0.011	0.064	0.211
2005	1.318	1.964	3.698
2006	0.892	1.579	3.690
2007	0.013	0.070	0.288
2008	2.043	5.248	17.581
2009	0.513	1.736	6.480
2010	0.055	0.932	10.261
2011	0.049	0.763	10.256
2012	0.041	0.762	10.733

Reference points

The average unexploited equilibrium spawning biomass estimate was 1.89 million mt, intermediate between the two estimates reported in the 2011 stock assessment. However, the uncertainty is very broad, with the 95% posterior credibility interval ranging from 1.49 to 2.53 million mt. The *MSY*-proxy target spawning biomass ($SB_{40\%}$) is estimated to be 0.76 million mt in the base-case model, slightly larger than the equilibrium spawning biomass implied by the $F_{40\%}$ default harvest rate target, 0.67 million mt. *MSY* is estimated to occur at an even smaller stock size, 0.46 million mt, with a yield of 317 thousand mt; only slightly higher than the equilibrium yield at the biomass target ($SB_{40\%}$), 290 thousand mt, and at the $F_{40\%}$ target, 299 thousand mt. The full set of reference points, with uncertainty intervals for the base case and among alternate sensitivity models, is reported in Table *f* below.

Exploitation status

The fishing intensity on the Pacific hake stock is estimated to have been below the $F_{40\%}$ target until 2007. Uncertainty in the value is large, and the base-case model estimates that the target has been exceeded in four of the last five years. The exploitation history in terms of both the biomass and *F*-target reference points is portrayed graphically via a phase-plot.

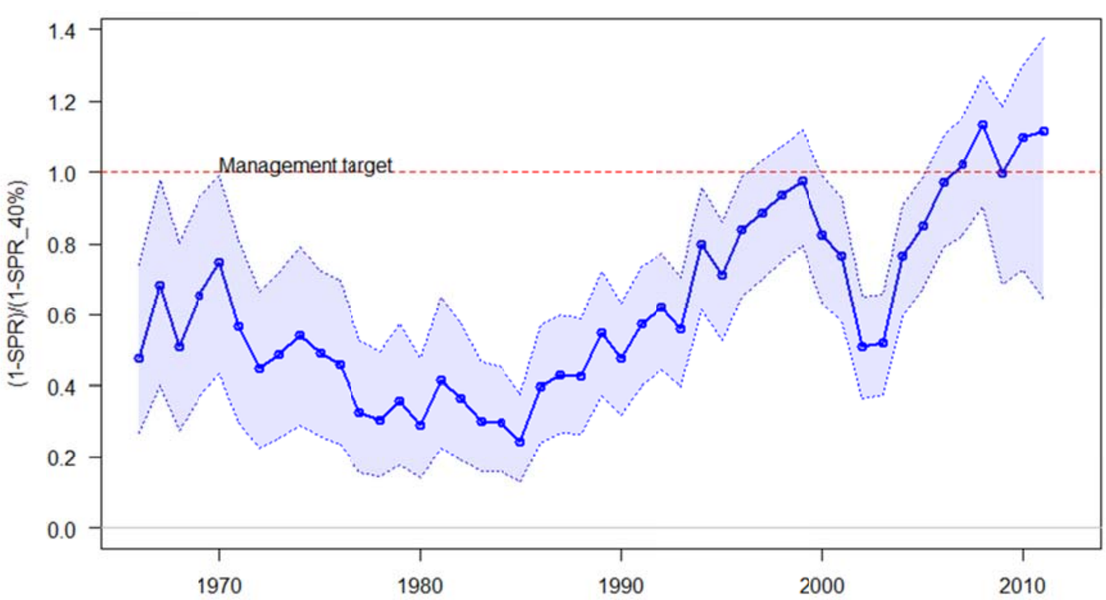

Figure f. Trend in fishing intensity (relative SPR) through 2011 with 95% posterior credibility intervals.

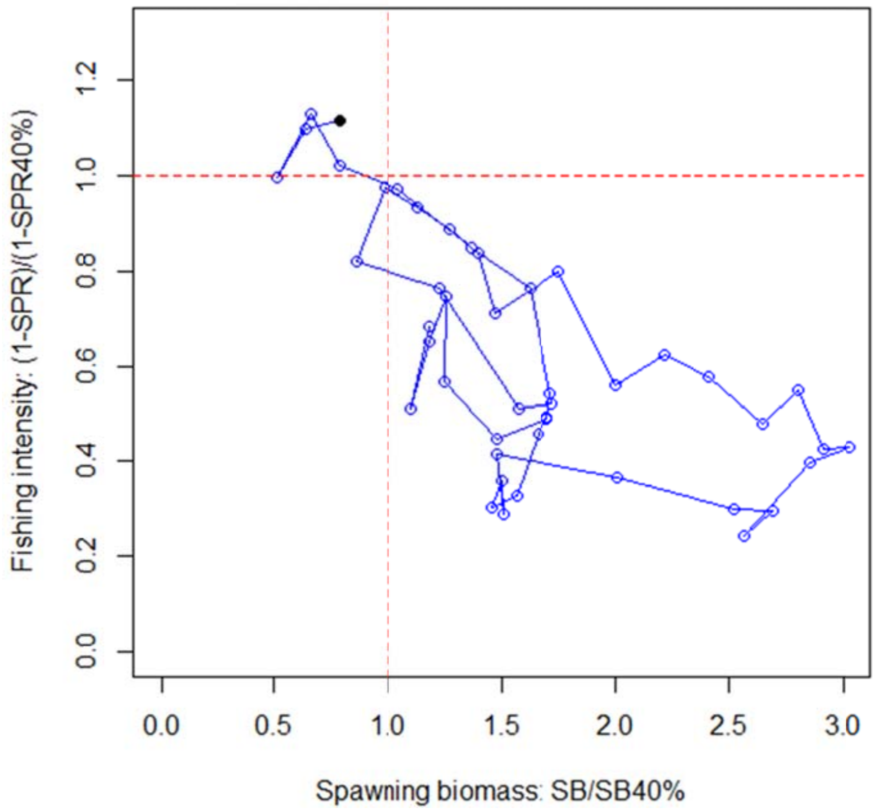

Figure g. Temporal pattern (phase plot) of posterior median fishing intensity vs. relative posterior median spawning biomass through 2011. The filled circle denotes 2011 and the line connects years through the time-series.

Table d. Recent trend in fishing intensity (relative spawning potential ratio; 1-SPR/1-SPR$_{40\%}$) and exploitation fraction.

	Fishing intensity			Exploitation fraction		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2002	36.7%	51.0%	65.0%	3.7%	4.8%	5.7%
2003	37.6%	52.0%	65.8%	5.2%	6.6%	7.7%
2004	59.5%	76.5%	90.7%	10.6%	13.3%	15.2%
2005	67.4%	84.8%	98.7%	15.3%	19.5%	22.3%
2006	79.0%	97.2%	110.3%	17.9%	23.8%	27.5%
2007	82.5%	102.1%	115.7%	20.4%	29.1%	34.8%
2008	90.4%	113.2%	126.7%	18.8%	31.4%	40.2%
2009	68.5%	99.6%	118.4%	10.1%	20.3%	29.7%
2010	72.6%	109.8%	130.1%	15.0%	34.3%	58.3%
2011	64.4%	111.6%	137.4%	7.4%	23.3%	49.9%

Unresolved problems and major uncertainties

The base case assessment model integrates over the substantial uncertainty associated with several important model parameters including: acoustic survey catchability (q), the productivity of the stock (via the steepness parameter, h, of the stock-recruitment relationship), and the rate of natural mortality (M). Although the Bayesian results presented include estimation uncertainty, this within-model uncertainty is likely a gross underestimate of the true uncertainty in current stock status and future projections, since it does not include structural modeling choices, data-weighting uncertainty and scientific uncertainty in selection of prior probability distributions.

The JTC investigated a broad range of alternate models, and we present a subset of key sensitivity analyses in order to provide a broad qualitative comparison of structural uncertainty with the base case. The primary axis of this uncertainty is the structural approach to fishery and survey selectivity parameterization. The alternate models were run on two independent modeling platforms: (i) Stock Synthesis (SS), used for the base case and for previous Pacific hake stock assessments; and (ii) the Canadian Catch at Age Model (CCAM), first developed at the University of British Columbia (Martell 2011) and customized at the Pacific Biological Station for this assessment. Both models are thoroughly described in this assessment document. We report additional sensitivity analyses in the main text of this document.

Pacific hake displays the highest degree of recruitment variability of any west coast groundfish stock, resulting in large and rapid changes in stock biomass. This volatility, coupled with a dynamic fishery, which potentially targets strong cohorts, and a biennial rather than annual fishery-independent acoustic survey, will continue to result in highly uncertain estimates of current stock status and even less-certain projections of future stock trajectory. Currently uncertainty in this assessment is largely a function of the disparate survey indices in 2009 and 2011 coupled with the large, but uncertain 2008 year-class. The vast uncertainty in current status and future trends will likely persist as long as the acoustic survey is conducted only every other year, since the dynamics of Pacific hake are elastic enough for the assessment model to respond dramatically to each new biennial survey observation.

Given the uncertainty in stock status and magnitude, the JTC proposes that a Management Strategy Evaluation (MSE) be developed to explore topics including testing of the basic performance of the current harvest control rule. Many Pacific hake stock-assessment uncertainties may not be resolvable, but it may be possible to design management, data collection, and modeling strategies that provide an adequate trade-off in performance among stock and fishery objectives using MSE. The Pacific hake fishery is relatively data-rich, with a directed, fishery-independent survey program, substantial biological sampling for both commercial fisheries and the acoustic survey, and reliable estimates of catch. However, the data are apparently insufficient to resolve key uncertainties that can produce large differences in stock-status estimates between years, as observed in the acoustic index observations directly, or when all data are synthesized within an assessment model. The MSE approach is distinct from traditional stock assessment in that it seeks to find a management strategy that is robust to uncertainties and provides explicit evaluation of the expected trade-offs among conservation and yield objectives even when the current best assessment is in error. The process of identifying appropriate performance indicators required for a full MSE is very time consuming and should include management and stakeholder input, but one issue that could be tested immediately is analysis of whether stock assessment performance could be improved by investing in annual, rather than biennial, surveys. The experiment would consist of simulating the stock assessment procedure using the current biennial vs. annual surveys, under different assumptions about observation and process error, the number of survey stations, the harvest control rule and assessment procedures. Management procedures could, for example, be evaluated based on three main performance categories: catch, catch variability, and conservation (Cox and Kronlund 2008). For example, catch and catch variability could be represented by average annual catch and average absolute variation in catch (Punt and Smith 1999) and conservation could be represented in terms of the proportion of years that the stock was below target biomass levels.

Forecast decision table

In order to better reflect the considerable uncertainty in this assessment all forecasts are reported in two decision tables: one representing uncertainty within the base-case model; and the other representing uncertainty among alternate models. This allows for the evaluation of alternative management actions based on both types of uncertainty. The decision tables are organized such that the projected implications for each potential management action (the rows, containing a range of potential catch levels) can be evaluated across the quantiles of the posterior distribution for the base-case model (the columns), or among median estimates from the alternate models. For clarity, each decision table is divided into two sections: the first table projects the depletion estimates, the second the degree of fishing intensity (based on the relative SPR; see table legend). Fishing intensity exceeding 100% indicates fishing in excess of the $F_{40\%}$ default harvest rate. A set of management metrics were identified during the Scientific Review Group (SRG) review of this stock assessment, based on input from the Joint Management Committee (JMC), Advisory Panel (AP) and other attendees. These metrics summarize the probability of various outcomes from the base case model given each potential management action (Table g.5 below). Although not linear, probabilities can be interpolated from this table for intermediate catch values.

The median stock estimate from the base-case model is projected to increase or remain constant from 2012 to 2013 for all management actions considered except the *status quo*. However, the posterior distribution is highly uncertain, and either increasing or decreasing trends are possible over a broad range of 2012 catch levels. The base-case model predicts a rapid increase in the absence of future fishing, surpassing the management target with a 50% probability in 2013; this is attributable largely to the strong 2008 cohort. However, the difference between this trajectory and that conditioned on the default harvest rate is extremely small, relative to the uncertainty in the current stock status. There is 47% chance of exceeding the harvest target in 2012 for catch levels approaching the default harvest rate, however this level of catch corresponds to a 47% chance of having a smaller stock in 2013 than in 2012.

Among the key alternate sensitivity models, there is also considerable uncertainty in current status and future trends. Although these models fall within the 'envelope' of the posterior distribution from the base-case model, the median trajectories under each potential management action are somewhat more robust to alternate management actions.

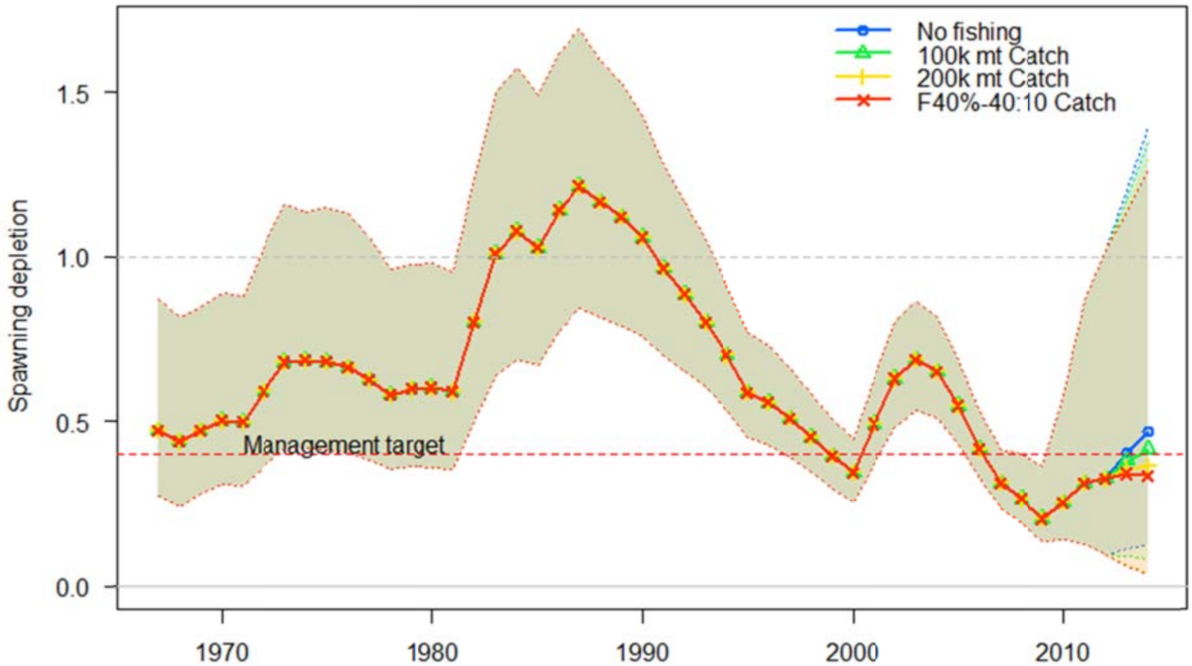

Figure h. Time-series of estimated spawning depletion through 2012 from the base-case model, and forecast trajectories for several arbitrary management options from the decision table, with 95% posterior credibility intervals.

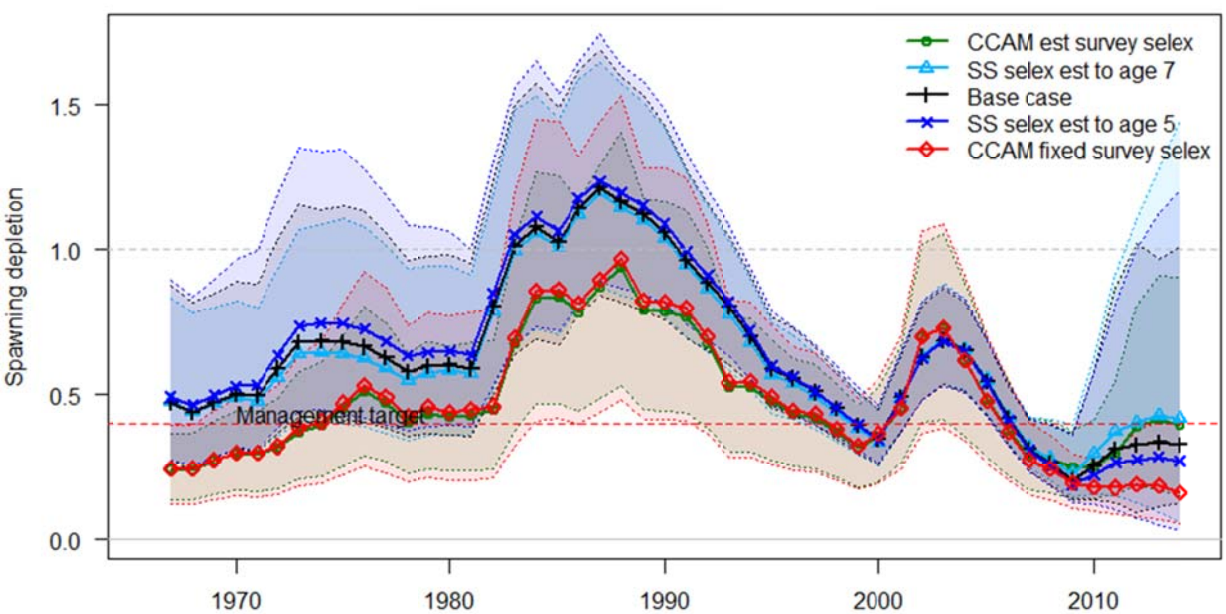

Figure i. Time-series of estimated spawning depletion through 2012 from the base-case model, with 95% posterior credibility intervals, and among alternate sensitivity models, with forecast trajectories for the $F_{40\%}$-40:10 default harvest rate catch level from the base-case model.

Table e.1. Posterior distribution quantiles for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place) from the base model. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g).

Within model quantile			5%	25%	50%	75%	95%
Management Action							
	Year	Catch (mt)	**Beginning of year depletion**				
a	2012	0	11%	22%	33%	51%	86%
	2013	0	14%	28%	40%	60%	104%
	2014	0	18%	32%	47%	67%	120%
b	2012	50,000	11%	22%	33%	51%	86%
	2013	50,000	13%	27%	39%	59%	103%
	2014	50,000	15%	30%	44%	65%	117%
c	2012	100,000	11%	22%	33%	51%	86%
	2013	100,000	12%	25%	38%	58%	102%
	2014	100,000	13%	27%	41%	63%	115%
d	2012	150,000	11%	22%	33%	51%	86%
	2013	150,000	10%	24%	37%	57%	101%
	2014	150,000	10%	25%	39%	60%	113%
e	2012	200,000	11%	22%	33%	51%	86%
	2013	200,000	9%	23%	36%	56%	99%
	2014	200,000	8%	22%	37%	58%	111%
f	2012	251,809	11%	22%	33%	51%	86%
	2013	267,146	8%	21%	34%	54%	98%
	2014	277,887	6%	19%	34%	55%	109%
g	2012	393,751	11%	22%	33%	51%	86%
	2013	393,751	7%	18%	30%	51%	95%
	2014	393,751	5%	13%	27%	49%	102%

Table e.2. Posterior distribution quantiles for Pacific hake **fishing intensity (**spawning potential ratio; 1-SPR/1-$SPR_{40\%}$; values greater than 100% denote fishing in excess of the $F_{40\%}$ default harvest rate) from the base model. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g).

Within model quantile			5%	25%	50%	75%	95%
Management Action							
	Year	Catch (mt)	**Fishing intensity**				
a	2012	0	0%	0%	0%	0%	0%
	2013	0	0%	0%	0%	0%	0%
	2014	0	0%	0%	0%	0%	0%
b	2012	50,000	13%	24%	36%	52%	79%
	2013	50,000	11%	21%	31%	44%	71%
	2014	50,000	10%	18%	26%	38%	63%
c	2012	100,000	25%	42%	59%	79%	107%
	2013	100,000	22%	38%	53%	72%	104%
	2014	100,000	19%	33%	48%	66%	100%
d	2012	150,000	35%	56%	76%	95%	121%
	2013	150,000	31%	52%	71%	91%	122%
	2014	150,000	27%	47%	65%	87%	123%
e	2012	200,000	43%	67%	87%	106%	129%
	2013	200,000	39%	64%	84%	105%	132%
	2014	200,000	35%	59%	80%	104%	133%
f	2012	251,809	51%	77%	97%	115%	133%
	2013	267,146	49%	76%	97%	118%	135%
	2014	277,887	46%	74%	97%	120%	136%
g	2012	393,751	68%	95%	113%	128%	137%
	2013	393,751	65%	95%	116%	131%	138%
	2014	393,751	61%	94%	119%	132%	138%

Table e.3. Median of the posterior distribution for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place) from alternate modeling approaches. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g). See main text for descriptions of alternative models.

Alternate models			CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Management action			**Beginning of year depletion**				
	Year	Catch (mt)					
a	2012	0	19%	27%	33%	40%	39%
	2013	0	25%	35%	40%	49%	48%
	2014	0	30%	40%	47%	55%	53%
b	2012	50,000	19%	27%	33%	40%	39%
	2013	50,000	24%	33%	39%	47%	47%
	2014	50,000	27%	37%	44%	52%	50%
c	2012	100,000	19%	27%	33%	40%	39%
	2013	100,000	23%	32%	38%	46%	45%
	2014	100,000	25%	35%	41%	50%	48%
d	2012	150,000	19%	27%	33%	40%	39%
	2013	150,000	21%	31%	37%	45%	44%
	2014	150,000	22%	32%	39%	47%	45%
e	2012	200,000	19%	27%	33%	40%	39%
	2013	200,000	20%	30%	36%	44%	43%
	2014	200,000	19%	30%	37%	45%	43%
f	2012	251,809	19%	27%	33%	40%	39%
	2013	267,146	19%	28%	34%	43%	42%
	2014	277,887	16%	27%	34%	42%	39%
g	2012	393,751	19%	27%	33%	40%	39%
	2013	393,751	15%	25%	30%	39%	38%
	2014	393,751	12%	21%	27%	35%	33%

Table e.4. Median of the posterior distribution for Pacific hake **fishing intensity** (spawning potential ratio; 1-SPR/1-SPR$_{40\%}$; values greater than 100% denote fishing in excess of the $F_{40\%}$ default harvest rate) from alternate modeling approaches. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g). See main text for descriptions of alternative models.

Alternate models			CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Management action							
	Year	Catch (mt)	**Fishing intensity**				
a	2012	0	0%	0%	0%	0%	0%
	2013	0	0%	0%	0%	0%	0%
	2014	0	0%	0%	0%	0%	0%
b	2012	50,000	58%	41%	36%	31%	34%
	2013	50,000	47%	33%	31%	26%	26%
	2014	50,000	40%	30%	26%	24%	22%
c	2012	100,000	86%	67%	59%	52%	57%
	2013	100,000	75%	57%	53%	46%	46%
	2014	100,000	69%	54%	48%	44%	41%
d	2012	150,000	102%	83%	76%	67%	72%
	2013	150,000	95%	75%	71%	62%	62%
	2014	150,000	91%	73%	65%	60%	57%
e	2012	200,000	113%	96%	87%	78%	84%
	2013	200,000	109%	89%	84%	74%	74%
	2014	200,000	108%	89%	80%	74%	71%
f	2012	251,809	121%	105%	97%	88%	93%
	2013	267,146	122%	103%	97%	87%	87%
	2014	277,887	126%	107%	97%	90%	88%
g	2012	393,751	132%	120%	113%	105%	110%
	2013	393,751	134%	122%	116%	106%	107%
	2014	393,751	135%	126%	119%	110%	110%

Table e.5. Probabilities of various management metrics given different catch alternatives. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt, 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case, and the *status quo* catch target.

Catch	$P(SB_{2013}>SB_{2012})$	$P(SB_{2013}>SB_{40\%})$	$P(SB_{2013}>SB_{25\%})$	$P(SB_{2013}>SB_{10\%})$	P(Fishing intensity in 2012 > 40% Target)
0	>99%	51%	80%	99%	0%
50,000	99%	49%	78%	98%	<1%
100,000	88%	46%	76%	96%	7%
150,000	74%	44%	73%	95%	17%
200,000	58%	42%	70%	94%	31%
251,809	47%	40%	68%	93%	47%
393,751	28%	35%	61%	91%	70%

Research and data needs

There are many areas of research that could improve stock assessment efforts, however we focus here on those efforts that might appreciably reduce the uncertainty (both perceived and unknown) in short-term forecasts for management decision-making. This list is in prioritized order:

1) Conduct an annual acoustic survey.

2) Develop management strategy evaluation (MSE) tools to evaluate major sources of uncertainty relating to data, model structure and the harvest control rule for this fishery and compare potential methods to address them.

3) Continue to explore alternative indices for juvenile or young (0 and/or 1 year old) Pacific hake.

4) Apply bootstrapping methods to the acoustic survey time-series in order to bring more of the relevant components into the variance calculations. These factors include the target strength relationship, subjective scoring of echograms, thresholding methods, the species-mix and demographic estimates used to interpret the acoustic backscatter, and others.

5) Routinely collect life history information, including maturity and fecundity data for Pacific hake. Explore possible relationships among these observations as well as with growth and population density. Currently available information is limited and outdated.

6) Evaluate the quantity and quality of historical biological data (prior to 1988 from the Canadian fishery, and prior to 1975 from the U.S. fishery) for use in developing age-composition data.

7) Conduct further exploration of ageing imprecision and the effects of large cohorts via simulation and blind source age-reading of samples with differing underlying age distributions – with and without dominant year classes.

8) Continue to explore process-based assessment modeling methods that may be able to use the large quantity of length observations to reduce model uncertainty and better propagate life-history variability into future projections.

9) Investigate meta-analytic methods for developing a prior on degree of recruitment variability (σ_r), and for refining existing priors for natural mortality (M) and steepness of the stock-recruitment relationship (h).

Table f.1. Summary of Pacific hake reference points for the base-case model.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female *SB* (SB_0, millions mt)	1.489	1.888	2.529
Unfished recruitment (R_0, billions)	1.540	2.326	3.976
Reference points based on $SB_{40\%}$			
Female spawning biomass ($SB_{40\%}$ million mt)	0.595	0.755	1.011
$SPR_{SB40\%}$	40.6%	43.5%	52.1%
Exploitation fraction resulting in $SB_{40\%}$	13.5%	18.6%	23.2%
Yield at $SB_{40\%}$ (million mt)	0.207	0.290	0.433
Reference points based on $F_{40\%}$			
Female spawning biomass ($SB_{F40\%}$ million mt)	0.501	0.670	0.902
$SPR_{MSY\text{-}proxy}$	0.40	0.40	0.40
Exploitation fraction corresponding to SPR	18.1%	21.4%	25.7%
Yield at $SB_{F40\%}$ (million mt)	0.210	0.299	0.443
Reference points based on estimated MSY			
Female spawning biomass (SB_{MSY} million mt)	0.291	0.460	0.781
SPR_{MSY}	18.3%	28.9%	47.9%
Exploitation fraction corresponding to SPR_{MSY}	15.9%	33.0%	56.9%
MSY (million mt)	0.215	0.317	0.482

Table f.2. Summary of Pacific hake reference points (median values) across alternate sensitivity models. Note that recruits are defined as age-0 in SS and age-1 in CCAM.

Quantity	CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Unfished female *SB* (SB_0, million mt)	1.905	1.912	1.888	1.909	1.963
Unfished recruitment (R_0, billions)	1.631	2.367	2.326	2.367	1.776
Reference points based on $SB_{40\%}$					
*F*emale spawning biomass ($SB_{40\%}$ million mt)	0.762	0.765	0.755	0.764	0.785
$SPR_{SB40\%}$	42.7%	43.6%	43.5%	43.7%	42.6%
Exploitation fraction resulting in $SB_{40\%}$	16.5%	18.5%	18.6%	18.8%	17.0%
Yield at $SB_{40\%}$ (million mt)	0.264	0.293	0.290	0.295	0.285
Reference points based on $F_{40\%}$					
Female spawning biomass ($SB_{F40\%}$ million mt)	0.697	0.680	0.670	0.676	0.724
$SPR_{MSY\text{-}proxy}$	0.40	40%	40%	40%	0.4
Exploitation fraction corresponding to SPR	18.4%	21.3%	21.4%	21.5%	18.7%
Yield at $SB_{F40\%}$ (million mt)	0.271	0.302	0.299	0.302	0.292
Reference points based on estimated MSY					
Female spawning biomass (SB_{MSY} million mt)	0.441	0.470	0.460	0.471	0.449
SPR_{MSY}	26.2%	28.9%	28.9%	29.4%	26.2%
Exploitation fraction corresponding to SPR_{MSY}	31.2%	32.6%	33.0%	32.5%	32.4%
MSY (million mt)	0.293	0.320	0.317	0.318	0.319

1. Introduction

Prior to 1997, separate Canadian and U.S. assessments for Pacific hake were submitted to each nation's assessment review process. This practice resulted in differing yield options being forwarded to each country's managers for this shared trans-boundary fish stock. Multiple interpretations of Pacific hake status made it difficult to coordinate an overall management policy. Since 1997, the Stock Assessment and Review (STAR) process for the Pacific Fishery Management Council (PFMC) has evaluated assessment models and the PFMC council process, including NOAA Fisheries, has generated management advice that has been largely utilized by both nations. The Joint US-Canada treaty on Pacific hake was formally ratified in 2006 (signed in 2007) by the United States as part of the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act. Although the treaty has been considered in force by Canada since June 25, 2008, an error in the original U.S. text required that the treaty be ratified again before it could be implanted. This second ratification occurred in 2010. Under the treaty, Pacific hake stock assessments are to be prepared by the Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists and reviewed by the Scientific Review Group (SRG), with memberships to both groups appointed by both parties to the agreement.

In keeping with the spirit of the treaty, this stock assessment document represents the work of a joint U.S. and Canadian JTC and their associates. Extensive modeling efforts conducted during 2010 and 2011 as well as highly productive discussions among analysts have resulted in unified documents for both the 2011 and 2012 (present) assessments.

This assessment reports a single base-case model representing the collective work of the Joint Technical Committee (JTC). The assessment depends primarily upon the acoustic survey biomass index (1995, 1998, 2001, 2003, 2005, 2007, 2009 and 2011) for information on the scale of the current hake stock. The 2011 index was the lowest in the time-series. The aggregate fishery age-composition data (1975-2011) and the age-composition data from the acoustic survey contribute to the models ability to resolve strong and weak cohorts. Both sources show a strong 2008 cohort, but differ somewhat in the relative magnitude of the weaker 2005 and 2006 cohorts.

The assessment is fully Bayesian, with the base-case model incorporating prior information on two key parameters (natural mortality, M, and steepness of the stock-recruit relationship, h) and integrating over estimation and parameter uncertainty to provide results that can be probabilistically interpreted. From a range of alternate models investigated by the JTC, a subset of sensitivity analyses are also reported in order to provide a broad qualitative comparison of structural uncertainty with the base case. The primary axis of this uncertainty is the structural approach to fishery and survey selectivity parameterization. The alternate models were run on two independent modeling platforms: (i) Stock Synthesis (SS), used for the base case and in previous Pacific hake stock assessments; and (ii) the Canadian Catch at Age Model (CCAM), developed at the University of British Columbia (Martell et al. 2011) and customized for this assessment by the authors of this assessment. Both models are thoroughly described in this assessment document.

The current document highlights progress made during 2011, residual areas of needed research, as well as ongoing scientific uncertainties in modeling choices, such that future technical working groups will enjoy a much easier working environment which fosters collaborative solutions to these difficult issues.

1.1 Stock structure and life history

Pacific hake (*Merluccius productus*), also referred to as Pacific whiting, is a semi-pelagic schooling species distributed along the west coast of North America generally ranging from 25^0 N. to 55^0 N. latitude. It is among 18 species of hake from four genera (being the majority of the family *Merluccidae)*, which are distributed worldwide in both hemispheres of the Atlantic and Pacific oceans and recently generate around 1.25 million mt of catch annually (Alheit and Pitcher 1995, Lloris et al. 2005). The coastal stock of Pacific hake is currently the most abundant groundfish population in the California Current system. Smaller populations of this species occur in the major inlets of the Northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California. Genetic studies indicate that Strait of Georgia and the Puget Sound populations are genetically distinct from the coastal population (Iwamoto et al. 2004; King et al. 2012). Genetic differences have also been found between the coastal population and hake off the west coast of Baja California (Vrooman and Paloma 1977). The coastal stock is also distinguished from the inshore populations by larger body size and seasonal migratory behavior.

The coastal stock of Pacific hake typically ranges from the waters off southern California to southern Alaska, with the northern boundary related to fluctuations in annual migration. However, a recent genetic and parasite-load study found evidence of some summer mixing with inshore stocks in Queen Charlotte Sound (King et al. 2012). Distributions of eggs, larvae, and infrequent observations of spawning aggregations indicate that Pacific hake spawning occurs off south-central California during January-March. Due to the difficulty of locating major offshore spawning concentrations, details of spawning behavior of hake remains poorly understood (Saunders and McFarlane 1997). In spring, adult Pacific hake migrate onshore and to the north to feed along the continental shelf and slope from northern California to Vancouver Island. In summer, Pacific hake form extensive mid-water aggregations in association with the continental shelf break, with highest densities located over bottom depths of 200-300 m (Dorn 1991, 1992). Pacific hake feed on euphausiids, pandalid shrimp, and pelagic schooling fish (such as eulachon and Pacific herring) (Livingston and Bailey 1985). Larger Pacific hake become increasingly piscivorous, and Pacific herring are commonly a large component of hake diet off Vancouver Island. Although Pacific hake are cannibalistic, the geographic separation of juveniles and adults usually prevents cannibalism from being an important factor in their population dynamics (Buckley and Livingston 1997).

Older Pacific hake exhibit the greatest northern migration each season, with two- and three-year old fish rarely observed in Canadian waters north of southern Vancouver Island. During El Niño events (warm ocean conditions, such as 1998), a larger proportion of the stock migrates into Canadian waters, apparently due to intensified northward transport during the period of active migration (Dorn 1995, Agostini et al. 2006). El Niño conditions also result in range extensions to the north, as evidenced by reports of hake off of southeast Alaska during these warm water years. Throughout the warm period experienced in 1990s, there were changes in typical patterns of hake distribution. Spawning activity was recorded north of California. Frequent reports of unusual numbers of juveniles off of Oregon to British Columbia suggest that juvenile settlement patterns also shifted northwards in the late 1990s (Benson et al. 2002, Phillips et al. 2007). Because of this shift, juveniles may have been subjected to increased cannibalistic predation and fishing mortality. However, the degree to which this was significant, and the proportion of the spawning and juvenile settlement that was further north than usual is unknown. Subsequently, La Nina conditions (colder water) in 2001 resulted in a southward shift in the stock's distribution, with a much smaller proportion of the population found in Canadian waters in the 2001 survey. Hake were distributed across the entire range of the survey in 2003, 2005, 2007 (Figures 1 and 2) after displaying a very southerly distribution in 2001. Although a few adult hake (primarily from the 1999 cohort) were observed north of the Queen Charlotte Islands in 2009 most of the stock appears to have been distributed off Oregon and Washington. The 2011 acoustic survey observed what appears to have been the most southerly distribution of Pacific hake since 2001. Some adult hake were observed in the Quatsino area (northwest Vancouver Island), but most of the stock was found off the coasts of Washington, Oregon, and California (Figure 1).

1.2 Ecosystem considerations

Pacific hake are an important contributor to ecosystem dynamics in the Eastern Pacific due to their relatively large total biomass and potentially large role as both prey and predator in the Eastern Pacific Ocean. The role of hake predation in the population dynamics of other groundfish species is likely to be important (Harvey et al. 2008), although difficult to quantify. Hake migrate farther north during the summer during relatively warm water years and their local ecosystem role therefore differs year-to-year depending on environmental conditions. Recent research indicates that hake distributions may be growing more responsive to temperature, and that spawning and juvenile hake may be occurring farther North (Phillips et al. 2007; Ressler et al. 2007). Given long-term climate-change projections and changing distributional patterns, considerable uncertainty exists in any forward projections of stationary stock productivity and dynamics.

Hake are also important prey items for many piscivorous species including lingcod (*Ophiodon elongatus*) and Humboldt squid (also known as jumbo flying squid, *Dosidicus gigas*). In recent years, the coastal U.S. lingcod stock has rebuilt rapidly from an overfished level and jumbo flying squid have intermittently extended their range northward from more tropical waters to the west coast of North America. Recent Humboldt squid observations in the hake fishery, recreational fisheries, and scientific surveys in the U.S. and Canada reflect a very large increase in squid abundance as far north as southeast Alaska (e.g., Gilly et al., 2006; Field et al., 2007) during the same portions of the year that hake are present, although the number and range vary greatly between years. While the relative biomass of these squid and the cause of such range extensions are not completely known, squid predation on Pacific hake is likely to have increased substantially in some years. There is evidence from the Chilean hake (a similar gadid species) fishery that squid may have a large and adverse impact on abundance, due to direct predation on individuals of all sizes (Alarcón-Muñoz et al., 2008). Squid predation as well as secondary effects on schooling behavior and distribution of Pacific hake may become important for future assessments, however it is unlikely that the current data sources will be able to detect squid-related changes in population dynamics (such as an increase in natural mortality) until well after they have occurred, if at all. There is considerable ongoing research to document relative abundance, diet composition and habitat utilization of Humboldt squid in the California current ecosystem (e.g., J. Field, SWFSC, and J. Stewart, Hopkins Marine Station, personal communication, 2010; Gilly et al., 2006; Field et al., 2007) which should be considered in future assessments. However, there were very few Humboldt squid present in the California Current during 2010 and 2011, despite the great abundance in 2009. Given the volatility of squid populations, future presence and abundance trends are impossible to predict.

1.3 Fisheries

The fishery for the coastal population of Pacific hake occurs along the coasts of northern California, Oregon, Washington, and British Columbia primarily during April-November. The fishery is conducted almost exclusively with mid-water trawls. Most fishing activity occurs over bottom depths of 100-500 m, while offshore extensions of fishing activity have occurred in recent years to reduce bycatch of depleted rockfish and salmon. The history of the coastal hake fishery is characterized by rapid changes brought about by the development of substantial foreign fisheries in 1966, joint-venture fisheries by the early 1980s, and domestic fisheries in 1990s (Table 1).

Large-scale harvesting of Pacific hake in the U.S. zone began in 1966, when factory trawlers from the Soviet Union began targeting Pacific hake. During the mid-1970s, factory trawlers from Poland, Federal Republic of Germany, the German Democratic Republic and Bulgaria also participated in the fishery. During 1966-1979, the catch in U.S. waters is estimated to have averaged 137,000 t per year (Table 1, Figure 3). A joint-venture fishery was initiated in 1978 between two U.S. trawlers and Soviet factory trawlers acting as mother-ships (the practice where the catch from several boats is brought back to the larger, slower ship for processing and storage until the return to land). By 1982, the joint-venture catch surpassed the foreign catch, and by 1989, the U.S. fleet capacity had grown to a level sufficient to harvest the entire quota, and no further foreign fishing was allowed, although joint-venture fisheries continued for another two years. In the late 1980's, joint ventures involved fishing companies from Poland, Japan, the former Soviet Union, the Republic of Korea and the People's Republic of China.

Historically, the foreign and joint-venture fisheries produced fillets as well as headed and gutted products. In 1989, Japanese mother-ships began producing surimi from Pacific hake using a newly developed process to inhibit myxozoan-induced proteolysis. In 1990, domestic catcher-processors and mother ships entered the Pacific hake fishery in the U.S. zone. These vessels had previously and continue to engage in Alaskan walleye pollock (*Theragra chalcogramma*) fisheries. The development of surimi production techniques for pollock was expanded to include Pacific hake as a viable alternative. Similarly, shore-based processors of Pacific hake had been constrained by a limited domestic market for Pacific hake fillets and headed and gutted products. The construction of surimi plants in Newport and Astoria, Oregon, led to a rapid expansion of shore-based landings in the U.S. fishery in the early 1990's, when the Pacific council set aside an allocation for that sector. In 1991, the joint-venture fishery for Pacific hake in the U.S. zone ended because of the increased level of participation by domestic catcher-processors and mother ships, and the growth of shore-based processing capacity. In contrast, Canada, at its discretion, allocates a portion of the Pacific hake catch to joint-venture operations once shore-side capacity is filled.

The sectors involved in the Pacific hake fishery in Canada exhibit a similar historical pattern, although phasing out of the foreign and joint-venture fisheries has proceeded more slowly relative to the U.S. (Table 1). Since 1968, more Pacific hake have been landed than any other species in the groundfish fishery on Canada's west coast. Prior to 1977, the fishing vessels from the former Soviet Union caught the majority of Pacific hake in the Canadian zone, with Poland and Japan accounting for much smaller landings. After declaration of the 200-mile extended fishing zone in 1977, the Canadian fishery was divided among shore-based, joint-venture, and foreign fisheries. In 1992, the foreign fishery ended, but the demand of Canadian shore-based processors remained below the available yield, thus the joint-venture fishery continues today, although no joint-venture fishery took place in 2002, 2003, or 2009. The majority of the shore-based landings of the coastal hake stock is processed into fillets for human consumption, surimi, or mince by processing plants at Ucluelet, Port Alberni, and Delta, British Columbia. Although significant aggregations of hake are found as far north as Queen Charlotte Sound, in most years the fishery has been concentrated below 49° N. latitude off the south coast of Vancouver Island, where there have been sufficient quantities of fish in proximity to processing plants.

1.4 Management of Pacific hake

Since implementation of the Magnuson-Stevens Fishery Conservation and Management Act in the U.S. and the declaration of a 200-mile fishery conservation zone in Canada in the late 1970's, annual harvest quotas have been the primary management tool used to limit the catch of Pacific hake. Scientists from both countries historically collaborated through the Technical Subcommittee of the Canada-U.S. Groundfish Committee (TSC), and there were informal agreements on the adoption of annual fishing policies. During the 1990s, however, disagreements between the U.S. and Canada on the allotment of the catch limits between U.S. and Canadian fisheries led to quota overruns; 1991-1992 quotas summed to 128% of the limit, while the 1993-1999 combined quotas were 107% of the limit on average. In the current Pacific hake agreement, the United States is allocated 73.88% of the total coast-wide harvest and Canada 26.12%.

In the last decade, the total coast-wide catch has tracked the harvest targets reasonably closely (Table 2). In 2002, after Pacific hake was declared overfished by the U.S., the catch of 181 thousand metric tons exceeded the target; however it was still below the limit of 208 thousand mt. In 2004, after Pacific hake was declared rebuilt, and when the large 1999 cohort was at near-peak biomass, the catch fell well short of the catch target of 501 thousand mt which is larger than the largest catch ever realized. Constraints imposed by bycatch of canary and widow rockfishes limited the commercial U.S. catch target to 259 thousand mt. Neither the U.S. portion nor the total catch has substantially exceeded the harvest guidelines in any recent year, indicating that management procedures have been effective.

1.4.1 United States

In the U.S. zone, participants in the directed fishery are required to use pelagic trawls with a codend mesh that is at least 7.5 cm (3 inches). Regulations also restrict the area and season of fishing to reduce the bycatch of Chinook salmon and several depleted rockfish stocks. More recently, yields in the U.S. zone have been restricted to levels below optimum yields due to bycatch of overfished rockfish species, primarily widow and canary rockfishes, in the Pacific hake fishery. At-sea processing and night fishing (midnight to one hour after official sunrise) are prohibited south of 42° N. latitude. Fishing is prohibited in the Klamath and Columbia River Conservation zones, and a trip limit of 10,000 pounds is established for Pacific hake caught inside the 100-fathom contour in the Eureka INPFC area. During 1992-1995, the U.S. fishery opened on April 15; however in 1996 the opening date was changed to May 15. Shore-based fishing is allowed after April 1 south of 42° N. latitude, but is limited to 5% of the shore-based allocation being taken prior to the opening of the main shore-based fishery. The main shore-based fishery opens on June 15. Prior to 1997, at-sea processing was prohibited by regulation when 60 percent of the harvest guideline was reached. The current allocation agreement, effective since 1997, divides the U.S. non-tribal harvest guideline among factory trawlers (34%), vessels delivering to at-sea processors (24%), and vessels delivering to shore-based processing plants (42%). Since 1996, the Makah Indian Tribe has conducted a separate fishery with a specified allocation in its "usual and accustomed fishing area", and beginning in 2009 there has also been a Quileute tribal allocation.

1.4.2 Industry actions

Shortly after the 1997 allocation agreement was approved by the PFMC, fishing companies owning factory trawlers with U.S. west coast groundfish permits established the Pacific Whiting Conservation Cooperative (PWCC). The primary role of the PWCC is to allocate the factory trawler quota among its members to allow more efficient allocation of resources by fishing companies, improvements in processing efficiency and product quality, and a reduction in waste and bycatch rates relative to the former "derby" fishery in which all vessels competed for a fleet-wide quota. The PWCC also initiated recruitment research to support hake stock assessment. As part of this effort, PWCC sponsored a juvenile recruit survey in the summers of 1998 and 2001, which since 2002 has become an ongoing collaboration with NMFS. In 2009, the PWCC contracted a review of the 2009 stock assessment which was discussed in the 2010 stock assessment and was one of the contributing factors to the extensive re-analysis of historical data and modeling methods subsequent to that assessment.

1.5 Overview of Recent Fisheries

1.5.1 United States

In 2005 and 2006, the coast-wide ABCs were 531,124 and 661,680 mt respectively. The OYs for these years were set at 364,197 and 364,842 and were nearly fully utilized with abundant 1999 year-class comprising nearly all of the catch. For the 2007 fishing season the PFMC adopted a 612,068 mt ABC and a coast-wide OY of 328,358 mt. This coast-wide OY continued to be set considerably below the ABC in order to avoid exceeding bycatch limits for overfished rockfish. In 2008, the PFMC adopted an ABC of 400,000 mt and a coast-wide OY of 364,842 mt, based upon the 2008 stock assessment. This ABC was set below the overfishing level indicated by the stock assessment, and therefore the difference between the ABC and OY was substantially less than in prior years. However, the same bycatch constraints caused a mid-season closure in the U.S. in both 2007 and 2008 and resulted in final landings being below the OY in both years. Based on the 2009 assessment, the Pacific council adopted a U.S.-Canada coast-wide ABC of 253,582 mt, and a U.S. ABC of 187,346 mt. The council adopted a U.S.-Canada coast-wide OY of 184,000 mt and a U.S. OY of 135,939 mt, reflecting the agreed-upon 73.88% of the OY apportioned to U.S. fisheries and 26.12% to Canadian fisheries. Bycatch limits were assigned to each sector of the fishery for the first time in 2009, preventing the loss of opportunity for all sectors if one sector exceeded the total bycatch limit. This greatly reduced the 'race for fish' as bycatch accumulated during the season. In total, the 2009 U.S. fishery caught 121,110 mt, or 89.1% of the U.S. OY, without exceeding bycatch limits. In 2010 the Pacific council adopted a U.S.-Canada coast-wide ABC of 455,550 mt, a U.S.-Canada coast-wide OY of 262,500 mt and a U.S. OY of 190,935 mt, reflecting the agreed-upon apportionment. As in 2009, tribal fisheries did not harvest the full allocation granted them (49,939 mt in 2010), and two reapportionments were made to other sectors during the fishing season. In total, the 2010 U.S. fishery caught 170,109 mt, or 89.1% of the U.S. OY. Bycatch rates were generally not a problem, although known areas of high historical bycatch were still (anecdotally) being avoided. For periods during the fishing season and in certain areas of the coasts, many fishermen found it difficult to avoid the large schools of age-2 hake (200-300 grams) present off the U.S. coast. There were reports that increased search time resulted from efforts to avoid the schools of smaller fish. This was especially so for the shore-side fishery, which due to the presence of these small fish, and to avoid bycatch of canary rockfish, opted for a voluntary stand-down between June 30 to July 20. Some processors were able to make changes during the season in order to process the smaller fish. The U.S. tribal fishery reported a reduced amount of hake in their fishing areas and generally smaller sized fish.

The Pacific Council adopted a U.S.-Canada coast-wide overfishing level (OFL) of 973,700 mt in 2011, with an annual catch limit (ACL) of 393,751 mt. The U.S. annual catch limit was 290,903 mt, after apportioning the coast-wide ACL by the agreed upon U.S.-Canada apportionment. Tribal allocation was 17.5% of the U.S. ACL plus 16,000 mt, resulting in 66,908 mt. Therefore, given 3,000 mt for research catch and bycatch in non-groundfish fisheries, the 2011 non-tribal U.S. catch limit of 220,995 mt was allocated to the catcher/processor (34%), mothership (24%), and shore-based (42%) commercial sectors. Therefore, the at-sea fleet (catcher/processors and motherships) was allocated 128,177 mt and the shore-based fleet was allocated 92,818 mt.

The 2011 U.S. fisheries caught 78.7% of their catch limit (229,067 mt) and were below the 2011 catch limit mainly due to smaller tribal catches. This year was the first time that motherships participated under the co-op system, thus were able to pool bycatch limits. Remaining mothership bycatch allocations were transferred to the catcher/processor sector in mid-December. This was also the first year that the shore-based fleet operated under the new catch shares program with individual fishing quotas (IFQ). All U.S. sectors encountered smaller fish in the 35–40 cm range, dominated by the 2008 year class. In previous years, the fishery may have avoided these small fish, but markets for smaller fish appear to be developing in 2011. The at-sea fleet encountered larger fish in May, which were encountered less often in June and rarely after then. The at-sea fleet additionally encountered even smaller fish in October through December, ranging in size from 24–34 cm, which likely corresponds to the 2009 year class and possibly the 2010 year class. Bycatch was generally not an issue, but anecdotal evidence suggests that the fishery was avoiding aggregations of larger fish to avoid bycatch of rockfish.

1.5.2 Canada

The Canadian fishery has operated under an Individual Vessel Quota (IVQ) management system since 1997. Groundfish trawl vessels are allocated a set percentage of the Canadian TAC that is fully transferable within the trawl sector. Additionally the IVQ management regime allows an opportunity for vessel owners to exceed license holding by up to 15% and have these overages deducted from the quota for the subsequent year. Conversely, if less than the quota is taken, up to 15% can be carried over into the next year. For example, an apparent overage in 1998 was due to carry-over from 1997 when 9% of the quota was not taken; this policy has not resulted in catch exceeding the coast-wide OY in the past 8 years (Table 1).

Canadian Pacific hake quotas were fully utilized in the 2005 fishing season with 85,284 mt and 15,178 mt taken by the shore-based and joint venture fisheries, respectively. In 2006, the joint-venture and shore-based fisheries harvested 13,700 mt and 80,000 mt, respectively. During the 2007 fishing season, Canadian fisheries harvested 85% of the 85,373 mt allocation. In 2008, Canadian fisheries harvested 78% of the 95,297 mt allocation with joint-venture and shore-based sectors catching 3,590 mt and 70,160 mt, respectively. During the 2009 season, no catches were made under joint-venture program. The Canadian shore-based fishery harvested 55,620 mt in 2009, or 115.7% of the Canadian OY. The 2010 season had an established TAC of 68,565 mt, or 26.12% of the coast-wide OY taking into account the 2010 assessment, and in agreement with actions of the PFMC on setting the coast-wide OY. The carry forward from the 2009 season was 5,877 mt resulting in a total allowable harvest of 74,442 mt. This was allocated as 65,942 mt for delivery to shore-based facilities and 8,500 mt for delivery to the joint-venture fleet. The total catch for each fleet was 48,833 mt and 8,242 mt respectively, giving a total of 57,075 mt, or 77.0% of the 2010 quota. Since 23% of the quota was not captured in 2010, the Canadian fishery carried over the maximum 15% into the 2011 season, as an overage allowance for 2011. The total catch for 2011 was 56,050mt split between the domestic and JV fisheries as 46,333mt and 9,717mt respectively, far less than the TAC for the year. This difference means there will again be a 15% overage allowance for the 2012 fishery. The JV fishery ended in early September due to lack of fish.

The 2011 fishery commenced in January near the La Perouse area off the west coast of Vancouver Island. There were approximately 24 mt landed from January 1- March 3, 2011. In April the fishery began to catch more significant amounts, with most of the landings taking place in the summer and fall as follows: August with 15,403 mt, September with 12,607 mt, October with 10,767 mt, and November with 6,039 mt.

From July to mid-August, most of the fishing took place in the traditional area around La Perouse Bank. In August, the fishery was divided between Queen Charlotte Sound and South La Perouse, near the US-Canada border, with JV and domestic fisheries working in both areas. This spatial shift of the fishery to Queen Charlotte Sound has been occurring for the past four years. From September through the end of November much of the fishing took place in the Quatsino Sound area, near Brooks Peninsula on the northwest coast of Vancouver Island, an area which has not been targeted to this extent before. Unlike the 2009 and 2010 fishery, there were no significant catches in the Strait of Juan de Fuca in 2011.

2. Available data sources

Nearly all of the data sources available for Pacific hake were re-evaluated during 2010. That process included obtaining the original raw data, reprocessing the entire time-series with standardized methods, and summarizing the results for use in the 2011 stock assessment. These sources have been updated with all newly available information for 2012. Primary fishery-dependent and -independent data sources used here (Figure 4) include:

- Total catch from all U.S. and Canadian fisheries (1966-2011).
- Age compositions from the U.S. fishery (1975-2011) and Canadian fishery (1990-2011).
- Biomass indices and age compositions from the Joint U.S. and Canadian integrated acoustic and trawl survey (1995, 1998, 2001, 2003, 2005, 2007, 2009, and 2011).

Some sources were not included but have been explored, used for sensitivity analyses, or discarded in recent stock assessments (these data are discussed in more detail below):

- Fishery and acoustic survey length composition information.
- Fishery and acoustic survey age-at-length composition information.
- Biomass indices and age compositions from the Joint U.S. and Canadian integrated acoustic and trawl survey (1977, 1980, 1983, 1986, 1989, 1992).
- NWFSC/SWFSC/PWCC coast-wide juvenile hake and rockfish survey (2001-2009).
- Bycatch of Pacific hake in the trawl fishery for pink shrimp off the coast of Oregon, 2004-2005, 2007-2008.
- Historical biological samples collected in Canada prior to 1990, but currently not available in electronic form.
- Historical biological samples collected in the U.S. prior to 1975, but currently not available in electronic form or too incomplete to allow analysis with methods consistent with more current sampling programs.
- CalCOFI larval hake production index, 1951-2006. The data source was previously explored and rejected as a potential index of hake spawning stock biomass, and has not been revisited since the 2008 stock assessment.
- Joint-U.S. and Canada Acoustic survey index of age-1 Pacific hake.

The assessment model also used biological relationships derived from external analysis of auxiliary data. These include:

- Mean observed weight (at both size and age) from fishery and survey catches, 1975-2011.
- Mean observed length-at-age from fishery and survey catches, 1975-2011.
- Proportion of individual female hake mature by size and/or age from a sample collected in 1995.
- Aging-error matrices based on cross-read and double-blind-read otoliths.

2.1 Fishery-dependent data

2.1.1 Total catch

The catch of Pacific hake for 1966-2011 by nation and fishery sector is shown in Table 1. Catches in U.S. waters prior to 1978 are available only by year from Bailey et al. (1982) and historical assessment documents. Canadian catches prior to 1989 are also unavailable in disaggregated form. For more recent catches, haul or trip-level information was available to partition the removals by month, during the hake fishing season, and estimate bycatch rates from observer information at this temporal resolution. This has allowed a more detailed investigation of shifts in fishery timing (See Figure 5 in Stewart et al. 2011). Although the application of monthly bycatch rates differed from previous, simpler analyses, it resulted in less than a 0.3% change in aggregate catch during the time-series. The U.S. shore-based landings are from the Pacific Fishery Information Network (PacFIN), foreign and joint-venture catches for 1981-1990 and domestic at-sea catches for 1991-2011 are estimated from the AFSC's and, subsequently, the NWFSC's at-sea hake observer programs stored in the NORPAC database. Canadian joint-venture catches from 1989 are from the Groundfish Biological (GFBio) database, the shore-based landings from 1989 to 1995 are from the Groundfish Catch (GFCatch) database, then from 1996 from the Pacific Harvest Trawl (PacHarvTrawl) database. Discards are nominal relative to the total fishery catch. The majority of vessels in the U.S. shore-based fishery have operated under experimental fishing permits that required them to retain all catch and bycatch for sampling by plant observers. All U.S. at-sea vessels and Canadian joint-venture catches are monitored by at-sea observers. Observers use volume/density methods to estimate total catch. Domestic Canadian landings are recorded by dockside monitors using total catch weights provided by processing plants.

One of the concerns identified in recent assessments has been the presence of shifts in the within-year distribution of catches during the time series. Subsequent to the ascension of the domestic fleet in the U.S. and both the domestic and Joint-Venture fleets in Canada, the fishery shifted most of the catch to the early spring during the 1990s (Table 1). This fishery gradually spread out over the summer and fall, and in recent years has seen some of the largest catches in the fall through early winter. This pattern is likely to continue in U.S. waters, as the fishery proceeds under the individual trawl quota system adopted in 2011.

2.1.2 Fishery biological data

Biological information from the U.S. at-sea commercial Pacific hake fishery was extracted from the NORPAC database. This yielded length, weight and age information from the foreign and joint-venture fisheries from 1975-1990, and from the domestic at-sea fishery from 1991-2011. Specifically these data include sex-specific length and age data which observers collect by selecting fish randomly from each haul for biological data collection and otolith extraction. Biological samples from the U.S.

shore-based fishery, 1991-2011, were collected by port samplers located where there are substantial landings of Pacific hake: primarily Crescent City, Newport, Astoria, and Westport. Port samplers routinely take one sample per offload (or trip) consisting of 100 randomly selected fish for individual length and weight and from these, 20 fish are randomly selected for otolith extraction. The Canadian domestic fishery is subject to 100% observer coverage on the two processing vessels *Viking Enterprise* and *Osprey*, which together make up 25% of the coast-wide catch. The joint-venture fishery has 100% observer coverage on their processing vessels, which in 2011 made up 16% of the Canadian catch. The total of these for 2011 is 42% observer coverage, with 100% electronic coverage (video) on all vessels for catch records. On observed trips, otoliths (for ageing) and lengths are sampled from Pacific hake caught in the first haul of the trip, with length samples taken on subsequent hauls. Sampled weight from which biological information is collected must be inferred from year-specific length-weight relationships. For unobserved trips, port samplers obtain biological data from the landed catch. Observed domestic haul-level information is then aggregated to the trip level to be consistent with the unobserved trips that are sampled in ports. For the Canadian joint-venture fishery, an observer aboard the factory ship estimates the codend weight for each delivery from a companion catcher boat. Length samples are collected every second day of fishing operations, and otoliths are collected once a week. Length and age samples are taken randomly from a given codend. Since the weight of the sample from which biological information is taken is not recorded, sample weight must be inferred from a weight-length relationship applied to all lengths taken and summed over haul.

The sampling unit for the shore-based fisheries is the trip, while the haul is the primary unit for the at-sea fisheries. Since detailed haul-level information is not recorded on trip landings documentation in the shore-based fishery, and hauls sampled in the at-sea fishery cannot be aggregated to a comparable trip level, there is no least common denominator for aggregating at-sea and shore-based fishery samples. As a result, samples sizes are simply the summed hauls and trips for fishery biological data. The magnitude of this sampling among sectors and over time is presented in Table 3.

Biological data were analyzed based on the sampling protocols used to collect them, and expanded to estimate the corresponding statistic from the entire landed catch by fishery and year when sampling occurred. In general, the analytical steps can be summarized as follows:

1) Count the number of fish (or lengths) at each age (or length bin) within each trip (or haul), generating "raw" frequency data.
2) Expand the raw frequencies from the trip (or haul) based on the fraction of the total haul sampled.
3) Weight the summed frequencies by fishery sector landings and aggregate.
4) Calculate sample sizes (number of trips or hauls) and normalize to proportions that sum to unity within each year.

To complete step (2), the expansion factor was calculated for each trip or haul based on the ratio of the total estimated catch weight divided by the total weight from which biological samples were taken. In cases where there was not an estimated sample weight, a predicted sample weight was computed by multiplying the count of fish in the sample by a mean individual weight, or by applying a year-specific length-weight relationship to the length of each fish in the sample, then summing these predicted weights. Anomalies can emerge when very small numbers of fish are sampled from very large landings; these were avoided by constraining expansion factors to not exceed the 95th percentile of all expansion factors calculated for each year and fishery. The total number of trips or hauls sampled is used as either the initial multinomial sample size input to the SS stock assessment model (prior to iterative reweighting) or as a relative weighting factor among years. Motivated by a recent downward trend in fishery sampling for ages in the Canadian sector, the method of weighting the fleet-specific proportions (Step 3) was revised in 2012 to be based on the estimated numbers in the total sector catch, rather than the number of samples collected from that catch. This allows for adequate representation of even sparsely sampled sectors.

The aggregate fishery age-composition data (1975-2011) confirm the well-known pattern of very large cohorts born in 1980, 1984 and 1999, with a small proportion from the 1999 year class (12 years old in 2011) still present in the fishery (Figure 5). The most recent age-composition data from the 2010 and 2011 fisheries suggest the presence of an above average 2008 year class, with a large proportion of the catch represented by this cohort. The previously strong 2005 and 2006 year classes appear to have declined in strength in the 2011 fishery, compared to previous years. We caution that the age-composition data contains information about the relative numbers-at-age, such that the absolute size of incoming cohorts cannot be precisely determined until it has been observed several times.

Both the weight- and length-at-age information suggest that hake growth has changed markedly over time. This is particularly evident in the frequency of larger fish (> 55 cm) before 1990 and a shift to much smaller fish in more recent years. The treatment of length-at-age and weight-at-length are described in more detail in section 2.3.3 and 2.3.4 below. Although length composition data are not fit explicitly in the base case assessment models presented here, the presence of the 2008 year class is clearly observed in both of the U.S. fishery sectors.

2.1.3 Catch per unit effort

Catch-per-unit-effort (CPUE) is a common source of information about relative population trend in stock assessments world-wide, although numerous studies question its utility. Calculation of a reliable CPUE metric is particularly problematic for Pacific hake, however, and it has never been used as a tuning index for assessment of this stock. This is mainly because the basic concept of “effort” is difficult to define for the hake fishery, as the use of acoustics, communication among vessels, extensive time spent searching and transit time between fishing ports and known areas of recurrent hake aggregations means that, by the time a trawl net is put in the water, catch rates can be predicted by the fishing vessel reasonably well. Factory trawlers may continue to fish the same aggregation for days, while shore-based sectors may be balancing running time with hold capacity and therefore opt for differing catch rates. Further, during the last decade, the hake fishery has been severely constrained in some areas due to avoidance of rockfish bycatch. Periodic voluntary ‘stand-downs’, and temporary in-season closures have resulted from high bycatch rates, and in some years fishermen have changed their fishing behavior and fishing areas, in order to reduce bycatch of overfished rockfish species. Furthermore, the US at-sea fleet generally leaves the hake fishing grounds for a period during the season to participate in the Bering Sea pollock fishery. It is unlikely that such fleet dynamics and inter-species effects can be dealt with adequately in order to produce a reliable index for Pacific hake based on fishery CPUE data.

2.2 Fishery independent data

2.2.1 Acoustic survey

The joint U.S. and Canadian integrated acoustic and trawl survey has been the primary fishery independent tool used to assess the distribution, abundance and biology of coastal Pacific hake, along the west coasts of the United States and Canada. Coast-wide surveys were carried out jointly by the Alaska Fisheries Science Center (AFSC) and the Pacific Biological Station (PBS) of the Canadian Department of Fisheries and Oceans (DFO) in 1995, 1998, and 2001. Following 2001, the responsibility for the U.S. portion of the survey was transferred to the Fishery Resource Analysis and Monitoring (FRAM) Division of NOAA's Northwest Fisheries Science Center (NWFSC). The survey was scheduled on a biennial basis, with joint acoustic surveys conducted by FRAM and PBS from 2003 to 2011. Between 1977 and 1992, acoustic surveys of Pacific hake were conducted every three years by the AFSC. However, these early surveys (1977–1992) covered only a reduced depth range and focused on U.S. waters. Therefore, they are not used in the current assessment because of concerns over both bias due to arbitrary expansion factors used to extrapolate to the entire depth and latitudinal range of the survey. More details are given in Stewart et al (2011). Only acoustic surveys performed in 1995, 1998, 2001, 2003, 2005, 2007, 2009, and 2011 were used in this assessment (Table 4). The acoustic survey includes all waters off the coasts of the U.S. and Canada thought to contain portions of the coastal hake stock and all portions of the hake stock older than age-1. Age-0 and age-1 hake have been historically excluded from the survey efforts, due to largely different schooling behavior relative to older hake and concerns over markedly different catchability by the trawl gear.

The distribution of Pacific hake can vary greatly between years. It appears that northward migration patterns are related to the strength of subsurface flow of the California Current (Agostini et al. 2006) and upwelling conditions (Benson et al. 2002). Distributions of hake backscatter plotted for each acoustic survey since 1995 illustrate the variable spatial patterns among years (Figure 1). The 1998 acoustic survey is notable because it shows an extremely northward occurrence that is thought to be related to the strong 1997-1998 El Nino (Figure 2). In contrast, the distribution of hake during the 2001 survey was compressed into the lower latitudes off the coast of Oregon and Northern California. In 2003, 2005 and 2007 the distributions generally followed the "normal" coast-wide pattern, but in 2009 and 2011, the majority of the hake distribution was again found in U.S. waters. Pacific hake also tend to migrate farther north as they age. Figure 2 shows the mean location of Pacific hake observed in the acoustic survey by age and year. Age-2 hake are located in the southern portion of their distribution, while older age classes are found in more northerly locations within the same year. The mean locations of Pacific hake age-6 and older tend to be more similar among years than those for the younger ages. With the aging of the strong 1999 year class causing a reduction in the number of older fish, a more southerly distribution has been observed in recent surveys.

For the 2012 assessment of Pacific hake, acoustic survey data from 1995 onward were analyzed using geostatistical techniques (kriging), which accounts for spatial correlation to provide an estimate of total biomass as well as an estimate of the year-specific sampling variability due to patchiness of hake schools and irregular transects (Petitgas 1993; Rivoirard et al. 2000; Mello & Rose 2005; Simmonds and MacLenann, 2005). Advantages to the kriging approach are: 1) it simultaneously provides the estimates of the hake biomass and associated sample while properly accounting for spatial correlation along and between transects; 2) it provides biomass estimates in the area beyond transect lines but within the correlation distance; 3) it provides maps of hake biomass and variance that take into account the heterogeneous and patchy hake distribution; and 4) it allows for greater flexibility (and potentially efficiency) in survey transect design, in that transects do not need to be more or less perpendicular to the coast line. A comparison of the kriged estimates to previous conventional design-based estimates was presented in Stewart et al. (2011), and showed a reasonable degree of consistency between the two methods.

During the acoustic surveys, mid-water trawls are made opportunistically to determine the species composition of observed acoustic marks and to obtain the length data necessary to scale the acoustic backscatter into biomass (see Table 4 for the number of trawls in each survey year). Biological samples collected from these trawls are post-stratified, based on similarity in size composition and geographic proximity. Results from research done in 2010 on representativeness of the biological data (i.e., repeated trawls on the same aggregation of hake) showed that trawl sampling and post-stratification is only a small source of variability among all of the sources of variability inherent to the acoustic analysis (see Stewart et al 2011).

The composite length frequency developed from the biological sampling was used to characterize the hake size distribution along each transect and to predict the expected backscattering cross section for Pacific hake based on the fish size-target strength (TS) relationship TS_{db} = 20logL-68 (Traynor 1996). Recent target strength work (Henderson and Horne 2007), based on in-situ and ex-situ measurements, estimated a regression intercept of 4-6 dB lower than that of Traynor (1996), suggesting that an individual hake reflects less acoustic energy, resulting in a larger estimated biomass than when using Traynor's (1996) equation. This difference would be accounted for directly in estimates of acoustic catchability within the assessment model, but variability in the estimated biomass due to uncertainty in target strength is not explicitly accounted for.

Figure 6 shows the backscatter of age-2+ hake as observed in the 2011 survey. It can be seen that a considerable amount of hake were observed off Cape Mendocino in Northern California, and near the U.S./Canadian border. There were few locations in Canada with assigned hake backscatter, mainly off of the northern portion of West Vancouver Island. Although small numbers of hake were sampled in some trawls in areas far north of Vancouver Island, it was determined that these hake were a very small part of the observed backscatter due to mixing with smaller species such as euphausiids or eulachon, and no backscatter was assigned to the regions on these transects (Figure 6). Comparing the distribution of backscatter in 2011 to the distribution of backscatter in previous surveys (Figure 1) shows that the stock was distributed more southerly in 2011, and was found in a narrower band across depth contours (East to West). The distribution of hake in 2011 was most similar to the distribution of hake in 2001, when the population was also dominated by young fish.

The 2011 acoustic survey biomass estimate is 521,476 metric tons, the lowest observed in the time series and approximately one-third of the 2009 estimate (Figure 7). Only 7% of this biomass was observed in Canadian waters. A smaller correlation distance estimated from the kriging analysis suggested that the hake schools encountered in 2011 were consistently smaller than the average size of schools over the longer time-series. No Humboldt squid were observed in 2011, although considerable numbers were caught in both the survey and fishery in 2009.

The variability of the 2011 biomass estimate, measured as a coefficient of variance (CV), is 10.2%, the second largest in the series (Figure 7). These estimates of uncertainty account for sampling variability (and the variability due to squid in 2009), but several additional sources of observation error are also possible. For example, haul-to-haul variation in size and age, target strength uncertainty of hake as well as the presence of other species in the backscatter and interannual differences in catchability likely comprise additional sources of uncertainty in the acoustic estimates. In the future, it is possible that a bootstrapping analysis that incorporates of many of these sources of variability can be conducted and the estimation of variance inflation constants in the assessment may become less important (O'Driscoll 2004). At present, though, there is strong reason to believe that all survey variance estimates are underestimated relative to the true variability.

As with the fishery data, age compositions were used to reconstruct the age structure of the hake observed by this survey. Proportions-at-age for the eight acoustic surveys are summarized in Figure 8 and clearly show the strong 1999 and 2008 year classes. The large 2005 and 2006 year classes appeared to be very strong in the 2009 survey but contribute less to the total age composition in 2011. The 2011 survey attributed 63% of the estimated number of hake observed to the 2008 year-class, and a total of 88% to the 2008 and 2009 year-classes combined. While this finding supports the previously estimated strength of these incoming cohorts, it differs substantially from 2011 stock assessment model predictions which, while uncertain, indicated that the 2005 and 2006 year classes would be important contributors to survey catches during 2011. The acoustic survey data in this assessment do not include age-1 fish (and therefore give no indication of the strength of the 2010 year-class), although a separate age-1 index is being developed (see below).

2.2.2 Bottom trawl surveys

The Alaska Fisheries Science Center conducted a triennial bottom trawl survey along the west coast of North America from 1977 to 2001 (Wilkins et al. 1998). This survey was repeated for a final time by the Northwest Fisheries Science Center in 2004. In 1999, the Northwest Fisheries Science Center began to take responsibility for bottom trawl surveys off of the U.S. west coast, and, in 2003, the Northwest Fisheries Science Center survey was extended shoreward to a depth of 55 m to match the shallow limit of the triennial survey (Keller et al., 2008). Despite similar seasonal timing of the two surveys, the 2003 and subsequent annual surveys differ from the triennial survey in size/horsepower of the chartered fishing vessels and bottom trawl gear used. As such, the two were determined (at a workshop on the matter in 2006) to be separate surveys which cannot be combined into one. In addition, the presence of significant densities of hake, both offshore and to the North of the area covered by the trawl survey, coupled with the questionable effectiveness of bottom trawls in catching mid-water schooling hake, limits the usefulness of this survey to assess the hake population. For these reasons neither the triennial, nor the Northwest Fisheries Science Center shelf trawl survey, have been used in recent assessments. With the growing time-series length of the NWFSC survey (now 8 years), future assessments should re-evaluate the use of the survey as an index of the adult and/or juvenile (age 0-1) hake population.

2.2.3 Pre-recruit survey

From 1999-2009, the NWFSC and Pacific Whiting Conservation Cooperative (PWCC), in coordination with the SWFSC Rockfish survey have conducted an expanded survey (relative to historical efforts) targeting of juvenile hake and rockfish. The SWFSC/NWFSC/PWCC pre-recruit survey used a mid-water trawl with an 86' headrope and ½" codend with a 1/4" liner to obtain samples of juvenile hake and rockfish (identical to that used in the SWFSC Juvenile Rockfish Survey). Trawling was done at night with the head rope at 30 m at a speed of 2.7 kt. Some trawls were made before dusk to compare day/night differences in catch. Trawl tows of 15 minutes duration at target depth were conducted along transects at 30 nm intervals along the coast. Stations were located along each transect, at bottom depths of 50, 100, 200, 300, and 500 m. Since 2001, side-by-side comparisons were made between the vessels used for the survey.

Trends in the coast-wide index have shown very poor correlations with estimated year-class strengths in recent assessment models, thus it has not been used in them. Because the survey has not been conducted since 2009, it has not been revisited in subsequent stock assessments.

2.2.4 Age-1 Index from the acoustic survey

The acoustic survey has historically focused its at-sea and analysis efforts on the age-2+ portion of the Pacific hake stock. The rationale for this included: inshore and southerly distribution of age-1 fish required additional survey time to provide adequate geographic coverage; relatively lower catchability of age-1 fish in the trawl net used by the survey; and perhaps greater difficulty in identifying these schools from other small pelagic fish. This choice was also consistent with the needs of early stock assessments, where recruitments were modeled as at age-2. Despite these reasons for excluding age-1 fish historically, a reliable index of age-1 hake would now be extremely valuable for this stock assessment. An age-1 index could potentially reduce uncertainty around the strength of incoming cohorts much more rapidly than only the biennial survey estimates for age-2+ fish and the annual commercial fishery data.

During 2011, the acoustic survey team re-processed all echogram data available, spanning the period from 1995 to 2011. All age-1 aggregations were identified and the backscatter integrated following the simple polygon methods that were used for the adult stock prior to development of the kriging method currently employed. The results of this analysis were made available to the JTC just prior to the completion of this document. The number of data points is currently very small. Unfortunately, correlation analysis for the index and assessment-estimated year-class strengths is hampered by low variability among the years for which age-1 hake have been enumerated by the acoustic survey. However, the results are generally consistent with a large 2008 cohort (Figure 9). With no other data yet available with which to corroborate this index, it is premature to draw conclusions on the strength of the 2010 cohort, although the estimate in the age-1 index is larger than that for the 2008 (Figure 9). The JTC encourages a continuation of this effort, which, in addition to an annual survey could reduce assessment model uncertainty in the future.

2.3 Externally analyzed data

2.3.1 Maturity

The fraction mature, by size and age, is based on data reported in Dorn and Saunders (1997) and has remained unchanged since the 2006 stock assessment. These data consisted of 782 individual ovary collections based on visual maturity determinations by observers. The highest variability in the percentage of each length bin that was mature within an age group occurred at ages 3 and 4, with virtually all age-one fish immature and age 4+ hake mature. Within ages 3 and 4, the proportion of mature hake increased with larger sizes, such that only 25% were mature at 31 cm while 100% were mature at 41 cm. Less than 10% of the fish smaller than 32 cm are predicted to be mature, while 100% maturity is predicted by 45 cm. Histological samples have been collected during recent U.S. bottom trawl surveys, and these collections are currently under evaluation at the NOAA Fisheries NWFSC. The JTC anticipates receiving these data during 2012 and revisiting the maturity schedule used in the stock assessment for 2013.

2.3.2 Aging error

The large inventory of age determinations for Pacific hake include many duplicate reads of the same otolith, either by more than one laboratory, or by more than one age-reader within a lab. Recent stock assessments have utilized the cross- and double-reads to generate an ageing error vector describing the imprecision in the observation process as a function of fish age. New data and analysis was used in the 2009 assessment to address an additional process influencing the ageing of hake: cohort-specific ageing error related to the relative strength of a year-class. This process reflects a tendency for uncertain age determinations to be assigned to predominant year classes. The result is a tendency towards reduced mis-ageing of strong year classes, and increased mis-ageing of neighboring year-classes. To account for this process in the model, year-specific ageing-error matrices (or vectors of standard deviations of observed age at true age) are applied, where the standard deviations of strong year classes were reduced by a constant proportion. For the 2009 and 2010 assessments this proportion was determined empirically by comparing double-read error rates for strong year classes with rates for other year classes. In 2010, a blind double-read study was conducted using otoliths collected across the years 2003-2009. One read was conducted by a reader who was aware of the year of collection, and therefore of the age of the strong year classes in each sample, while the other read was performed by a reader without knowledge of the year of collection, and therefore with little or no information to indicate which ages would be more prevalent. The resulting data were analyzed via an optimization routine to estimate both ageing error and the cohort effect. The resultant ageing error was similar to the ageing error derived from the 2008 analysis. This approach, unchanged from the 2011 assessment has been retained for 2012.

2.3.3 Weight-at-length and age

A matrix of empirically derived population weight at age is required as input for the current assessment models. Mean weight at age was calculated from samples pooled from all fisheries and the acoustic survey for the years 1975 to 2011 (Figure 10). Ages 15 and over were pooled and assumed to have the same weight at age. For ages 2 to 15+, 99% of the combinations of year and age had samples from which to calculate mean weight at age. At age 1, 58% of the years had samples available. Linear interpolation over both age and year dimensions was used to fill in missing values. However, the number of samples is generally proportional to the amount of catch, so the combinations of year and age with no samples have very little importance in the overall estimates of the population dynamics. The use of empirical weight at age is a convenient method to capture the variability in both the weight-at-length relationship within and among years, as well as the variability in length-at-age, without requiring parametric models to represent these relationships. However, this method requires the assumption that observed values are not biased by strong selectivity at length or weight and that the spatial and temporal patterns of the data sources provide a representative view of the underlying population

2.3.4 Length-at-age

In both 2011 assessment models, and in models used for management prior to the 2006 stock assessment, variability in length-at-age was included in stock assessments via the calculation of empirical weight-at-age. In the 2006 and subsequent assessments that attempted to estimate the parameters describing a parametric growth curve, strong patterns have been identified in the observed data indicating sexually dimorphic and temporally variable growth. Parametric growth models fit externally to data collected prior to 1990 and afterward show the same dramatically different rates of growth when it has been estimated inside the assessment model in recent years. Hake show very rapid growth at younger ages, and the length-at-age trajectories of individual cohorts also vary greatly, as has been documented in previous assessments.

In aggregate, these patterns result in a greater amount of process error for length-at-age than is easily accommodated with parametric growth models. This means that even complex approaches to modeling growth (and therefore fitting to length or age-at-length data explicitly) will have great difficulty in making predictions that mimic the observed data. This has been particularly evident in the residuals to the length-frequency data from models prior to 2011. We have not revisited the potential avenues for explicitly modeling variability in length- and weight-at age in this model, but retain the empirical approach to weight-at-age described above.

2.4 Prior probability distributions

The informative prior probability distributions used in this stock assessment are reported in Table 5. A summary of the priors used for the base-case model and the alternate CCAM model is provided in Tables 6 and 7. Several important distributions are discussed in detail below.

2.4.1 Natural Mortality

In recent stock assessments, the natural mortality rate for Pacific hake has either been fixed at a value of 0.23 per year, or estimated using an informative prior to constrain the probability distribution to a reasonable range of values. The 0.23 estimate was originally obtained via tracking the decline in abundance of individual year classes (Dorn et. al 1994). Pacific hake longevity data, natural mortality rates reported for Merluciids in general, and previously published estimates for Pacific hake natural mortality indicate that natural morality rates in the range 0.20-0.30 could be considered plausible for Pacific hake (Dorn 1996).

Beginning in the 2008 assessment, Hoenig's (1983) method for estimating natural mortality (M), was applied to hake, assuming a maximum age of 22. The relationship between maximum age and M was recalculated using data available in Hoenig (1982) and assuming a log-log relationship (Hoenig, 1983), while forcing the exponent on maximum age to be -1. The recalculation was done so that uncertainty about the relationship could be evaluated, and the exponent was forced to be -1 because theoretically, given any proportional survival, the age at which that proportion is reached is inversely related to M (when free, the exponent is estimated to be -1.03). The median value of M via this method was 0.193. Two measures of uncertainty about the regression at the point estimate were calculated. The standard error, which one would use assuming that all error about the regression is due to observation error (and no bias occurred) and the standard deviation, which one would use assuming that the variation about the regression line was entirely due to actual variation in the relationship (and no bias occurred). The truth is likely to be between these two extremes (the issue of bias not withstanding). The value of the standard error in log space was 0.094, translating to a standard error in normal space of about 0.02. The value of the standard deviation in log space was 0.571, translating to a standard deviation in normal space of about 0.1. Thus Hoenig's method suggests that a prior distribution for M with mean of 0.193 and standard deviation between 0.02 and 0.1 would be appropriate if it were possible to accurately estimate M from the data, all other parameters and priors were correctly specified, and all correlation structure was accounted for.

In several previous assessments (2008-2010) natural mortality has been allowed to increase with age after age 13, to account for the relative scarcity of hake at age 15+ in the observed data. This choice was considered a compromise between using dome-shaped selectivity - and assuming the oldest fish were extant but unavailable to the survey or fishery - and specifying increasing natural mortality over all ages, which tended to create residual patterns for ages with far more fish in them. The reliability of this approach has been questioned repeatedly, and it makes little difference to current assessment results, so in the interest of parsimony, natural mortality is considered to be constant across age and time for all models reported in this assessment document.

For the 2011 assessment and again this year, a combination of the informative prior used in recent Canadian assessments and the results from Hoenig's method described above support the use of a log-normal distribution with a mean of 0.2 and a log-standard deviation of 0.1. Sensitivity to this prior is evaluated by examination of the posterior distribution, as updated by the data, as well as the use of alternate priors, specifically a larger standard deviation about the point estimate (see Section 3.4.7).

2.4.2 Steepness

The prior for steepness is based on the median (0.79), 20th (0.67) and 80th (0.87) percentiles from Myers et al. (1999) meta-analysis of the family Gadidae, and has been used in previous U.S. assessments since 2007. This prior is distributed $\beta(9.76,2.80)$. We tested the CCAM model's sensitivity to alternative priors on steepness (reported in section 3.4.7).

2.4.3 Acoustic survey catchability (q)

There was no prior placed on the value for survey catchability in the base case. A lognormal prior was placed on the survey catchability parameter q, in the CCAM alternate models, with mean corresponding to 1 and log-standard deviation 0.1 (95% confidence interval of 0.82 and 1.22). The prior was used to help achieve model convergence. Although it might be considered overly precise, sensitivity tests were done to evaluate the influence of the standard deviation of this prior (see Section 3.4.7).

3. Stock assessment

3.1 Modeling history

Age-structured assessment models of various forms have been used to assess Pacific hake since the early 1980s, using total fishery landings, fishery length and age compositions, and abundance indices. Modeling approaches have evolved as new analytical techniques have been developed. Initially, a cohort analysis tuned to fishery CPUE was used (Francis et al. 1982). Later, the cohort analysis was tuned to NMFS triennial acoustic survey estimates of absolute abundance at age (Francis and Hollowed 1985, Hollowed et al. 1988a). In 1989, the hake population was modeled using a statistical catch-at-age model (Stock Synthesis) that utilized fishery catch-at-age data and survey estimates of population biomass and age-composition data (Dorn and Methot, 1991). The model was then converted to AD Model Builder (ADMB; Fournier et al. 2011) in 1999 by Dorn et al. (1999), using the same basic population dynamics equations. This allowed the assessment to take advantage of ADMB's post-convergence routines to calculate standard errors (or likelihood profiles) for any quantity of interest. Beginning in 2001, Helser et al. (2001, 2003, and 2004) used the same ADMB model to assess the hake stock and examine important assessment modifications and assumptions, including the time-varying nature of the acoustic survey's selectivity and catchability. The acoustic survey catchability coefficient (q) was one of the major sources of uncertainty in the model. The 2004 and 2005 assessments presented uncertainty in the final model result as a range of biomass. The lower end of the biomass range was based upon the conventional assumption that the acoustic survey q was equal to 1.0, while the higher end of the range represented a q=0.6 assumption.

In 2006, the coastal hake stock was modeled using the Stock Synthesis (SS) modeling framework written by Dr. Richard Methot (U.S. National Marine Fisheries Service, Northwest Fisheries Science Center) in AD Model Builder. Conversion of the previous hake model into SS2 was guided by three principles: 1) incorporate less *derived* data, favoring the inclusion of unprocessed data where possible, 2) explicitly model the underlying hake growth dynamics, and 3) pursue parsimony in model complexity. "Incorporating less *derived* data" entailed fitting observed data in their most elemental form. For instance, no pre-processing to convert length data to age-compositional data was performed. Also, incorporating conditional age-at-length data for each fishery and survey allowed explicit estimation of expected growth, dispersion about that expectation, and its temporal variability, all conditioned on selectivity. In both 2006 and 2007, as in 2004 and 2005, assessments presented two models (which were assumed equally likely) in an attempt to bracket the range of uncertainty in the acoustic survey catchability coefficient, *q*. The lower end of the biomass range was again based upon the conventional assumption that the acoustic survey *q* was equal to 1.0, while the higher end of the range allowed estimation of q with a fairly tight prior about q = 1.0 (effective q = 0.6 - 0.7). The 2006 and 2007 assessments were collaborative, including both U.S. and Canadian scientists.

During 2008, three separate stock assessments were prepared independently by U.S. and Canadian scientists. The U.S. model was reviewed during the STAR panel process, and both the VPA and TINSS models were presented directly to the SSC, but were not formally included in the U.S. assessment review and management process. The post-STAR-panel U.S. model freely estimated q for the first time, and this resulted in very large relative stock size and yield estimates. In 2009, the U.S. assessment model incorporated further uncertainty in the degree of recruitment variability (σ_R) as well as more flexible time-varying fishery selectivity. Additionally, the 2009 assessment incorporated further refinements to the ageing-error matrices, including both updated data and cohort-specific reductions in ageing error to reflect "lumping" effects due to strong year classes. The 2009 U.S. model continued to integrate uncertainty in acoustic survey *q* and selectivity and in *M* for older fish. Residual patterns that had been present in the age and length data were discussed at length, and efforts were undertaken to build the tools necessary to re-evaluate input data to allow more flexibility in potential modeling approaches.

In 2010, two competing models (one built using TINSS, Martell 2010; and one in SS, Stewart and Hamel 2010) were presented to the STAR panel. Estimates of absolute stock size and yields differed greatly between the two models, and the causes of these differences went largely unidentified. The SSC recommended that the Pacific Council base management advice on both models.

In 2011, two models were again put forward by a joint stock assessment team comprised of U.S. and Canadian scientists collaborating in the spirit of the as-yet unimplemented treaty. Results from both models were presented in a single document (Stewart et al. 2011). Considerable efforts were made to refine both models to better understand the reasons for previous differences among models and to better present the uncertainty in current stock status. The exercise resulted in two models that were structurally very similar, although they still contained some fundamental differences in underlying assumptions about certain likelihood components and prior assumptions about the productivity and scale of the population. Both models were deemed equally plausible by the STAR panel, in terms of their ability to capture the dynamics of the Pacific hake stock and provide advice for management in the face of considerable scientific uncertainty. The models achieved a greater degree of parsimony compared with some earlier versions. Notably, neither model attempted to fit to observed lengths at age. Annual variability in length at age was instead captured through use of empirically-derived estimates of weight at age in the data files.

In 2012, members of a provisional Joint Technical Committee (JTC), comprised of Canadian and U.S. scientists, continued to collaborate in the production of a single stock assessment document. Now under treaty, members of the provisional JTC agreed on a single base-case model, using the SS3 modeling platform configured almost identically to that used in the 2011 assessment. Sensitivity to structural and parameter uncertainty was analyzed using this model and a new statistical catch at age model (CCAM), originally developed at the University of British Columbia (Martell 2011) and customized by members of the JTC.

3.2 Response to recent review recommendations

3.2.1 2012 SRG review

Subsequent to the distribution of the draft 2012 stock assessment for SRG review and prior to the review meeting an error was discovered in the 2011 acoustic survey biomass index calculations. In response to this error, the base case and key sensitivity models were updated to include the revised results. The SRG endorsed the use of these revised models for 2012. Other recommendations for this assessment made during the SRG review also included inclusion of a table of management metrics that were of particular interest to meeting participants and several adjustments to some technical terms to improve the readability of the assessment results.

3.2.2 2011 STAR Panel and SSC review

The 2011 STAR panel (7-11 February, 2011) conducted a thorough review of the data, analyses and modeling conducted by the joint technical team (a full summary can be found in the STAR panel report). During the course of the review, several aspects of the TINSS model were improved, leading to results that were more similar to those from the SS model. Further, several errors and inconsistencies were identified in the underlying code, and these were rectified during the review. Subsequent to the STAR review, several additional inconsistencies in the treatment of weight-at-age for various calculations were discovered. These issues were corrected, and the revised results presented to the SSC during the PFMC meeting (5 March, 2011). At the request of the SSC, the posterior distributions for management-related quantities from the SS and TINSS models were combined with equal weight in order to provide model-averaged estimates.

3.2.3 2011 STAR Panel recommendations

The 2011 STAR panel made the following recommendations (in no particular order).

1. *Conduct the acoustic survey annually. Reason: the survey is now biennial. An annual survey would help to the reduce CI on the current biomass estimate. Consideration should be given to a joint government / industry survey.*

> Response: The JTC strongly supports this recommendation, and especially supports an interim survey in 2012. Discussions on this topic among scientists and managers from the U.S. and Canada have already begun.

2. *Conduct target strength research. Reason: the relationship used in the biomass estimate calculations is dated and more recent research indicates substantial differences in the target strength / fish length relationship.*

> Response: Although some target strength research was planned for 2011, there were no suitable opportunities for collecting appropriate observations of individual hake targets of identifiable size.

3. *Conduct further work to validate haul representativeness and sampling design of the trawling component of the acoustic survey. Reason: uncertainty remains in the representativeness of the hauls used to characterize the biological composition of the acoustic survey.*

Response: The JTC supports this recommendation but there have so far been no opportunities to carry out this work. This type of work is typically done in even-numbered years (between biannual surveys). However, given the extremely low acoustic index estimate in 2011, an interim biomass survey would appear to be a greater need in 2012.

4. *Explore alternative spatial analyses using different regression techniques with the kriging data. Reason: Spatial and temporal variation of hake influence the level of homogeneity in the acoustic biomass estimates.*

Response: A workshop to evaluate acoustic survey design and methods is being planned.

5. *Explore fundamental differences in assumptions that drive output differences in the TINSS and SS models. Reason: the fundamental structure of the two models differs and an explicit evaluation of assumptions will help to evaluate reasons for differences in the resulting advice for management coming from the two models.*

Response: We continued the comparison of alternate assessment models subsequent to the 2011 review. This included the transition from TINSS to CCAM and additional work comparing the TINSS and CCAM code, behavior and results with those from SS. During preliminary modelling for the 2012 assessment, committee members felt that they had succeeded in generating very comparable behavior among the three models (especially CCAM and SS) and were comfortable that the assessment results were very robust to the choice of one platform or the other. Much of this work is documented here (see Appendix E). Further, the JTC concluded that extensive time spent comparing relatively small differences among specific model implementations had the potential to significantly detract from discussion of greater areas of uncertainty in the 2012 stock assessment. For this reason, we present a single base-case model and utilize the work that has been done to provide an extended sensitivity analysis (see sections below) including alternate structural assumptions within and among SS and CCAM.

6. *Further evaluate the method of age composition weighting and the different approaches taken in TINSS and SS models.*

Response: It is noted that TINSS is no longer used by for the hake assessment, although its replacement CCAM, uses the same likelihood function for the age-composition data as TINSS. We find that despite differences in specific likelihood calculations and weighting of data sources the SS and CCAM models produce very similar results. We conclude that additional exploration of this topic, while of some scientific interest, is likely to be of little importance to the results for Pacific hake.

7. *Further explore time-varying growth and alternate model structures, as appropriate, to characterize this phenomenon.*

Response: The JTC did not have the resources to successfully revisit more detailed approaches to explicitly modelling time-varying growth for 2012. The empirically derived weight-at-age method employed appears to capture this variability and specific alternatives are not currently identified.

8. *Further explore time-varying selectivity and alternate model structures, as appropriate, to characterize this phenomenon.*

Response: The use of time-varying selectivity has been a topic of extensive discussion during assessment reviews over the last decade. Assessment models have applied approaches ranging from selectivity smoothed over time and age, for multiple explicit fishing fleets to simple parametric curves that were assumed to be time-invariant. Many of these models were criticised as being overparameterized, failing to achieve parsimony, lacking robust estimation properties, and requiring too many subjective decisions regarding the specific structure of breaks, nodes or joints in time-varying functions. In the 2011 assessment, the assessment team simplified both the fleet structure and the selectivity approach in the two models. The goal was to represent the central tendency of the realized selectivity for a single fishing fleet representing an amalgamation of sectors, targeting strategies and temporal behavior over both time and space. This approach propagates the uncertainty in selectivity without requiring a large number of parameters which reduce computational efficiency and robustness. For 2012, the JTC spent some time investigating preliminary model configurations that employed time-varying components, but concluded that without adequate simulation studies to investigate the estimation properties of these approaches they were not yet ready for management use.

9. *Produce an age 0 or age 1 recruit index. Reason: recruitment variability is a major driver in the uncertainty of the hake assessment.*

Response: Extensive work was completed on this topic during 2011 and is reported above. It is likely to be several years before the reliability of the acoustically derived age-1 index can be determined and it can be quantitatively included in the stock assessment.

10. *Update the maturity-at-age relationship by collecting new data and using histological analysis techniques. Reason: substantial changes in growth in early 1990s may have resulted in maturation changes.*

Response: This work is underway, and described more fully herein. It is expected that a revised maturity schedule will be available for the 2013 assessment.

11. *Explore the role of ecological covariates that could inform the stock assessment.*

Response: The JTC agrees with this recommendation, particularly with respect to ecological covariates that could lead to a better understanding of variability in the distribution of hake. An initial project begun in 2010 is still ongoing at the U.S. NOAA Fisheries NWFSC, but it is not currently clear which personnel or resources will be allocated to continue this work. The JTC recommends that this be given consideration by the Joint Management Committee in 2012. However, it is noted that correlations with environmental variables have not always proved consistent enough to inform stock assessment. For this reason, the JTC recommends serious consideration be given to allocation of resources to develop a Management Strategy Evaluation (as recommended by previous STAR panels and by this and previous stock assessment teams). Management Strategy Evaluation can be used to search for management and assessment approaches that are robust to uncertainty in terms of achieving pre-defined objectives for the fishery.

3.3 2011 Model descriptions

3.3.1 Base-case model (using Stock Synthesis)

The base-case model reported in this assessment uses the Stock Synthesis (SS) modeling framework developed by Dr. Richard Methot at the NWFSC. The Stock Synthesis application provides a general framework for modeling fish stocks that permits the complexity of population dynamics to vary in response to the quantity and quality of available data. In the base model, both the complexity of the data and the dynamics of the model are intended to be quite simple, and efforts have been made to be as consistent with the CCAM model as possible. Additional complexity is explored via sensitivity analysis, and sources of difference between the two models are highlighted where they have been identified.

The basic model structure, aggregation-level and treatment of data, as well as parameterizations for key processes remain unchanged from the 2011 assessment. The Pacific hake population is assumed to be a single coast-wide stock along the Pacific coast of the United States and Canada. Sexes are combined within all data sources, including fishery and survey age compositions, as well as in the model dynamics. The accumulator age for the internal dynamics of the population is set at 20 years, well beyond the expectation of asymptotic growth. The modeled period includes the years 1966-2011 (last year of available data), with forecasts extending to 2014. The population was assumed to be in equilibrium 20 years prior to the first year of the model, allowing a 'burn-in' of recruitment estimates such that the age structure in the first year of the model was free of all equilibrium assumptions. Since there were no large-scale commercial fisheries for hake until the arrival of foreign fleets in the mid- to late 1960s, no fishing mortality is assumed prior to 1966.

The model structure, including parameter specifications, bounds and prior distributions (where applicable) is summarized Table 6. The assessment model includes a single fishery representing the aggregate catch from all sectors in both nations). The effect of modeling the U.S. foreign, joint-venture, at-sea and shore-based fisheries, as well as the Canadian foreign, joint-venture and domestic fisheries as separate fleets is explored in a sensitivity analysis. Estimated selectivity for both the acoustic survey and commercial fishery does not change over time. However, the selectivity curves were modeled as non-parametric functions estimating age-specific values for each age beginning at age 2 for the acoustic survey, since age-1 fish are not included in the design, and age-1 for the fishery, as small numbers are observed in some years. Selectivity is forced to be constant after age-6 (increased from age-5 in the 2011 assessment). The decision to increase the number of estimated selectivity parameters was motivated by the intention to let the data better inform the assessment results (a likelihood ratio test, although not strictly applicable to integrated stock assessments supports this choice), as well as propagation of uncertainty related to selectivity at age. Further, the JTC had sufficient time to ensure that estimation of these additional two parameters was reliable and robust in both a maximum likelihood and Bayesian context. The results of models using selectivity constant after age-5 and age-7 (bracketing the current base case assumption) are included, but this restriction is evaluated via sensitivity analysis, as are alternate parameterizations using the CCAM model.

Growth is represented via the externally derived matrix of weight-at-age described above. Alternate models including a time-varying von Bertalanffy function, dimorphic growth and seasonally explicit growth within years were compared via sensitivity analyses during the 2011 assessment but did not provide substantially different results.

For the base model, the instantaneous rate of natural mortality (*M*) is estimated with a lognormal prior having a mean of 0.2 and σ (in log-space) of 0.1 (described above). The stock-recruitment function is a Beverton-Holt parameterization, with the log of the mean unexploited recruitment freely estimated. This assessment uses the Beta-distributed prior for stock-recruit steepness (*h*) applied to previous assessments and described above. Year-specific recruitment deviations were estimated from 1946-2011. The standard deviation, σ_r, for recruitment variability, serving as both a recruitment deviation constraint and bias-correction, is fixed at a value of 1.4 in this assessment. This value is based on consistency with the observed variability in the time-series, and represents a small increase from the iterative value derived in 2011, although this change had a negligible effect on the model results. Maturity and fecundity relationships are assumed to be time-invariant and fixed values remain unchanged from recent assessments.

The acoustic survey index of abundance was fit via a log-normal likelihood function, using the observed sampling variability, estimated via kriging as year-specific weighting. An additional constant and additive log(SD) component is included, which was freely estimated to accommodate unaccounted for sources of process and observation error. Survey catchability was freely estimated with a uniform (noninformative) prior in log-space. A Multinomial likelihood was applied to age-composition data, weighted by the sum of the number of trips or hauls actually sampled across all fishing fleets, and the number of trawl sets in the research surveys. Input sample sizes were then iteratively down-weighted to allow for additional sources of process and observation error. This process resulted in tuned input sample sizes roughly equal to the harmonic mean of the effective sample sizes after model fitting.

3.3.2 CCAM

The Canadian catch-age model (CCAM), an age-structured model conditioned on historical catch, was used to evaluate the sensitivity of the base case results to structural uncertainty. The model was developed at the University of British Columbia and has been posted as an open source project by its original author, Dr. Steven Martell, with the title ISCAM (Integrated Statistical Catch Age Model). The model has been further developed and customized by the Canadian authors of this document to calculate the outputs needed for this assessment. We therefore refer to it as CCAM to distinguish this customized version from the original software. The model is fully described in Appendix F. The original ISCAM source code and additional documentation are available at http://code.google.com/p/iscam-project/source/checkout.

The main differences between CCAM and SS are: the negative log-likelihood function for catch-at-age residuals; approach to partitioning of observation and process error; use of an informative prior on survey catchability *q*; and use of parametric selectivity functions. In other respects, the model is structurally very similar to the base case SS model for Pacific hake. Where possible, sensitivity to these factors is reported below.

The fundamental difference between the CCAM model presented here and the TINSS model used in the 2011 assessment (Stewart et al. 2011) is that it is no longer parameterized in terms of management parameters MSY and F_{MSY} (although management-oriented parameterization is now an optional switch in the CCAM version of the model). The decision to switch to a model with biological leading parameters (steepness and unfished recruitment) was taken by the provisional JTC late in 2011, due to difficulties in interpreting and initializing a management-oriented model in the presence of large changes in weight at age during the history of the fishery; and also because of future interest in modeling the effects of time-varying selectivity. Initial comparisons of CCAM with management-oriented key parameters compared to "biological-oriented" parameters have revealed some of the possible sources of difference between TINSS and SS in the 2011 assessment (Appendix E). Further comparative work on this subject may provide more insights into relative advantages and disadvantages of each alternative parameterization for volatile stocks like Pacific hake.

As with TINSS in the 2011 assessment, the CCAM model is not initialized at equilibrium. Instead, annual recruitment is estimated as the product of an estimated mean recruitment (estimated in log space) and log-normally distributed annual recruitment deviations, with a separate estimated log mean recruitment and estimated vector of fifteen years of log deviates used to initialize the numbers-at-age matrix (the same approach as in SS). Recruitment residuals are constrained to conform to a Beverton-Holt stock recruitment relationship, as in SS, with the stock-recruit parameters derived from the leading parameters B_0 and h. The validity of the assumption of equilibrium starting conditions has been questioned in previous assessments, particularly because the stock displays a high degree of recruitment variability. The decision to remove this assumption was made in 2011 by the joint hake technical working group.

As is the case for most statistical catch age models, the approach of CCAM is to fit an age-structured population dynamics model to time-series information on relative abundance, and age-composition data from the commercial fishery and survey using a Bayesian estimation framework. CCAM is conditioned on the total landings where the fishing mortality rate each year is estimated directly, but is constrained so that catches conform to the instantaneous Baranov catch equation using the observed total landings and the estimated vulnerable biomass (see Appendix F). The model is fit to the acoustic survey index (Table 4 and Figure 7), assuming that these data are proportional to the vulnerable biomass seen by the survey and also that observation errors are lognormal. Survey data were weighted multiplicatively in the objective function by the relative CVs from the kriging estimates (Table 4).

As with TINSS, CCAM estimates the inverse of the total standard deviation φ^{-1} as well as the variance ratio, ρ, which partitions the total standard deviation into the standard deviations used for observation and process error (i.e., ρ represents the proportion of the total error that is due to observation error). Therefore, the process error standard deviation is calculated as $\sigma_R = (1 - \rho)/\varphi^{-1}$ and the observation error as $\sigma_I = \rho/\varphi^{-1}$ (see Punt and Butterworth 1993, Deriso et al. 2007).

The objective function contains five major components: 1) the negative log-likelihood of the relative abundance data; 2) the negative log-likelihood of the catch-at-age proportions in the commercial fishery; 3) the negative log-likelihood of the catch-at-age proportions in the acoustic survey; 4) the prior distributions for model parameters, and 5) two penalty functions that constrain the estimates of steepness to lie between 0.2 and 1, and prevent annual exploitation rates from exceeding 1. Note that the value of the penalty functions was zero for all samples from the posterior distribution. The joint posterior distribution was numerically approximated using the Markov Chain Monte Carlo routines built into AD Model Builder (Otter Research 2008). Posterior samples were drawn systematically every 15,000 iterations from a chain of length 30 million, resulting in 2,000 posterior samples (the first 1,000 samples were dropped to allow for sufficient burn-in). Convergence was diagnosed using visual inspection of the trace plots and examination of autocorrelation in posterior chains.

The biomass index was treated as a relative abundance index that is directly proportional to the survey vulnerable biomass halfway through the year. It is assumed that the observation errors in the relative abundance index are log-normally distributed. The survey catchability parameter q is treated as an uncertain parameter, but the maximum likelihood estimate of q is used in the calculation of the objective function (see Walters and Ludwig 1994). A normal prior with mean = 0.0 and SD = 0.1 was placed on log q. Sensitivity to the standard deviation of this prior was tested. Fishing mortality in the assessment model was conditioned on the observed total catch weight (combined US and Canada catch), and it was assumed that total catch is known and reported without error.

Age-composition information was assumed to come from a multivariate logistic distribution, where the predicted proportion-at-age is a function of the predicted population age-structure and the age specific vulnerability to the fishing gear (Richards and Schnute 1998). The likelihood for the age-composition data was evaluated at the conditional maximum likelihood estimate of the variance (i.e., no subjective weighting scheme was used to scale likelihood for the age-composition information). Unlike the base SS model, no ageing errors were assumed in CCAM.

Historical observations on mean weight-at-age show systematic declines after the mid-1970s and increases again in late 1990s (Figure 12). A number of the historical cohorts have growth trajectories that initially increase from age-2 to age-8 then decline or stay relatively flat (e.g., the 1977 cohort). Given these data, there are at least three alternative explanations for the observed decreases in mean weight-at-age: 1) changes in condition factor associated with food availability or density dependence; 2) intensive size selective fishing mortality with differential fishing mortality rates on faster growing individuals; and 3) apparent changes in selectivity over time. All three of these variables are confounded, and it is not possible to capture decreasing weight-at-age using the von Bertalanffy growth model and a fixed allometric relationship between length and weight. As such, like SS, CCAM uses the observed mean weight-at-age data from the commercial fishery to scale population numbers to biomass.

Selectivity, or vulnerability-at-age, to the fishing gear was assumed to be age-specific, time-invariant, and is represented by an asymptotic logistic function. Selectivity in the acoustic survey was also assumed to be asymptotic, following a logistic function, and time-invariant. The model results showed considerable sensitivity to the parameters of the survey selectivity function. Survey selectivity was therefore treated as a major source of structural uncertainty in this assessment. Age-specific fecundity was assumed to be proportional to the product of mean body-weight-at-age and the proportion-at-age that are sexually mature.

A total of 117 model parameters are conditionally estimated (Table 7). A summary of the input data is provided in Appendix D. The technical description of the model is provided in Appendix F. See Appendix E for documentation of steps bridging between the 2011 TINSS model and the current CCAM model.

3.4 Modeling results

3.4.1 Changes from 2011

A set of 'bridging' models in SS was constructed to clearly illustrate the component-specific effects of all changes to the base-case model from 2011 to 2012. The first link in this bridge analysis was to update to the most recent version of the Stock Synthesis software (3.23b, 2011; 5 November, 2011). This change produced no observable difference in the model results (MLE; Figure 11). The second change involved updating all historical (<=2010) catch estimates to reflect any changes in the underlying databases and to get a final estimate for 2010 to replace the preliminary estimate available at the time the 2011 stock assessment; this also produced no discernible difference in results. The third change included recalculating the age-frequency distributions for the stock assessment to include additional historical ages read after the 2011 assessment; this too produced very little difference in model results (Figure 11).

The second phase of the bridging analysis consisted of adding the 2011 acoustic survey data (pre-SRG panel revision) and the 2011 commercial fishery data, both individually and in combination. The results show unambiguously that the acoustic survey data from 2011 causes the stock assessment results to be revised downward very dramatically (Figure 12). Further, the age-composition data from the commercial fishery does not contain sufficient information to adjust the model results from either the bridge model or the model containing the 2011 acoustic data. The primary source of the change from 2011 lies in the rescaling of the 2005, 2006 and 2008 cohorts, precipitated by the 2011 acoustic survey results.

3.4.2 Model selection and evaluation

Both the SS and CCAM modeling frameworks allow the fitting of a wide range of model complexities with only relatively small changes to input files and data organization. With the extensive structural explorations conducted during the 2011 stock assessment (see Stewart et al. 2011 for a thorough description of these analyses, ranging from simple production models to seasonal, sex-fleet/sector-specific approaches incorporating time-varying growth) as a springboard, the JTC attempted to focus on a smaller subset of structural choices for 2012. Of the many models investigated, only a small subset representing those with the best estimation behavior was selected to illustrate the dominant sources of uncertainty via sensitivity analyses. The ability to use two independent model platforms for this exploration dramatically increased the breadth of the assessment team's efforts. Of the sensitivity analyses presented, those alternate models focusing on fishery and acoustic survey selectivity were selected for more in-depth investigation and reporting and are used to illustrate the among-model uncertainty for comparison with the base case within-model estimates. We report additional sensitivity analyses below.

Iterative reweighting of the composition data in the base case SS model did not produce large changes in the results, and resulted in a down-weighting of the fishery sample sizes to 12%, and the acoustic data to 94%, of the observed number of trips/hauls, while retaining the relative differences in sampling among years. This is virtually unchanged from the 2011 assessment and is consistent with the high degree of correlation among fishery tows for the at-sea fleet and the much greater temporal and spatial spread of the acoustic hauls. The additional variance component for the acoustic survey was estimated to be 0.46 at the median of the posterior distribution, indicating substantial additional process error, beyond simple sampling variability was present (as expected). This estimate is much larger than that from the 2011 assessment (0.26) reflecting the *post hoc* deduction that the 2009 survey observation is largely inconsistent with the trend over adjacent years. Despite the relatively large amount of combined process and observation error for the acoustic time-series, fit to this data source still provides the strongest information available in the assessment on the scale of the current Pacific hake stock.

The CCAM model is provided as a supplement to the SS models in order to test the effects of certain structural assumptions. In the present assessment, every attempt has been made to understand the reasons for different results given by the different models, even though the general results from each model were more similar than has been achieved in recent years. Both models contain aggregated fishery information, empirical weights at age and similar prior assumptions where possible. A fundamental difference is the multivariate logistic likelihood function used to calculate residuals in the commercial and survey age compositions. The multivariate logistic likelihood function (Richards et al. 1997) uses the conditional maximum likelihood estimate of the variance to weight the age-composition data. This likelihood function had been originally introduced into the TINSS models in response to problems encountered in previous assessments, where the age-composition data had to be subjectively down-weighted to reduce retrospective bias (Martell 2010). In general, the multivariate logistic likelihood is robust to weighting problems, although it does assume a single variance across all years, which may produce overly large residuals in some years.

A summary of the fit to the age-composition data (for the base case) and survey index (for both models) can be found in the model results section below.

3.4.3 Assessment model results

For the base-case model, the MCMC chain was run for 10,000,000 iterations with the first 10,000 discarded to eliminate 'burn-in' effects. Each $10{,}000^{th}$ value thereafter was retained, resulting in 999 samples from the posterior distributions for model parameters and derived quantities. Stationarity of the posterior distribution for model parameters was assessed via a suite of standard diagnostic tests. The objective function, as well as all estimated parameters and derived quantities, showed good mixing during the chain and no evidence for lack of convergence. Autocorrelation was low and correlation-corrected effective sample sizes were sufficient to summarize the posterior distributions (Figures 13-15). Neither the Geweke nor the Hiedelberger and Welch statistics for these parameters exceeded critical values more frequently than expected via random chance (Figure 15). Correlations among key parameters were generally low (Figure 16), with the exception of natural mortality and the average unexploited equilibrium recruitment level (R_0).

The modeled time series fit to the acoustic survey biomass index is shown in Figure 17. The fit to the acoustic survey biomass time series is quite reasonable, given the sum of the input and estimated variance components. The 2001 data point was well below the predictions made by any model we evaluated, and no direct cause for this is known, however it was conducted about one month earlier than all other surveys between 1995 and 2009 (Table 4), which may explain some portion of the anomaly. The 2009 index is much higher than any predicted value observed during model evaluation. The uncertainty of this point is also higher than in other years, due to the presence of large numbers of Humboldt squid during the survey. This has been accounted for in both the data and the models.

Selectivity at age for both the fishery and survey is relatively uncertain (an important property of the non-parametric selectivity option) but generally consistent with the observation that fish are fully selected by the time they reach their full size (Figure 18). Fits to the age-composition data in the SS model are also reasonably good, with close correspondence to the dominant cohorts observed in the data and also identification of small cohorts, where the data give a consistent signal (Figures 19-21). These fits are improved over simpler models that do not include ageing error and the cohort effect on ageing error. Residual patterns to the fishery and survey age data do not show particularly evident trends that would indicate systematic bias in model predictions (Figures 22 and 23).

Posterior distributions for model parameters showed that for both steepness and natural mortality the prior distributions were likely strongly influencing the posterior (Figure 24). All other parameters showed substantial updating from noninformative priors to stationary posterior distributions.

The base-case stock assessment model indicates that the Pacific hake female spawning biomass was well below the average unfished equilibrium level at the start of the fishery and during the 1970s (Figure 25 and Tables 8-9). The stock increased rapidly after two or more large recruitment events in the early 1980s and then declined rapidly after a peak in the mid- to-late 1980s to a low in 2000 (Figures 26-27 and Table 10). This long period of decline was followed by a brief increase to a peak in 2003 (median estimate of 1.29 million mt in the SS model) as the exceptionally large 1999 year class matured. The stock is then estimated to have declined with the ageing 1999 year class to a time-series low of 0.38 million mt in 2009. This recent decline is much more extreme than that estimated in the 2011 assessment. At the beginning of 2012 spawning biomass is estimated to be increasing based on the strength of the 2008 year class; however this estimate is quite uncertain, with 95% posterior credibility intervals ranging from historical lows to above the equilibrium levels. The current median posterior spawning biomass equates to 32.6% of the average unfished equilibrium level (SB_0, Figure 28). Estimates of uncertainty in current relative depletion are extremely broad, from 9.4%-102% (Figure 28). The estimate of spawning biomass for 2012 is 0.62 million mt, much smaller than the two 2011 estimates from the 2011 assessment (1.87, and 2.18 million metric tons from SS and TINSS, respectively). This change is largely due to the very low 2011 acoustic survey biomass index.

Estimates of historical Pacific hake recruitment indicate very large year classes in 1980 and 1999 in both assessment models, with 1970, 1984 and 2008 accounting for the other three of the five largest estimated to have occurred in the last 40 years. The strength of the 2008 cohort is estimated to be large (5.2 billion), although not nearly as large as was estimated in the 2011 stock assessment (16.2 billion). In both the U.S. fishery and acoustic age compositions, the 2008 year class comprised a very large proportion of the observations. Uncertainty in estimated recruitments is substantial, especially for 2008, as indicated by the broad posterior intervals (Figure 26). The stock-recruit estimates (based on MLE) are provided in Figure 29; both the extremely large variability about the expectation and the lack of relationship between spawning stock and subsequent recruitment are clearly evident in this plot.

3.4.4 Model uncertainty

Both assessment models integrate over the substantial uncertainty associated with several important model parameters including: acoustic survey catchability (q) and the productivity of the stock (via the steepness, h, of the stock-recruitment relationship and natural mortality, M). Although the Bayesian results presented include estimation uncertainty, this within-model uncertainty is likely a gross underestimate of the true uncertainty in current stock status and future projections, since it does not include structural modeling choices, data-weighting uncertainty and scientific uncertainty in selection of prior probability distributions. In an effort to capture some of these additional sources of uncertainty, especially with respect to treatment of selectivity, we provide an extended set of key sensitivity analyses, using both SS and CCAM (see section below).

The Pacific hake stock displays the highest degree of recruitment variability of any west coast groundfish stock, resulting in large and rapid changes in stock biomass. This volatility, coupled with a dynamic fishery, which potentially targets strong cohorts and a biennial rather than annual fishery independent acoustic survey, will continue to result in highly uncertain estimates of current stock status and even more uncertain projections of stock's future trajectory. The JTC considers the primary source of uncertainty that is relevant to management decision-making for the 2012 fishing season to be the selectivity in both the acoustic survey and the fishery. In both models the fit to the 2011 survey index point (Figure 30) and the estimated scale of the hake population (Figure 31) was highly sensitive to estimates of selectivity. The sensitivity cases evaluated explore an axis of uncertainty related primarily to parameterization of fishery and survey selectivity, although the independent platforms used also provide a much broader exploration than is routinely conducted in many stock assessments.

The primary axis of uncertainty in the 2011 assessment was considered to be the magnitude of the 2008 cohort, which had only been seen once, and only in commercial catch-composition data. The 2011 stock assessment team expressed concern that the large proportion of two year old fish in the commercial age-composition data could possibly be explained by a change in fishing practices or other factors affecting gear selectivity in the commercial fishery. To some extent, age composition data from the 2011 fishery and acoustic survey support the hypothesis of a strong 2008 cohort, although estimates of its magnitude have been reduced somewhat by the low index of abundance in 2011. Uncertainty in the magnitude of this year class will likely persist until the cohort has been seen by the survey and the fishery for several more years, although its relative influence on model uncertainty is expected to diminish as it moves through the fishery.

3.4.5 Reference points

The average unexploited equilibrium spawning biomass estimate was 1.89 million mt (Table 11), intermediate between the two estimates reported in the 2011 stock assessment. However, the uncertainty is very broad, with the 95% posterior credibility interval ranging from 1.49 to 2.53 million mt. The *MSY*-proxy target spawning biomass ($SB_{40\%}$) is estimated to be 0.76 million mt in the base-case model, slightly larger than the equilibrium spawning biomass implied by the $F_{40\%}$ default harvest rate target, 0.76 million mt. *MSY* is estimated occur at an even smaller stock size, 0.46 million mt, with a yield of 317 thousand mt; only slightly higher than the equilibrium yield at the biomass target ($SB_{40\%}$), 290 thousand mt, and the $F_{40\%}$ target, 299 thousand mt. The full set of reference points with uncertainty intervals for the base case and among alternate sensitivity models are reported in Table 11.

The fishing intensity on the Pacific hake stock is estimated to have been below the $F_{40\%}$ target until 2008 (Figure 32). Uncertainty in the recent SPR estimates is large, and the estimates from the base-case model indicate that the catch has exceeded the target in four of the last five years. The exploitation history, in terms of both the biomass and *F* targets, is portrayed graphically via a phase-plot (Figure 33).

3.4.6 Model projections

In order to better reflect the considerable uncertainty in this assessment, all forecasts are reported in two decision tables: one representing uncertainty within the base-case model; and the other representing uncertainty among alternate models (see Section 3.4.7 for description of models). This allows for the evaluation of alternative management actions based on both types of uncertainty. The decision tables are organized such that the projected implications for each potential management action (the rows, containing a range of potential catch levels) can be evaluated across the quantiles of the posterior distribution for the base-case model (the columns), or among median estimates from the alternate models. For clarity, each decision table is divided into two sections: the first table projects the depletion estimates, the second the degree of fishing intensity (based on the relative SPR; see table legend). Fishing intensity exceeding 100% indicates fishing in excess of the $F_{40\%}$ default harvest rate. A set of management metrics were identified during the Scientific Review Group (SRG) review of this stock assessment, based on input from JMC, AP and other attendees. These metrics summarize the probability of various outcomes from the base case model given each potential management action. Although not linear, probabilities can be interpolated from this table for intermediate catch values.

The median stock estimate from the base-case model is projected to increase or remain constant from 2012 to 2013 for all management actions considered except the *status quo*. (Table 12). However, the posterior distribution is highly uncertain, and either increasing or decreasing trends are possible over a broad range of 2012 catch levels. The base-case model predicts a rapid increase in the absence of future fishing, surpassing the management target with a 50% probability in 2013; this is attributable largely to the strong 2008 cohort. However, the difference between this trajectory and that conditioned on the default harvest rate is extremely small, relative to the uncertainty in the current stock status (Figure 34). There is 47% chance of exceeding the harvest target in 2012 for catch levels approaching the default harvest rate, however this level of catch corresponds to a 47% chance of having a smaller stock in 2013 than in 2012.

Among alternate sensitivity models, there is also considerable uncertainty in current status and future trends (Table 12-13, Figure 35). Although these models fall within the 'envelope' of the posterior distribution from the base-case model, the median trajectories under each potential management action show less sensitivity to alternate management actions than the extreme quantiles from the base case.

3.4.7 Sensitivity and retrospective analyses

A number of sensitivity analyses were done to test the effect of priors, structural choices, and the modeling platform itself on the base-case model results. Some of these analyses were conducted prior to the 2012 SRG review and therefore do not reflect the final 2011 acoustic survey data as updated during that meeting. The results of these investigations, as well as retrospective analyses, are presented below. Since this assessment is fully Bayesian, posterior parameter distributions for the base case are provided instead of the frequently reported likelihood profiles, which are an imperfect proxy for the actual posteriors. The maximum likelihood estimates (technically an approximation to the maximum of the posterior density as implemented in ADMB) for model parameters and derived quantities are on the same scale, but the posterior distributions better reflect the asymmetry inherent in the uncertainty estimates (compared to the multivariate normal approximation applied to the maximum likelihood estimates). A comparison of this asymmetry is provided in Table 14 and Figure 36.

During preliminary model investigation, the assessment team found the 2012 assessment model results were highly sensitive to the specific parameterization of the selectivity functions for the acoustic survey and the commercial fishery. For this reason, this 'axis of uncertainty' was selected for representation in the second set of decision tables. Although the base case and CCAM models differ in many structural respects, the behavior and sensitivity to selectivity parameterization and/or application of priors was very similar between the two. Note that for the discussion below we refer to the CCAM model with survey selectivity parameters estimated as the "CCAM base model".

Adjusting the oldest age for which selectivity was independently estimated in the base model produced a difference in the scaling of the 2008 cohort strength, which is highly correlated with the 2012 stock size estimate (Figure 31). The CCAM model most comparable with the base case model (CCAM with estimated survey selectivity) is summarized in Table 7. As an alternate to that model, a second CCAM model is presented as a 'bounding case' with fixed survey selectivity, such that 50% of age-2 fish are fully selected and 100% of age-3 fish are fully selected. This run is intended to capture what the stock assessment would predict if it is the case that the survey selectivity is nearly knife-edged. A similar scaling pattern was observed for the CCAM model when the selectivity curve was fixed, compared to when survey selectivity parameters were freely estimated (Figure 37). However, these four alternate models all fit the acoustic survey index very similarly: capturing the trend over 2003 to 2011, but entirely missing the 2009 observation (Figure 30). None of the models investigated were able to fit the 2001 survey observation. This is likely due to the *post hoc* knowledge that the 1999 year-class was very large, and therefore, for any reasonable degree of selectivity for age-2 hake the stock, never reached a size as small as is implied by the survey observation.

The influence of the prior distribution for natural mortality (*M*) and the fixed value for the degree of recruitment variability (σ_r; iteratively tuned following the procedure of Methot and Taylor, 2011) were investigated using the base-case model. When the standard deviation on the prior for *M* was increased to 0.2, or 0.3 (from 0.10), the result was a modest increase in the posterior median estimate, indicating that the prior was having a limiting effect on the posterior distribution (Table 15). The assessment model adjusted to this increase in natural mortality by increasing the relative estimated magnitude of the largest cohorts (including 2008) and generally increasing the absolute scale of the population size (Figure 38). However, convergence diagnostics for these sensitivity analyses revealed a very high degree of parameter confounding between natural mortality and the logarithm of equilibrium recruitment (Figure 39). This confounding led to posterior chains that were extremely slow to converge (an effective sample size of less than 25% of the base case, even when the chain length was increased by a factor of 6) and therefore the reliability of these results should be considered suspect. In contrast, estimating the degree of recruitment variability with a moderately informative prior had very little effect on the model results (Figure 38), although it too revealed poor convergence. In summary, these alternate models were not reliable enough for use as a base model, but did reveal that more research into informative priors for hake could be warranted in future stock assessments.

The CCAM model also showed poor convergence diagnostics as the standard deviation on the normal prior for log natural mortality was increased, also due to confounding among model parameters (particularly *M* with R_0 and average recruitment). It should be noted here that the two key CCAM sensitivity cases described above were updated following the SRG meeting to include the revised 2011 survey index point. The 6% decrease in the 2011 data point had a stronger influence on CCAM model behavior than was seen in SS. MCMC diagnostics indicated that the model had failed to converge after 20 million iterations with the standard deviation on the prior for log(*M*) set to 0.1 (as in SS). Therefore, the assessment team agreed to reduce the standard deviation on the prior for log(*M*) to 0.05 in the CCAM 'base case' (with survey selectivity parameters estimated) to improve model diagnostics and predictive capability. Alternatively, it was not possible to achieve convergence in the alternate CCAM case (survey selectivity parameters fixed) unless the standard deviation on the prior for log(*M*) was increased to 0.2, highlighting confounding between estimates of selectivity and productivity in this problem. Therefore comparisons among the CCAM key sensitivity cases and the SS cases should bear in mind the effect of the different priors on log(*M*) (see Table 17; Figure 41 and text below for discussion on the effect of the prior on log (*M*)). We caution that the CCAM fixed selectivity case still showed strong autocorrelation in the MCMC chains, and reiterate that this sensitivity case is presented as an extreme example intended to bracket the probable lower bound of the uncertainty surrounding survey selectivity.

In addition to the two CCAM sensitivity cases described above, we explored several additional sensitivities using CCAM. We note that the cases discussed below were not updated to include the new 2011 survey index point, upon direction from the SRG. The qualitative direction of change caused by the alternative prior settings would not be expected to change given the new index point. However, we also point out that the standard deviation on the prior for log(*M*) for the "base case" discussed below was set to 0.2, higher than the 0.05 used in the CCAM base case discussed above. This discrepancy is unfortunate, but is a result of the correction to the 2011 survey index that occurred very late in the assessment cycle, precluding re-running of all the sensitivity cases as direct comparisons with the new CCAM base case.

The main axes of uncertainty that were considered were: steepness (*h*); the standard deviation for the prior on log(*M*); the mean of the prior on log(*M*); and the standard deviation for the prior on log survey *q* (Tables 16-19). For these analyses, the MCMC chain was run for 20,000,000 iterations and every subsequent 10,000th value was retained, resulting in 2,000 samples from the posterior distributions for model parameters and derived quantities (the first 1,000 samples were dropped to allow for sufficient burn-in). Stationarity of the posterior distribution for model parameters was assessed by visualization of trace plots and analysis of lagged autocorrelation. We caution that for those cases in which we increased the standard deviation on priors for log(*q*), and log(*M*), the convergence properties of the MCMC deteriorated so that the presented within-model uncertainties of some quantities may be unreliable. However, the objective of performing these sensitivity analyses was to illustrate a more complete presentation of structural uncertainty.

For sensitivity on the steepness prior, we based priors on the median steepness estimates of the Gadiform fishes using the Myers et al. 1999 meta-analysis of stock-recruitment time series. Due to time limitations, we did not simulate beta-distribution priors like those used for the CCAM and the SS base cases. Instead, we used the mean of the medians for: all Gadidae excluding Pacific hake (*Z*_gadids_noHake, Figure 40); the genus *Merluccius* including and excluding Pacific hake (*Z*_Merluccius wHake and *Z*_Merluccius_NoHake, respectively). The rational for excluding the steepness estimates of Pacific hake in the computation of the priors is that the data used for the Myers et al (1999) meta-analysis contained some data that are also analyzed in this stock assessment. In order for the model to converge and produce reasonable estimates, the coefficient of variation for the steepness prior had to be set to 0.1. Furthermore, readers should note that the paper states that family-level estimates for the Gadiform fishes should be used with caution so that any prior simulated using the Myers et al. (1999) meta-analysis may be unreliable. Future analyses to simulate steepness priors for hake could be based on life-history information using the method proposed by Mangel et al. (2010).

The sensitivities of CCAM estimates of spawning stock biomass and age-1 recruitment to alternative priors for steepness all fell within the uncertainty envelope of the base case, but the reference point estimates differed (Table 16). The posterior medians of steepness were lower than the CCAM model with estimated survey selectivity for the steepness productivity cases, as expected from the lower mean of the priors. In general, the median estimated 2012 biomass for the steepness sensitivity cases were lower than for CCAM with estimated survey selectivity (Figure 40). Similarly, median estimates of age-1 recruitment for the steepness sensitivity cases were lower than the medians of the case with estimated survey selectivity, but were within the 95% credible intervals (Figure 40). Estimates of 2012 depletion were also lower for these cases, and estimated exploitation fractions corresponding to $SB_{40\%}$, $SPR_{40\%}$, and *MSY*, respectively, tended to be higher (Table 16), although effects on the exploitation fraction were somewhat offset by the increased estimates of *M* that accompanied the decreased estimates of steepness (Table 16). Estimated exploitation fractions for the CCAM steepness sensitivity cases were also larger than those from the SS base case (Table 13).

Increasing the standard deviation of the prior on log natural mortality had a large effect on the CCAM estimates of spawning stock biomass, recruitment and reference points. As the standard deviation of the prior was increased, posterior medians of log(*M*), the estimated 2012 spawning biomass and recruitment increased (Table 17 and Figure 41). As the prior standard deviation on log(*M*) increased, CCAM estimated higher R_0. Exploitation fractions corresponding to $SB_{40\%}$, $SPR_{40\%}$, and *MSY* also increased, implying that stocks with higher productivity can tolerate higher exploitation rates (Table 17).

Varying the mean for the prior on log natural mortality also had a significant effect on CCAM's predictions. When the mean of the prior was increased, median spawning stock biomass estimates were marginally higher. When it was decreased to 0.175, the median estimates were much smaller (Table 18, Figure 42). Similarly, estimates of reference-point exploitation fractions were higher than the CCAM base when the mean was set to log(0.225), but lower when the mean was set to log(0.175).

CCAM median estimates of survey *q* were proportional to the standard deviation of the prior on log(*q*). The median estimates of *q* increased as the standard deviation was increased to 0.15, 0.25 and 0.3 respectively. Therefore base-case results will differ from those reported for the updated base case. Associated with these increased estimates of survey *q*, were lower initial, historical and current spawning biomass estimates (Figure 43) as well as exploitation rate reference points lower than the CCAM base. We note, as discussed above, that the 'base case' referred to here was not updated to include the corrected 2011 survey index point.

Retrospective analyses were conducted by systematically removing the terminal year's data sequentially for five years. For the base SS model, the effect of the 2011 data (almost entirely attributable to the survey index) is dramatic, as was observed in the bridge analysis (Figure 44). A retrospective pattern may seem to be present in recent estimates of spawning biomass, but this can be explained by the recent large year-classes supporting the spawning biomass. As data are removed, less information is available to accurately estimate these recruitments, thus they move towards equilibrium recruitment, and the estimated spawning biomass becomes lower. This pattern is most pronounced for the 1999 year class, estimates of which increase in magnitude as data are added since observations of this cohort are persistent through time. This further illustrates how multiple observations are needed to accurately determine the strength of the largest cohorts – it is not until they are nearly completely gone that we have precise estimates of their magnitude. Parameter estimates showed no clear patterns except that the additional variability on the acoustic survey index increased in 2011 and the estimate of unexploited biomass or recruitment decreased sharply (Table 20).

A comparison of the models put forward for management since 1991 (a retrospective among assessment models) shows that there has been considerable uncertainty in the Pacific hake stock biomass and status (Figure 45). Model-to-model variability (especially in the early portion of the time-series) is larger than the uncertainty reported in any single model, and this pattern does not appear to dampen as subsequent assessments are developed. An important aspect of this historical perspective is the inclusion of alternate values for survey catchability during 2004-2007, and then subsequently freely estimated values from 2008-the present. Prior to that period, catchability was ubiquitously assumed to be equal to 1.0. The 2012 base model estimates appear to be consistent with many previous time-series, and the uncertainty intervals bracket a large proportion of those historical estimates.

3.4.8 Potential Management Strategy Evaluation Analyses

Many Pacific hake stock assessment uncertainties may not be resolvable. Pacific hake is a relatively data-rich fishery, with a directed fishery-independent survey program, biological sampling from both commercial fisheries and the survey, and reliable estimates of catch. However, the data are apparently insufficient to resolve key uncertainties that can produce large differences in stock-status estimates between years. One reason is that the acoustic survey observations themselves are highly variable, due to factors including sampling error, uncertainty in acoustic target identification, and the distribution and movement of the target species. Furthermore, the assessment is very sensitive to small changes in assumptions: for example, small differences in the parameterization of selectivity can produce stock-status estimates that range from over-exploited to above target biomass levels. The actual magnitude of uncertainty is much larger than is typically represented in any given decision table; different assessment approaches may produce very different biomass reconstructions (Ralston et al. 2011). Moreover, recruitment, weight at age and natural mortality are affected by time-varying changes in productivity and predation regimes that make historical data poor predictors of the future (Hilborn and Walters 1992, Walters 1986, Walters and Martell 2004) making stock-assessment model predictions unreliable.

Rather than struggling to find a "best assessment model" in the face of uncertainty that cannot be resolved at the present time, it may be possible to design management, data collection, and modeling strategies that provide adequate trade-off performance among stock and fishery objectives. The design process involves simulation testing of candidate management strategies against plausible scenarios for a 'true' stock and fishery that encompass the range of known or suspected uncertainties. The Management Strategy Evaluation, or MSE, approach seeks to find a management strategy that is robust to the uncertainties and provides explicit evaluation of the expected trade-offs among conservation and yield objectives (Smith et al. 1999). There have been many precursers to MSE, some dating back several decades: Walters and Hilborn (1978) reviewed how to design optimization analyses that applied controls to modeled ecological systems in order to maximize objectives; and simulation studies on management procedures have been applied at the International Whaling Commission since the mid-1980s (e.g., de la Mare 1986). In a seminal paper on the subject, de la Mare (1998) proposed formulating management objectives that are measurable; specifying sets of decision rules, and the data and methods to be used, all in such a way that the properties of the resultant system could be prospectively evaluated. He called this the "management oriented paradigm", which has since been referred to as Management Procedure Evaluation (MPE) or MSE. The literature on MSE is too large to be reviewed here, but there have been several applications in the North Pacific (A'Mar et al. 2009; 2010; Cox and Kronlund 2008; Kurota et al. 2010; Punt et al. 2008; Punt and Ralston 2007).

More generally, MSE is a useful tool to investigate whether management strategies have a low probability of causing irreversible harm to the stock. Noting that it offers several advantages over annual stock assessments, Butterworth (2007) argued that the annual (or biennial) assessment approach suffers from: variability in "best assessments" from year to year; inability to compare longer-term tradeoffs; lengthy haggling over annual TACs; and default decisions of no change. Many of these difficulties have been observed in historical Pacific hake stock assessments and management. He suggests that MSE can help resolve some these difficulties but that lengthy development time, overly rigid frameworks, unavailable data inputs, and reference-case selection are some of the key disadvantages.

Acknowledging concerns about the high cost of MSE, it is likely that for Pacific hake, defining objectives and evaluating the performance harvest control rules, as well as achieving consensus among parties to agree to such modifications under the treaty, may be very time-consuming. However, there are some issues that could be dealt with now. One issue is to consider whether stock assessment performance could be improved by investing in annual, instead of biennial, surveys. This may help to resolve the current situation, where in non-survey years, the only available data on which to base an assessment are commercial catch-at-age observations that may produce unreliable updates to stock size.

Furthermore, a simulation experiment could be designed to investigate how the current harvest control rule (40:10-$F_{40\%}$) performs. The MSE would consist of simulating the stock assessment procedure using the current biannual vs. annual surveys, under different assumptions about observation error, the number of survey stations, control rules and assessment procedures. Management procedures could, for example, be evaluated based on three main performance categories: catch, catch variability, and conservation (Cox and Kronlund 2008). Catch and catch variability could be represented by average annual catch and average absolute variation in catch (Punt and Smith 1999) and conservation could be represented in terms of the proportion of years that the stock was below particular biomass levels.

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5. Bibliography

Agostini, V.N., R.C. Francis, A.B. Hollowed, S.D. Pierce, C. Wilson, and A.N. Hendrix. 2006. The relationship between Pacific hake (*Merluccius productus*) distribution and poleward subsurface flow in the California Current system. Can. J. Fish. Aquat. Sci. 63:2648-2659.

Alarcón-Muñoz, R., L. Cubillos, and C. Gatica. 2008. Jumbo squid (*Dosidicus gigas*) biomass off central Chile: Effects on Chilean hake (*Merluccius gayi*). Calif. Coop. Oceanic Fish. Invest. Rep. 49: 157-166.

Alheit J. and T.J. Pitcher. 1995. Hake: biology, fisheries, and markets. Chapman and Hall. London. 477 p.

A'Mar, Z.T., Punt, A.E., and Dorn, M.W. 2009. The evaluation of two management strategies for the Gulf of Alaska walleye pollock fishery under climate change. ICES Journal of Marine Science. 66: 1614-1632.

A'Mar, Z.T., Punt, A.E., and Dorn, M.W. 2010. Incorporating ecosystem forcing through predation into a management strategy evaluation for the Gulf of Alaska walleye pollock (*Theragra chalcogramma*) fishery. Fisheries Research 102: 98-114.

Anon, 1993. "Report of the workshop on the applicability of spatial techniques to acoustic survey data," ICES Coop. Res. Rep. 195, 87pp.

Bailey, K.M., R.C. Francis, and E.R. Stevens. 1982. The life history and fishery of Pacific whiting, *Merluccius productus*. Calif. Coop. Oceanic Fish. Invest. Rep. 23:81-98.

Benson, A.J., G.A. McFarlane, S.E. Allen, and J.F. Dowler. 2002. Changes in Pacific hake (*Merluccius productus*) migration patterns and juvenile growth related to the 1989 regime shift. Can. J. Fish. Aquat. Sci. 59: 1969-1979.

Bentley, N., Breen, P.A., Kim, S.W., and Starr, P.J. 2005. Can additional abundance indices improve harvest control rules for New Zealand rock lobster (*Jasus edwardsii*) fis heries? New Zealand journal of marine and freshwater research 39: 629-644.

Buckley, T.W. and P. A. Livingston. 1997. Geographic variation in the diet of Pacific hake, with a note on cannibalism. Calif. Coop. Oceanic Fish. Invest. Rep. 38:53-62.

Butterworth, D.S. 2007. Why a management procedure approach? Some positives and negatives. *ICES J. Mar. Sci.* 64: 613-617.

Cox, S.P., and Kronlund, A.R. 2008. Practical stakeholder-driven harvest policies for groundfish fisheries in British Columbia, Canada. Fisheries Research 94: 224-237.

de La Mare, W.K. 1986. Simulation studies on management procedures. Reports of the International Whaling
Commission.. 36: 429-450.

de La Mare, W.K. 1998. Tidier fisheries management requires a new MOP (management-oriented paradigm). Reviews in Fish Biology and Fisheries 8: 349-356.

Deriso, R. B., M. N. Maunder, and J.R. Skalski. 2007. Variance estimation in integrated assessment models and its importance for hypothesis testing. Can. J. Fish. Aquat. Sci. 64: 187-197.

Dorn, M.W. 1991. Spatial and temporal patterns in the catch of Pacific whiting in the U.S. management zone during 1978-88. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/NWC-205, 68 p.

Dorn, M.W. and R.D. Methot. 1991. Status of the coastal Pacific whiting resource in 1990. U.S. Dept. Commer., NOAA Tech. Memo. NMFS F/AFSC-47, 101 p.

Dorn, M.W. 1992. Detecting environmental covariates of Pacific whiting (*Merluccius productus*) growth using a growth-increment regression model. Fish. Bull. U.S. 90: 260-275.

Dorn, M.W. 1995. The effects of age composition and oceanographic conditions on the annual migration of Pacific whiting *Merluccius productus*. Calif. Coop. Oceanic Fish. Invest. Rep. 36:97-105

Dorn, M.W. 1996. Status of the coastal Pacific whiting resource in 1996. In Pacific Fishery Management Council, Appendix Volume I: Status of the Pacific Coast groundfish fishery through 1996 and recommended acceptable biological catches in 1997, p. A1-A77. (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Dorn, M.W., E.P. Nunnallee, C.D. Wilson and M.E. Wilkins. 1994. Status of the coastal Pacific whiting resource in 1993. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/AFSC-47, 101 p.

Dorn, M.W. and M.W. Saunders. 1997. Status of the coastal Pacific whiting stock in U.S. and Canada in 1997. In Pacific Fishery Management Council, Appendix: Status of the Pacific Coast groundfish fishery through 1997 and recommended acceptable biological catches in 1998: Stock assessment and fishery evaluation. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Dorn, M.W., M.W. Saunders, C.D. Wilson, M.A. Guttormsen, K. Cooke, R. Kieser, and M.E. Wilkins. 1999. Status of the coastal Pacific hake/whiting stock in U.S. and Canada in 1998. In Pacific Fishery Management Council, Appendix: Status of the Pacific Coast groundfish fishery through 1998 and recommended acceptable biological catches in 1999: Stock assessment and fishery evaluation. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Field, J.C., K. Baltz, A.J. Phillips, and W.A. Walker. 2007. Range expansion and trophic interactions of the jumbo squid, *Dosidicus gigas*, in the California Current. Calif. Coop. Oceanic Fish. Invest. Rep. 48: 131-146.

Fleischer, G.W., K.D. Cooke, P.H. Ressler, R.E. Thomas, S.K. de Blois, L.C. Hufnagle, A.R. Kronlund, J.A. Holmes, and C.D. Wilson. 2005. The 2003 integrated acoustic and trawl survey of Pacific hake, Merluccius productus, in U.S. and Canadian waters off the Pacific coast. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-65, 45 p.

Forrest, R.E., S.J.D. Martell, M.C. Melnychuk and C.J. Walters. 2008. An age-structured model with leading management parameters, incorporating age-specific selectivity and maturity. . Can. J. Fish. Aquat. Sci 65, 286-296.

Fournier, D. A., H. J. Skaug, et al. 2011. AD Model Builder: using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optimization Methods and Software: 1-17.

Francis, R.C., G.L. Swartzman, W.M. Getz, R. Harr, and K. Rose. 1982. A management analysis of the Pacific whiting fishery. U.S. Dep. Commer., NWAFC Processed Report 82-06. 48 p.

Francis, R.C., and A.B. Hollowed. 1985. History and management of the coastal fishery for Pacific whiting, *Merluccius productus*. Mar. Fish. Rev. 47(2):95-98.

Gelman, A., Carlin, J.B., Stern, H.S., and Rubin, D.B. 2004. Bayesian data analysis, 2nd Edition. Chapman and Hall, New York.

Gilly, W.F., U. Markaida, C.H. Baxter, B.A. Block, A. Boustany, L. Zeidberg, K. Reisenbichler, B. Robison, G. Bazzino and C. Salinas. 2006. Vertical and horizontal migrations by the jumbo squid *Dosidicus gigas* revealed by electronic tagging. Mar. Eco. Prog. Ser. 324: 1-17.

Hamel, O.S. and I.J. Stewart. 2009. Stock assessment of the Pacific hake, *Merluccius productus*, (a.k.a. whiting) in the U.S. and Canadian waters in 2009. Pacific Fishery Management Council, Portland, OR. 246 p.

Hannah, R.W. and S. Jones. 2009. 20th Annual pink shrimp review. Oregon Department of Fish and Wildlife, 2040 S.E. Marine Science Dr., Newport, OR 97365. 12 p.

Harvey, C.J., K. Gross, V.H. Simon, and J. Hastie. 2008. Trophic and fishery interactions between Pacific hake and rockfish: effect on rockfish population rebuilding times. Marine Ecology-Progress Series 365:165-176.

Helser, T.E, M.W. Dorn, M.W. Saunders, and R.D. Methot. 2001. Pacific whiting assessment update for 2000. In Pacific Fishery Management Council, Status of the Pacific Coast groundfish fishery through 2001 and recommended acceptable biological catches in 2002 (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E. , M.W. Dorn, M.W. Saunders, C.D. Wilson, M.A. Guttormsen, K. Cooke and M.E. Wilkins. 2002. Stock assessment of Pacific whiting in U.S. and Canadian waters in 2001. In: Status of the Pacific Coast groundfish fishery through 2001 and recommended acceptable biological catches in 2002 (Document prepared for the Council and its advisory entities). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E, R.D. Methot, and G.W. Fleischer. 2004. Stock assesment of Pacific hake (whiting) in U.S. and Canadian waters in 2003. In: Status of the Pacific Coast groundfish fishery through 2004 and stock assessment and fishery evaluation (Document prepared for the Council and its advisory entities). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E., M.W. Fleisher, S. Martell and N. Taylor. 2005. Stock assessment of Pacific hake (whiting) in U.S. and Canadian waters in 2004. In: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses (Document prepared for the Council and its advisory entities). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E, I. J. Stewart, G.W. Fleischer, and S. Martell. 2006. Stock assessment of Pacific hake (whiting) in U.S. and Canadian waters in 2006. In: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses (Document prepared for the Council and its advisory entities). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E. and S. Martell. 2007. Stock assessment of Pacific hake (whiting) in U.S. and Canadian waters in 2007. In: Status of the Pacific Coast groundfish fishery through 200 and recommended acceptable biological catches in 2006 (Document prepared for the Council and its advisory entities). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.

Helser, T.E., I.J. Stewart, and O.S. Hamel. 2008. Stock Assessment of Pacific Hake, *Merluccius productus*, (a.k.a Whiting) in U.S. and Canadian Waters in 2008. *In*: Status of the Pacific Coast groundfish fishery through 2008, Stock Assessment and Fishery evaluation: Stock Assessments, STAR Panel Reports, and Rebuilding Analyses. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR.

Henderson, M.J., and J.K. Horne. 2007. Comparison of in situ, ex situ, and backscatter model estimates of Pacific hake (Merluccius productus) target strength. Can. J. Fish. Aquat. Sci. 64: 1781-1794.

Hilborn, R., and Walters, C.J. 1992. Quantitative Fisheries Stock Assessment Choice, Dynamics and Uncertainty. Routledge, Chapman and Hall.

Hoenig, J.M. 1982. A compilation of mortality and longevity estimates for fish, mollusks, and cetaceans, with a bibliography of comparative life history studies. Technical Report No. 82-2. Narragansett Marine Laboratory, University of Rhode Island.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin 82:898-903.

Hollowed, A.B., S.A. Adlerstein, R.C. Francis, M. Saunders, N.J. Williamson, and T.A. Dark. 1988a. Status of the Pacific whiting resource in 1987 and recommendations to management in 1988. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-138, 54 p.

Iwamoto, E., M. J. Ford, and R. G. Gustafson. 2004. Genetic population structure of Pacific hake, Merluccius productus, in the Pacific Northwest. Environmental Biology of Fishes 69:187-199.

Jolly, G.M., and I. Hampton. 1990. A stratified random transect design for acoustic surveys of fish stocks. Can. J. Fish. Aquat. Sci. 47:1282–1291.

Jow, T. 1973. Pacific hake length frequencies at California ports, 1963-1970. Marine Resources Technical Report No. 2. California Department of Fish and Game.

Keller, A. A., B.H. Horness, E.L. Fruh, V.H. Simon, V.J. Tuttle, K.L. Bosley, J.C. Buchanan, D. J. Kamikawa, and J.R. Wallace. 2008. The 2005 U.S. West Coast bottom trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition., U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-93, 136 p.

King, J.R., MacFarlane, G.A., Jones, S.R.M., Gilmore, S.R., and Abbott, C.L. 2012. *Stock delineation of* migratory and resident Pacific hake in Canadian waters. Fisheries Research 114: 19-30.

Kurota, H., Hiramatsu, K., Takahashi, N., Shono, H., Itoh, T., and Tsuji, S. 2010. Developing a management procedure robust to uncertainty for southern bluefin tuna: a somewhat frustrating struggle to bridge the gap between ideals and reality. Popul. Ecol 52: 359-372.

Livingston, P.A. and K.M. Bailey. 1985. Trophic role of the Pacific whiting, Merluccius productus. Mar. Fish. Rev. 47(2):16-22-34.

Lo, N.C.H. 2007. Daily larval production of Pacific hake (*Merluccius productus*) off California in 1951-2006. CalCOFI rep. Vol. 48:147-164.

Martell, S. J. D. 2010. Assessment and management advice for Pacific hake in U.S. and Canadian waters in 2010. Pacific Fishery Management Council. Portland, Oregon. 80 p.

Martell, S. J. D. 2011. iSCAM User's Guide. Version 1.0. University of British Columbia, Vancouver. 34 pp. Available online at http://code.google.com/p/iscam-project/source/checkout.

Mello, L. G. S. and Rose, G. A. 2005. Using geostatistics to quantify seasonal distribution and aggregation patterns of fishes: an example of Atlantic cod (Gadus morhua). Can. J. Fish. Aquat. Sci. 62: 659–670.

Methot, R.D. 1989. Synthetic estimates of historical abundance and mortality for northern anchovy. In E.F. Edwards and B.A. Megrey, (eds.), Mathematical Analysis of Fish Stock Dynamics: Reviews. Evaluations, and Current Applications, p. 66-82. Am. Fish. Soc. Symp. Ser. No. 6.

Myers, R.A, K.G. Bowen, and N.J. Barrowman. 1999. Maximum reproductive rate of fish at low population sizes. Can. J. Fish. Aquat. Sci. 56: 2404-2419.

Northwest Fisheries Science Center (NWFSC). 2009. Data report and summary analyses of the California and Oregon pink shrimp trawl fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. 33 p.

O'Driscoll, R. L. 2004. Estimating the uncertainty associated with acoustic surveys of spawning hoki (*Macruronus novaezelandiae*) in Cook Strait, New Zealand. ICES J. of Mar. Sci. 61:84–97.

Pennington, M., 1983. Efficient estimators of abundance for fish and plankton surveys. Biometrics 39, 281–286.

Petitgas, P., 1993. Geostatistics for fish stock assessments: a review and an acoustic application, ICES J. Mar. Sci. 50: 285:298.

Phillips, A.J., S. Ralston, R.D. Brodeur, T.D. Auth, R.L. Emmett, C. Johnson, and V.G. Wespestad. 2007. Recent pre-recruit Pacific hake (*Merluccius productus*) occurrences in the northern California current suggest a northward expansion of their spawning area. CalCOFI Reps. Vol. 48: 215-229.

Punt, A.E. and D.S. Butterworth. 1993. Variance estimates for fisheries assessment: their importance and how best to evaluate them. p. 145-162. *In*: S.J. Smith, J.J. Hunt and D. Rivard [Ed.] Risk evaluation and biological reference points for fisheries management. Can. J. Fish. Aquat. Sci. Spec. Publ. 120.

Punt, A.E., Dorn, M.W., and Haltuch, M.A. 2008. Evaluation of threshold management strategies for groundfish off the US West Coast. Fisheries Research 94: 251-266.

Punt, A.E. and R. Hilborn. 1997. Fisheries stock assessment and decision analysis: the Bayesian approach. Rev. Fish. Biol. Fish. 7:35-63.

Punt, A.E., and Ralston, S. 2007. A Management Strategy Evaluation of Rebuilding Revision Rules for Overfished Rockfish Stocks. Biology, Assessment, and Management of North Pacific Rockfishes AK-SG-07-01: 329-351.

Punt, A.E., and Smith, A.D.M. 1999. Harvest strategy evaluation for the eastern stock of gemfish (*Rexea solandri*). ICES J. of Mar. Sci. 56: 860-875.

Punt, A. E., D. C. Smith, K. KrusicGolub, and S. Robertson. 2008. Quatifying age-reading error for use in fisheries stock assessments, with application to species in Australia's southern and eastern scalefish and shark fishery. Can. J. Fish. Aquat. Sc. 65:1991-2005.

Ralston, S. 2007. Coast-wide Pre-Recruit Indices from SWFSC and PWCC/NWFSC Midwater Trawl Surveys (2001-2006). Southwest Fisheries Science Center, Santa Cruz, California

Ralston, S., Punt, A.E., Hamel, O.S., DeVore, J.D., and Conser, R.J. 2011. A meta-analytic approach to quantifying scientific uncertainty in stock assessments. Fish. Bull. 109: 217-231.

Ressler, P.H., J.A. Holmes, G.W. Fleischer, R.E. Thomas, and K.C. Cooke. 2007. Pacific hake, *Merluccius productus*, autecology: a timely review. Mar. Fish. Rev. 69:1-24.

Richards, L. J., J. T. Schnute, and N. Olsen. 1997. Visualizing catch-age analysis: a case study. Can. J. Fish. Aquat. Sci. 54:1646-1658.

Richards, L. J. and J. T. Schnute. 1998. Model complexity and catch-age analysis. Can. J. Fish. Aquat. Sci. 55:949-957.

Rivoirard, J., E.J. Simmonds, K. Foote, P.G. Fernandes, and N. Bez, 2000. Geostatistics for Estimating Fish Abundance. Blackwell Science Ltd, Oxford.

Sakuma, K.M., S. Ralston, and V.G. Wespestad. 2006. Interannual and spatial variation in the distribution of young-of-the-year rockfish (*Sebastes* spp.): expanding and coordinating the survey sampling frame. Calif. Coop. Oceanic Fish. Invest. Rep. 47:127–139.

Saunders, M.W. and G.A. McFarlane. 1997. Observation on the spawning distribution and biology of offshore Pacific hake. Calif. Coop. Oceanic Fish. Invest. Rep. 38:147:160.

Simmonds, J. and D. MacLennan, 2005. Fisheries Acoustics: Theory and practice. 2nd ed. Blackwell Science Ltd, Oxford, 437p.

Spiegelhalter, D.J., Thomas, A., and Best, N.G. 1999. WinBUGS Version 1.2 User Manual. Medical Research Council Biostatistics Unit, Institute of Public Health, Cambridge, U.K.

Stefánsson, G., 1996. Analysis of groundfish survey abundance data: combining the GLM and delta approaches. ICES J. Mar. Sci. 53, 577–588.

Stewart, I. J. and O. S. Hamel. 2010. Stock Assessment of Pacific Hake, Merluccius productus, (a.k.a. Whiting) in U.S. and Canadian Waters in 2010. Pacific Fishery Management Council. Portland, Oregon. 290 p.

Stewart, I. J., R. E. Forrest, C.J. Grandin, O.S. Hamel, A.C. Hicks, S.J.D. Martell and I.G. Taylor. 2011. Status of the Pacific hake (whiting) stock in U.S. and Canadian waters in 2011, *In* Status of the Pacific Coast Groundfish Fishery through 2011, Stock Assessment and Fishery Evaluation: Stock Assessments, STAR Panel Reports, and rebuilding analyses. Pacific Fishery Management Council, Portland, Oregon. 217 p.

Thomas, A., Spiegelhalter, D.J, and Gilks, W.R. 1992. BUGS: a program to perform Bayesian statistical inference using Gibbs sampling. *In* Bayesian statistics 4. Edited by J.M. Bernardo, J.O. Berger, A.P. Dawid, and A.F.M. Smith. Oxford University Press, Oxford, U.K. pp. 837-842.

Traynor, J.J. 1996. Target-strength measurements of walleye pollock (*Theragra chalcogramma*) and Pacific whiting (*Merluccius productus*). ICES J. of Mar. Sci. 53:253-258.

Utter, F.M. 1971. Biochemical polymorphisms in Pacific hake (*Merluccius productus*). Cons. Perm. Int. Explor. Mer Rapp. P.-V. Reun. 161:87-89.

Vrooman, A.M. and P.A. Paloma. 1977. Dwarf hake off the coast of Baja California, Mexico. Calif. Coop. Oceanic Fish. Invest. Rep. 19:67-72.

Walters, C.J. 1986. Adaptive management of renewable resources. Macmillian Publishing Co., New York.

Walters, C.J., and Hilborn, R. 1978. Ecological optimization and adaptive management. Ann. Rev. Ecol.Syst. 9: 157-188.

Walters, C. J. and D. Ludwig. 1994. Calculation of Bayes posterior probability distributions for key population parameters. Canadian Journal of Fisheries and Aquatic Sciences 51: 713-722.

Walters, C.J., and Martell, S.J.D. 2004. Fisheries Ecology and Management. Princeton University Press, Princeton, New Jersey.

Wilkins, M.E. 1998. The 1995 Pacific west coast bottom trawl survey of groundfish resources: estimates of distribution, abundance, and length and age composition. NOAA Tech. Memo. NMFS-AFSC-89.

6. Tables

Table 1. Annual catches of Pacific hake (1000s mt) in U.S. and Canadian waters by sector, 1966-2011. Tribal catches are included in the sector totals.

	U.S					Canada				
Year	Foreign	JV	At-sea	Shore -based	Total U.S.	Foreign	JV	Domestic	Total Canada	Total
1966	137.00	0.00	0.00	0.00	137.00	0.70	0.00	0.00	0.70	137.70
1967	168.70	0.00	0.00	8.96	177.66	36.71	0.00	0.00	36.71	214.37
1968	60.66	0.00	0.00	0.16	60.82	61.36	0.00	0.00	61.36	122.18
1969	86.19	0.00	0.00	0.09	86.28	93.85	0.00	0.00	93.85	180.13
1970	159.51	0.00	0.00	0.07	159.58	75.01	0.00	0.00	75.01	234.59
1971	126.49	0.00	0.00	1.43	127.92	26.70	0.00	0.00	26.70	154.62
1972	74.09	0.00	0.00	0.04	74.13	43.41	0.00	0.00	43.41	117.54
1973	147.44	0.00	0.00	0.07	147.51	15.13	0.00	0.00	15.13	162.64
1974	194.11	0.00	0.00	0.00	194.11	17.15	0.00	0.00	17.15	211.26
1975	205.65	0.00	0.00	0.00	205.65	15.70	0.00	0.00	15.70	221.35
1976	231.33	0.00	0.00	0.22	231.55	5.97	0.00	0.00	5.97	237.52
1977	127.01	0.00	0.00	0.49	127.50	5.19	0.00	0.00	5.19	132.69
1978	96.83	0.86	0.00	0.69	98.38	3.45	1.81	0.00	5.26	103.64
1979	114.91	8.83	0.00	0.94	124.68	7.90	4.23	0.30	12.43	137.11
1980	44.02	27.54	0.00	0.79	72.35	5.27	12.21	0.10	17.58	89.93
1981	70.36	43.56	0.00	0.88	114.80	3.92	17.16	3.28	24.36	139.16
1982	7.09	67.46	0.00	1.03	75.58	12.48	19.68	0.00	32.16	107.74
1983	0.00	72.10	0.00	1.05	73.15	13.12	27.66	0.00	40.78	113.93
1984	14.77	78.89	0.00	2.72	96.38	13.20	28.91	0.00	42.11	138.49
1985	49.85	31.69	0.00	3.89	85.44	10.53	13.24	1.19	24.96	110.40
1986	69.86	81.64	0.00	3.47	154.97	23.74	30.14	1.77	55.65	210.62
1987	49.66	106.00	0.00	4.80	160.45	21.45	48.08	4.17	73.70	234.15
1988	18.04	135.78	0.00	6.87	160.69	38.08	49.24	0.83	88.15	248.84
1989	0.00	195.64	0.00	7.41	203.05	29.75	62.72	2.56	95.03	298.08
1990	0.00	170.97	4.54	9.63	185.14	3.81	68.31	4.02	76.14	261.29
1991	0.00	0.00	205.82	23.97	229.79	5.61	68.13	16.17	89.92	319.71
1992	0.00	0.00	154.74	56.13	210.87	0.00	68.78	20.04	88.82	299.69
1993	0.00	0.00	98.04	42.11	140.15	0.00	46.42	12.35	58.77	198.92
1994	0.00	0.00	179.87	73.62	253.48	0.00	85.16	23.78	108.94	362.42
1995	0.00	0.00	102.31	74.96	177.27	0.00	26.19	46.18	72.37	249.64
1996	0.00	0.00	128.11	85.13	213.24	0.00	66.78	26.36	93.14	306.38
1997	0.00	0.00	146.05	87.42	233.47	0.00	42.57	49.23	91.79	325.26
1998	0.00	0.00	145.16	87.86	233.01	0.00	39.73	48.07	87.80	320.81
1999	0.00	0.00	141.02	83.47	224.49	0.00	17.20	70.16	87.36	311.84
2000	0.00	0.00	120.92	85.85	206.77	0.00	15.06	6.38	21.44	228.21
2001	0.00	0.00	100.53	73.41	173.94	0.00	21.65	31.94	53.59	227.53
2002	0.00	0.00	84.75	45.71	130.46	0.00	0.00	50.24	50.24	180.70
2003	0.00	0.00	86.61	55.34	141.95	0.00	0.00	63.23	63.23	205.18
2004	0.00	0.00	117.07	96.50	213.57	0.00	58.89	66.19	125.08	338.65
2005	0.00	0.00	151.07	109.05	260.12	0.00	15.69	87.34	103.04	363.16
2006	0.00	0.00	139.79	127.17	266.96	0.00	14.32	80.49	94.80	361.76
2007	0.00	0.00	126.24	91.44	217.68	0.00	6.78	66.67	73.45	291.13
2008	0.00	0.00	180.64	67.76	248.40	0.00	3.59	70.16	73.75	322.14
2009	0.00	0.00	72.35	49.22	121.57	0.00	0.00	55.88	55.88	177.46
2010	0.00	0.00	106.31	63.79	170.10	0.00	8.08	48.01	56.09	226.20
2011	0.00	0.00	128.07	102.35	230.42	0.00	9.72	45.91	55.63	286.05
Average:					165.92				56.30	222.22

Table 2. Recent trend in Pacific hake landings and management.

Year	Total landings (mt)	Coast-wide (U.S. + Canada) catch target (mt)
2001	227,531	238,000
2002	180,698	162,000
2003	205,177	228,000
2004	338,654	501,073
2005	363,157	364,197
2006	361,761	364,842
2007	291,129	328,358
2008	322,145	364,842
2009	177,459	184,000
2010	226,202	262,500
2011	286,055	393,751

Table 3. Annual summary of U.S. and Canadian fishery sampling included in this stock assessment. Foreign, joint-venture and at-sea sectors are in number of hauls sampled for age-composition, the shore-based sector is in number of trips.

	U.S.				Canada		
Year	Foreign	Joint-venture	At-sea	Shore-based	Foreign	Joint-venture	Domestic
1975	13	—	—	—	—	—	—
1976	142	—	—	—	—	—	—
1977	320	—	—	—	—	—	—
1978	336	5	—	—	—	—	—
1979	99	17	—	—	—	—	—
1980	191	30	—	—	—	—	—
1981	113	41	—	—	—	—	—
1982	52	118	—	—	—	—	—
1983	0	117	—	—	—	—	—
1984	49	74	—	—	—	—	—
1985	37	19	—	—	—	—	—
1986	88	32	—	—	—	—	—
1987	22	34	—	—	—	—	—
1988	39	42	—	—	—	—	—
1989	—	77	—	—	—	—	—
1990	—	143	—	15	—	5	—
1991	—	—	116	26	—	18	—
1992	—	—	164	46	—	33	—
1993	—	—	108	36	—	25	—
1994	—	—	143	50	—	41	—
1995	—	—	61	51	—	35	—
1996	—	—	123	35	—	28	—
1997	—	—	127	65	—	27	3
1998	—	—	149	64	—	21	9
1999	—	—	389	80	—	14	31
2000	—	—	413	91	—	25	—
2001	—	—	429	82	—	28	2
2002	—	—	342	71	—	—	37
2003	—	—	358	78	—	—	21
2004	—	—	381	72	—	20	28
2005	—	—	499	58	—	11	45
2006	—	—	549	83	—	21	67
2007	—	—	524	68	—	1	36
2008	—	—	680	63	—	—	51
2009	—	—	594	66	—	—	26
2010	—	—	774	75	—	—	24
2011	—	—	708	81	—	13	

Table 4. Acoustic survey summary, 1995-2011.

Year	Start date	End date	Vessels	Biomass index (million mt)	Sampling CV[1]	Number of hauls with bio. samples
1995	1 July	1 Sept.	Miller Freeman, Ricker	1.518	0.067	69
1998	6 July	27 Aug.	Miller Freeman, Ricker	1.343	0.049	84
2001	15 June	18 Aug	Miller Freeman, Ricker	0.919	0.082	49
2003	29 June	1 Sept.	Ricker	2.521	0.071	71
2005	20 June	19 Aug.	Miller Freeman	1.755	0.085	49
2007	20 June	21 Aug.	Miller Freeman	1.123	0.075	130
2009	30 June	7 Sept.	Miller Freeman, Ricker	1.612	0.137[2]	61
2011	26 June	10 Sept	Bell Shimada, Ricker	0.521	0.1015	59

[1]Sampling CV includes only error associated with kriging of transect-based observations.
[2]Also includes bootstrapped estimates of uncertainty associated with delineation of Humboltd squid from hake.

Table 5. Informative prior probability distributions used in this stock assessment. Note "CCAM - est" refers to the CCAM sensitivity case with survey selectivity parameters estimated. "CCAM - fix" refers to the CCAM sensitivity case with survey selectivity parameters fixed. It was not possible to achieve convergence in both cases with the same standard deviation on the prior for natural mortality, see text.

Model Parameter prior Justification

Model	Parameter	prior	Justification
Base case	Steepness (*h*)	~Beta(mean=0.777, SD=0.113)	Myers et al. 1999 meta-analysis results for Gadids.
CCAM	Steepness (*h*)	~Beta(α=0.977, β=2.80)	Myers et al. 1999 meta-analysis results for Gadids.
Base case	Natural mortality (*M*)	~log(N)(mean=0.2, σ=0.1)	Hoenig's method and maximum age = 22
CCAM – est CCAM - fix	Natural mortality (*M*)	~log(N)(mean=0.2, σ=0.05) ~log(N)(mean=0.2, σ=0.2)	Hoenig's method and maximum age = 22
CCAM	Variance ratio (ρ)	~Beta(α=3.0, β=12.0)	Used in previous TINSS assessments to help achieve convergence
CCAM	Inverse total standard deviation (φ^{-1})	~Gamma(7.5,5.8)	Used in previous TINSS assessments to help achieve convergence
CCAM	Acoustic survey catchability (*q*)	~log(N)(mean=1.0, SD=0.1)	Used in previous TINSS assessments to help achieve convergence

Table 6. Summary of estimated model parameters in the base-case model.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD) (single value = fixed)
	Stock dynamics		
Ln(R_0)	1	(13,17)	uniform
Steepness (h)	1	(0.2,1.0)	~Beta(0.777,0.113)
Recruitment variability (σ_R)	-	NA	1.40
Ln(Rec. deviations): 1946-2011	66	(-6, 6)	~Ln(N(0, σ_r))
Natural mortality (M)	1	(0.05,0.4)	~Ln(N(0.2,0.1))
	Catchability and selectivity (double normal)		
Acoustic survey:			
Catchability (q)	1	NA	Analytic solution
Additional value for acoustic survey log(SE)	1	(0.0, 1.2)	uniform
Non parametric age-based selectivity: ages 3–6	4	(-5,9)	Uniform in scaled logistic space
Fishery:			
Non parametric age-based selectivity: ages 2–6	5	(-5,9)	Uniform in scaled logistic space
Total: 14 + 66 recruitment deviations = 90 estimated parameters. See Appendix A for all parameter estimates.			

Table 7. Summary of estimated model parameters in the CCAM model with survey selectivity parameters estimated.

Parameter	Number estimated	Bounds (low,high)	Prior (Mean, SD) (single value=fixed)
Log recruitment (log_ro)	1	[-1,4]	Uniform
Steepness (h)	1	[0.2,1]	~Beta(α=9.77,β=2.80)
Log natural mortality (log_m)	1	[-5,0]	~Normal(ln(0.2),0.05)
Log mean recruitment (log_avgrec)	1	[-5,15]	Uniform
Log initial recruitment (log_recinit)	1	[-5,15]	Uniform
Variance ratio (ρ)	1	[0.01,0.999]	~Beta(α=3.0, β=12.0)
Inverse total standard deviation (φ^{-1})	1	[0.01,150]	~Gamma(7.5,5.8)
Survey age at 50% vulnerability (ahat_surv)	1	[0,1]	Uniform
Fishery age at 50% vulnerability (ahat_comm)	1	[0,1]	Uniform
Survey SD of logistic selectivity (ghat_surv)	1	[0,Inf)	None
Fishery SD of logistic selectivity (ghat_comm)	1	[0,Inf)	None
Survey catchability (q)	1	None	~Normal(0,0.1)
Log fishing mortality values	46	None	[-30,3]
Log recruitment deviations	59	[-5,5]	~Normal(0,τ[1])

[1]τ = standard deviation of recruitment residuals

Table 8. Time-series of median posterior population estimates from the base-case model.

Year	Female spawning biomass (millions mt)	Depletion	Age-0 recruits (billions)	1-SPR / 1-SPR40%	Exploitation fraction
1966	0.960	NA	1.264	47.8%	6.9%
1967	0.887	47.2%	3.117	68.2%	11.8%
1968	0.835	44.0%	1.820	50.9%	7.1%
1969	0.887	47.3%	0.761	65.2%	10.2%
1970	0.940	50.2%	7.002	74.7%	11.5%
1971	0.928	49.8%	0.616	56.6%	7.5%
1972	1.107	59.0%	0.391	44.9%	6.1%
1973	1.262	67.9%	3.828	48.9%	5.4%
1974	1.279	68.6%	0.344	54.2%	7.5%
1975	1.274	68.0%	1.201	49.2%	7.2%
1976	1.248	66.4%	0.303	45.8%	6.1%
1977	1.180	62.7%	4.527	32.7%	4.2%
1978	1.092	58.1%	0.257	30.4%	3.7%
1979	1.126	59.9%	0.814	36.0%	5.2%
1980	1.134	60.2%	15.137	28.9%	3.1%
1981	1.114	59.1%	0.263	41.6%	5.5%
1982	1.499	80.1%	0.238	36.7%	5.2%
1983	1.882	100.9%	0.394	30.0%	2.6%
1984	2.007	107.7%	12.263	29.6%	3.2%
1985	1.920	102.8%	0.172	24.3%	2.8%
1986	2.141	114.1%	0.190	39.8%	6.2%
1987	2.261	121.3%	5.199	43.0%	4.7%
1988	2.174	116.6%	1.845	42.6%	5.5%
1989	2.097	112.2%	0.174	55.1%	8.5%
1990	1.978	105.9%	4.278	47.8%	6.6%
1991	1.806	96.4%	0.500	57.6%	8.7%
1992	1.661	88.6%	0.177	62.2%	10.5%
1993	1.502	80.0%	3.181	55.9%	7.8%
1994	1.321	70.0%	2.343	79.8%	15.5%
1995	1.105	58.7%	1.330	71.1%	13.2%
1996	1.049	55.7%	1.500	83.9%	15.7%
1997	0.956	50.9%	1.223	88.6%	16.6%
1998	0.854	45.2%	1.718	93.4%	19.4%
1999	0.742	39.4%	10.387	97.6%	22.1%
2000	0.648	34.5%	0.347	82.2%	15.3%
2001	0.924	49.2%	0.792	76.4%	13.9%
2002	1.179	62.9%	0.064	51.0%	4.8%
2003	1.288	68.7%	1.266	52.0%	6.6%
2004	1.219	65.1%	0.064	76.5%	13.3%
2005	1.020	54.6%	1.964	84.8%	19.5%
2006	0.774	41.6%	1.579	97.2%	23.7%
2007	0.580	31.3%	0.070	102.0%	29.1%
2008	0.491	26.4%	5.248	113.2%	31.4%
2009	0.384	20.4%	1.736	99.6%	20.3%
2010	0.483	25.4%	0.932	109.8%	34.3%
2011	0.587	31.3%	0.763	111.6%	23.3%
2012	0.616	32.6%	0.762	NA	NA

Table 9. Time-series of ~95% posterior credibility intervals for female spawning biomass, relative depletion estimates, age-0 recruits, relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) and exploitation fraction from the base-case model.

Year	Female spawning Biomass (millions mt)	Depletion	Age-0 recruits (billions)	(1-SPR) / (1-SPR_{target})	Exploitation fraction
1966	0.52-1.81	NA	0.06-6.72	0.27-0.74	0.04-0.13
1967	0.49-1.71	0.27-0.87	0.13-10.74	0.40-0.98	0.06-0.22
1968	0.45-1.58	0.24-0.82	0.10-7.76	0.28-0.80	0.04-0.14
1969	0.53-1.67	0.28-0.85	0.05-4.39	0.37-0.93	0.05-0.20
1970	0.60-1.83	0.31-0.89	3.40-17.14	0.43-0.99	0.06-0.20
1971	0.59-1.89	0.31-0.88	0.05-2.68	0.30-0.81	0.04-0.12
1972	0.72-2.16	0.37-1.04	0.05-1.63	0.22-0.67	0.03-0.10
1973	0.82-2.39	0.42-1.16	1.92-8.88	0.25-0.72	0.03-0.09
1974	0.81-2.45	0.42-1.14	0.04-1.51	0.29-0.79	0.04-0.12
1975	0.79-2.52	0.41-1.15	0.40-3.11	0.26-0.72	0.04-0.12
1976	0.77-2.44	0.40-1.13	0.03-1.33	0.23-0.70	0.03-0.10
1977	0.72-2.29	0.38-1.06	2.25-10.37	0.16-0.53	0.02-0.07
1978	0.67-2.10	0.35-0.96	0.03-1.36	0.15-0.50	0.02-0.06
1979	0.69-2.08	0.37-0.98	0.12-2.87	0.18-0.57	0.03-0.08
1980	0.69-2.14	0.36-0.98	8.92-30.18	0.14-0.48	0.02-0.05
1981	0.67-2.01	0.35-0.95	0.03-1.32	0.22-0.65	0.03-0.09
1982	0.97-2.63	0.50-1.24	0.03-1.14	0.19-0.57	0.03-0.09
1983	1.27-3.21	0.64-1.50	0.04-1.48	0.16-0.47	0.02-0.04
1984	1.38-3.35	0.69-1.58	7.90-21.74	0.16-0.45	0.02-0.05
1985	1.33-3.10	0.67-1.49	0.02-0.86	0.13-0.38	0.02-0.04
1986	1.56-3.27	0.77-1.62	0.03-0.95	0.24-0.57	0.04-0.09
1987	1.70-3.34	0.84-1.69	3.29-8.92	0.27-0.60	0.03-0.06
1988	1.66-3.13	0.82-1.60	0.67-3.80	0.27-0.59	0.04-0.07
1989	1.63-2.92	0.79-1.53	0.02-0.75	0.37-0.72	0.06-0.11
1990	1.57-2.69	0.76-1.43	2.84-6.71	0.32-0.63	0.05-0.08
1991	1.46-2.42	0.70-1.28	0.07-1.33	0.40-0.74	0.06-0.11
1992	1.37-2.20	0.65-1.16	0.02-0.64	0.45-0.77	0.08-0.13
1993	1.24-1.96	0.60-1.05	2.22-4.93	0.40-0.70	0.06-0.09
1994	1.11-1.68	0.54-0.91	1.52-3.62	0.61-0.96	0.12-0.18
1995	0.93-1.42	0.45-0.77	0.79-2.32	0.53-0.86	0.10-0.16
1996	0.88-1.33	0.43-0.73	0.97-2.40	0.65-0.99	0.12-0.19
1997	0.80-1.21	0.39-0.66	0.68-2.10	0.70-1.03	0.13-0.20
1998	0.72-1.08	0.35-0.58	1.09-2.89	0.75-1.07	0.15-0.23
1999	0.61-0.95	0.30-0.51	7.91-15.50	0.79-1.12	0.17-0.27
2000	0.52-0.84	0.26-0.45	0.08-0.80	0.63-0.99	0.12-0.19
2001	0.75-1.21	0.37-0.63	0.48-1.28	0.58-0.93	0.11-0.17
2002	0.98-1.54	0.48-0.80	0.01-0.23	0.37-0.65	0.04-0.06
2003	1.10-1.64	0.53-0.87	0.87-2.02	0.38-0.66	0.05-0.08
2004	1.06-1.52	0.51-0.82	0.01-0.21	0.59-0.91	0.11-0.15
2005	0.89-1.29	0.43-0.68	1.32-3.70	0.67-0.99	0.15-0.22
2006	0.67-1.02	0.33-0.53	0.89-3.69	0.79-1.10	0.18-0.28
2007	0.48-0.86	0.24-0.41	0.01-0.29	0.83-1.16	0.20-0.35
2008	0.38-0.83	0.19-0.40	2.04-17.58	0.90-1.27	0.19-0.40
2009	0.26-0.77	0.13-0.36	0.51-6.48	0.69-1.18	0.10-0.30
2010	0.26-1.24	0.14-0.58	0.06-10.26	0.73-1.30	0.15-0.58
2011	0.23-1.86	0.13-0.87	0.05-10.26	0.64-1.37	0.07-0.50
2012	0.17-2.23	0.09-1.02	0.04-10.73	NA	NA

Table 10. Estimated numbers at age at the beginning of the year from the base model (MLE; millions).

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1966	1.14	1.03	0.58	0.40	0.30	0.24	0.19	0.16	0.14	0.11	0.10	0.08	0.07	0.06	0.05	0.22
1967	2.80	0.94	0.84	0.48	0.32	0.23	0.18	0.14	0.12	0.10	0.08	0.07	0.06	0.05	0.04	0.19
1968	1.60	2.30	0.77	0.68	0.36	0.22	0.16	0.11	0.09	0.08	0.06	0.05	0.05	0.04	0.03	0.15
1969	0.76	1.31	1.89	0.62	0.53	0.27	0.16	0.11	0.08	0.06	0.05	0.05	0.04	0.03	0.03	0.13
1970	5.03	0.63	1.08	1.52	0.47	0.38	0.19	0.11	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.10
1971	0.64	4.13	0.51	0.87	1.13	0.33	0.25	0.12	0.07	0.05	0.03	0.03	0.02	0.02	0.02	0.08
1972	0.38	0.52	3.39	0.42	0.67	0.84	0.24	0.18	0.08	0.05	0.03	0.02	0.02	0.02	0.01	0.07
1973	2.71	0.31	0.43	2.76	0.33	0.51	0.63	0.17	0.13	0.06	0.04	0.02	0.02	0.01	0.01	0.06
1974	0.34	2.23	0.26	0.35	2.16	0.25	0.38	0.46	0.13	0.09	0.04	0.03	0.02	0.01	0.01	0.05
1975	0.89	0.28	1.83	0.21	0.27	1.61	0.18	0.27	0.33	0.09	0.07	0.03	0.02	0.01	0.01	0.04
1976	0.28	0.73	0.23	1.49	0.16	0.20	1.20	0.13	0.20	0.24	0.07	0.05	0.02	0.01	0.01	0.04
1977	3.42	0.23	0.60	0.19	1.17	0.12	0.15	0.88	0.10	0.14	0.17	0.05	0.04	0.02	0.01	0.03
1978	0.25	2.81	0.19	0.49	0.15	0.92	0.10	0.12	0.67	0.07	0.11	0.13	0.04	0.03	0.01	0.03
1979	0.76	0.21	2.31	0.15	0.39	0.12	0.71	0.07	0.09	0.52	0.06	0.08	0.10	0.03	0.02	0.04
1980	11.60	0.62	0.17	1.88	0.12	0.31	0.09	0.54	0.06	0.07	0.39	0.04	0.06	0.08	0.02	0.04
1981	0.28	9.53	0.51	0.14	1.51	0.10	0.24	0.07	0.42	0.04	0.05	0.31	0.03	0.05	0.06	0.05
1982	0.23	0.23	7.82	0.42	0.11	1.17	0.07	0.18	0.05	0.31	0.03	0.04	0.23	0.03	0.04	0.08
1983	0.38	0.19	0.19	6.38	0.33	0.09	0.90	0.06	0.14	0.04	0.24	0.02	0.03	0.17	0.02	0.09
1984	9.74	0.32	0.15	0.16	5.12	0.26	0.07	0.70	0.04	0.11	0.03	0.19	0.02	0.02	0.13	0.09
1985	0.19	8.00	0.26	0.13	0.13	4.05	0.21	0.05	0.54	0.03	0.08	0.02	0.14	0.02	0.02	0.17
1986	0.20	0.16	6.57	0.21	0.10	0.10	3.21	0.16	0.04	0.42	0.03	0.06	0.02	0.11	0.01	0.15
1987	4.17	0.17	0.13	5.36	0.17	0.08	0.08	2.43	0.12	0.03	0.32	0.02	0.05	0.01	0.09	0.12
1988	1.64	3.42	0.14	0.10	4.25	0.13	0.06	0.06	1.82	0.09	0.02	0.24	0.02	0.04	0.01	0.16
1989	0.17	1.35	2.81	0.11	0.08	3.29	0.10	0.05	0.04	1.37	0.07	0.02	0.18	0.01	0.03	0.12
1990	3.51	0.14	1.11	2.28	0.09	0.06	2.44	0.07	0.03	0.03	0.99	0.05	0.01	0.13	0.01	0.11
1991	0.51	2.88	0.11	0.90	1.80	0.07	0.05	1.81	0.05	0.02	0.02	0.74	0.04	0.01	0.10	0.09
1992	0.18	0.42	2.36	0.09	0.70	1.35	0.05	0.03	1.30	0.04	0.02	0.02	0.53	0.03	0.01	0.13
1993	2.66	0.15	0.34	1.92	0.07	0.52	0.99	0.03	0.02	0.92	0.03	0.01	0.01	0.37	0.02	0.10
1994	1.99	2.18	0.12	0.28	1.50	0.05	0.39	0.71	0.03	0.02	0.66	0.02	0.01	0.01	0.27	0.08
1995	1.12	1.63	1.79	0.10	0.21	1.05	0.04	0.25	0.46	0.02	0.01	0.43	0.01	0.01	0.01	0.23
1996	1.25	0.92	1.34	1.45	0.07	0.15	0.74	0.02	0.17	0.31	0.01	0.01	0.29	0.01	0.00	0.16
1997	1.04	1.02	0.75	1.08	1.08	0.05	0.10	0.47	0.02	0.11	0.20	0.01	0.00	0.18	0.01	0.10
1998	1.43	0.85	0.84	0.61	0.79	0.72	0.03	0.06	0.28	0.01	0.06	0.12	0.00	0.00	0.11	0.06
1999	8.61	1.18	0.70	0.67	0.44	0.52	0.45	0.02	0.03	0.16	0.01	0.04	0.07	0.00	0.00	0.10
2000	0.33	7.07	0.97	0.56	0.48	0.28	0.31	0.25	0.01	0.02	0.09	0.00	0.02	0.04	0.00	0.06
2001	0.66	0.27	5.80	0.78	0.41	0.33	0.18	0.20	0.16	0.01	0.01	0.06	0.00	0.01	0.02	0.04
2002	0.07	0.55	0.22	4.68	0.59	0.29	0.23	0.12	0.13	0.10	0.00	0.01	0.04	0.00	0.01	0.04
2003	1.04	0.05	0.45	0.18	3.68	0.45	0.22	0.17	0.09	0.09	0.07	0.00	0.01	0.03	0.00	0.03
2004	0.06	0.86	0.04	0.36	0.14	2.80	0.34	0.16	0.12	0.07	0.07	0.05	0.00	0.00	0.02	0.03
2005	1.57	0.05	0.70	0.04	0.28	0.10	1.94	0.22	0.11	0.08	0.04	0.05	0.04	0.00	0.00	0.03
2006	1.19	1.29	0.04	0.56	0.03	0.19	0.07	1.21	0.14	0.07	0.05	0.03	0.03	0.02	0.00	0.02
2007	0.06	0.98	1.06	0.03	0.40	0.02	0.11	0.04	0.67	0.08	0.04	0.03	0.01	0.02	0.01	0.01
2008	3.46	0.05	0.80	0.84	0.02	0.25	0.01	0.06	0.02	0.34	0.04	0.02	0.01	0.01	0.01	0.01
2009	1.11	2.84	0.04	0.63	0.54	0.01	0.12	0.00	0.02	0.01	0.13	0.02	0.01	0.01	0.00	0.01
2010	0.95	0.91	2.33	0.03	0.44	0.33	0.01	0.06	0.00	0.01	0.00	0.07	0.01	0.00	0.00	0.01
2011	0.69	0.78	0.74	1.82	0.02	0.23	0.16	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.00

Table 11. Summary of Pacific hake reference points from the base-case model.

Quantity	2.5^{th} percentile	Median	97.5^{th} percentile
Unfished female spawning biomass (SB_0, millions mt)	1.489	1.888	2.529
Unfished recruitment (R_0, billions)	1.540	2.326	3.976
Reference points based on $SB_{40\%}$			
Female spawning biomass ($SB_{40\%}$ million mt)	0.595	0.755	1.011
$SPR_{SB40\%}$	40.6%	43.5%	52.1%
Exploitation fraction resulting in $SB_{40\%}$	13.5%	18.6%	23.2%
Yield at $SB_{40\%}$ (million mt)	0.207	0.290	0.433
Reference points based on $F_{40\%}$			
Female spawning biomass ($SB_{F40\%}$ million mt)	0.501	0.670	0.902
$SPR_{MSY\text{-}proxy}$	0.40	0.40	0.40
Exploitation fraction corresponding to SPR	18.1%	21.4%	25.7%
Yield at $SB_{F40\%}$ (million mt)	0.210	0.299	0.443
Reference points based on estimated MSY			
Female spawning biomass (SB_{MSY} million mt)	0.291	0.460	0.781
SPR_{MSY}	18.3%	28.9%	47.9%
Exploitation fraction corresponding to SPR_{MSY}	15.9%	33.0%	56.9%
MSY (million mt)	0.215	0.317	0.482

Table 12.1. Posterior distribution quantiles for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place) from the base model. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g).

Within model quantile			5%	25%	50%	75%	95%
Management Action							
	Year	Catch (mt)	**Beginning of year depletion**				
a	2012	0	11%	22%	33%	51%	86%
	2013	0	14%	28%	40%	60%	104%
	2014	0	18%	32%	47%	67%	120%
b	2012	50,000	11%	22%	33%	51%	86%
	2013	50,000	13%	27%	39%	59%	103%
	2014	50,000	15%	30%	44%	65%	117%
c	2012	100,000	11%	22%	33%	51%	86%
	2013	100,000	12%	25%	38%	58%	102%
	2014	100,000	13%	27%	41%	63%	115%
d	2012	150,000	11%	22%	33%	51%	86%
	2013	150,000	10%	24%	37%	57%	101%
	2014	150,000	10%	25%	39%	60%	113%
e	2012	200,000	11%	22%	33%	51%	86%
	2013	200,000	9%	23%	36%	56%	99%
	2014	200,000	8%	22%	37%	58%	111%
f	2012	251,809	11%	22%	33%	51%	86%
	2013	267,146	8%	21%	34%	54%	98%
	2014	277,887	6%	19%	34%	55%	109%
g	2012	393,751	11%	22%	33%	51%	86%
	2013	393,751	7%	18%	30%	51%	95%
	2014	393,751	5%	13%	27%	49%	102%

Table 12.2. Posterior distribution quantiles for Pacific hake **fishing intensity (**spawning potential ratio; 1-SPR/1-$SPR_{40\%}$; values greater than 100% denote fishing in excess of the $F_{40\%}$ default harvest rate) from the base model. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g).

Within model quantile			5%	25%	50%	75%	95%
Management Action							
	Year	Catch (mt)	**Fishing intensity**				
a	2012	0	0%	0%	0%	0%	0%
	2013	0	0%	0%	0%	0%	0%
	2014	0	0%	0%	0%	0%	0%
b	2012	50,000	13%	24%	36%	52%	79%
	2013	50,000	11%	21%	31%	44%	71%
	2014	50,000	10%	18%	26%	38%	63%
c	2012	100,000	25%	42%	59%	79%	107%
	2013	100,000	22%	38%	53%	72%	104%
	2014	100,000	19%	33%	48%	66%	100%
d	2012	150,000	35%	56%	76%	95%	121%
	2013	150,000	31%	52%	71%	91%	122%
	2014	150,000	27%	47%	65%	87%	123%
e	2012	200,000	43%	67%	87%	106%	129%
	2013	200,000	39%	64%	84%	105%	132%
	2014	200,000	35%	59%	80%	104%	133%
f	2012	251,809	51%	77%	97%	115%	133%
	2013	267,146	49%	76%	97%	118%	135%
	2014	277,887	46%	74%	97%	120%	136%
g	2012	393,751	68%	95%	113%	128%	137%
	2013	393,751	65%	95%	116%	131%	138%
	2014	393,751	61%	94%	119%	132%	138%

Table 12.3. Median of the posterior distribution for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place) from alternate modeling approaches. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g). See main text for descriptions of alternative models.

Alternate models			CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Management action							
	Year	Catch (mt)	**Beginning of year depletion**				
a	2012	0	19%	27%	33%	40%	39%
	2013	0	25%	35%	40%	49%	48%
	2014	0	30%	40%	47%	55%	53%
b	2012	50,000	19%	27%	33%	40%	39%
	2013	50,000	24%	33%	39%	47%	47%
	2014	50,000	27%	37%	44%	52%	50%
c	2012	100,000	19%	27%	33%	40%	39%
	2013	100,000	23%	32%	38%	46%	45%
	2014	100,000	25%	35%	41%	50%	48%
d	2012	150,000	19%	27%	33%	40%	39%
	2013	150,000	21%	31%	37%	45%	44%
	2014	150,000	22%	32%	39%	47%	45%
e	2012	200,000	19%	27%	33%	40%	39%
	2013	200,000	20%	30%	36%	44%	43%
	2014	200,000	19%	30%	37%	45%	43%
f	2012	251,809	19%	27%	33%	40%	39%
	2013	267,146	19%	28%	34%	43%	42%
	2014	277,887	16%	27%	34%	42%	39%
g	2012	393,751	19%	27%	33%	40%	39%
	2013	393,751	15%	25%	30%	39%	38%
	2014	393,751	12%	21%	27%	35%	33%

Table 12.4. Median of the posterior distribution for Pacific hake **fishing intensity** (spawning potential ratio; 1-SPR/1-$SPR_{40\%}$; values greater than 100% denote fishing in excess of the $F_{40\%}$ default harvest rate) from alternate modeling approaches. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt (rows a–e), 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case (row f), and the status quo catch target (row g). See main text for descriptions of alternative models.

Alternate models			CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Management action							
	Year	Catch (mt)			**Fishing intensity**		
a	2012	0	0%	0%	0%	0%	0%
	2013	0	0%	0%	0%	0%	0%
	2014	0	0%	0%	0%	0%	0%
b	2012	50,000	58%	41%	36%	31%	34%
	2013	50,000	47%	33%	31%	26%	26%
	2014	50,000	40%	30%	26%	24%	22%
c	2012	100,000	86%	67%	59%	52%	57%
	2013	100,000	75%	57%	53%	46%	46%
	2014	100,000	69%	54%	48%	44%	41%
d	2012	150,000	102%	83%	76%	67%	72%
	2013	150,000	95%	75%	71%	62%	62%
	2014	150,000	91%	73%	65%	60%	57%
e	2012	200,000	113%	96%	87%	78%	84%
	2013	200,000	109%	89%	84%	74%	74%
	2014	200,000	108%	89%	80%	74%	71%
f	2012	251,809	121%	105%	97%	88%	93%
	2013	267,146	122%	103%	97%	87%	87%
	2014	277,887	126%	107%	97%	90%	88%
g	2012	393,751	132%	120%	113%	105%	110%
	2013	393,751	134%	122%	116%	106%	107%
	2014	393,751	135%	126%	119%	110%	110%

Table 12.5. Probabilities of various management metrics given different catch alternatives. Catch alternatives are based on: 1) arbitrary constant catch levels of 0, 50,000, 100,000, 150,000, and 200,000 mt, 2) the median values estimated via the default harvest control rule (the $F_{40\%}$ default harvest rate and *SB* 40:10 reduction) for the base case, and the *status quo* catch target.

Catch	$P(SB_{2013}>SB_{2012})$	$P(SB_{2013}>SB_{40\%})$	$P(SB_{2013}>SB_{25\%})$	$P(SB_{2013}>SB_{10\%})$	P(Fishing intensity in 2012 > 40% Target)
0	>99%	51%	80%	99%	0%
50,000	99%	49%	78%	98%	<1%
100,000	88%	46%	76%	96%	7%
150,000	74%	44%	73%	95%	17%
200,000	58%	42%	70%	94%	31%
251,809	47%	40%	68%	93%	47%
393,751	28%	35%	61%	91%	70%

Table 13. Select parameters, derived quantities, and reference point estimates for the alternate sensitivity models. Note that recruits are estimated as age-0 fish in SS and as age-1 fish in CCAM.

	CCAM Fixed survey selectivity	SS Selectivity est. to age-5	Base case	SS Selectivity est. to age-7	CCAM est. survey selectivity
Parameters					
R_0 (billions)	1.631	2.367	2.326	2.367	1.776
Steepness (h)	0.848	0.808	0.812	0.804	0.851
Natural mortality (M)	0.205	0.219	0.219	0.220	0.209
Acoustic catchability (Q)	1.015	NA	NA	NA	1.210
Additional acoustic survey SD	NA	0.504	0.464	0.478	NA
Derived Quantities					
2008 recruitment (billions)	1.922	4.624	5.248	6.412	3.443
SB_0 (million mt)	1.905	1.912	1.888	1.909	1.963
2012 Depletion	19.2%	27.5%	32.6%	40.3%	38.8%
2011 Fishing intensity (1-SPR/1-SPR40%)	131.7%	117.0%	111.6%	105.3%	113.6%
Reference points based on $SB_{40\%}$					
Female spawning biomass ($SB_{40\%}$ million mt)	0.762	0.765	0.755	0.764	0.785
$SPR_{SB40\%}$	42.7%	43.6%	43.5%	43.7%	42.6%
Exploitation fraction resulting in $SB_{40\%}$	16.5%	18.5%	18.6%	18.8%	17.0%
Yield at $SB_{40\%}$ (million mt)	0.264	0.293	0.290	0.295	0.285
Reference points based on $F_{40\%}$					
Female spawning biomass ($SB_{F40\%}$ million mt)	0.697	0.680	0.670	0.676	0.724
$SPR_{MSY\text{-}proxy}$	40%	40%	40%	40%	40%
Exploitation fraction corresponding to SPR	18.4%	21.3%	21.4%	21.5%	18.7%
Yield at $SB_{F40\%}$ (million mt)	0.271	0.302	0.299	0.302	0.292
Reference points based on estimated MSY					
Female spawning biomass (SB_{MSY} million mt)	0.441	0.470	0.460	0.471	0.449
SPR_{MSY}	26.2%	28.9%	28.9%	29.4%	26.2%
Exploitation fraction corresponding to SPR_{MSY}	31.2%	32.6%	33.0%	32.5%	32.4%
MSY (million mt)	0.293	0.320	0.317	0.318	0.319

Table 14. Select parameters, derived quantities, and reference point estimates for the base case MLE and posterior medians.

	MLE	Posterior median
Parameters		
R_0 (billions)	2.018	2.326
Steepness (h)	0.847	0.812
Natural mortality (M)	0.209	0.219
Acoustic catchability (Q)	1.211	
Additional acoustic survey SD	0.378	0.464
Derived Quantities		
2008 recruitment	4.059	
SB_0 (million mt)	1.766	1.888
2012 Depletion	27.4%	32.6%
2011 Fishing intensity (1-SPR/1-SPR40%)	121.5%	111.6%
Reference points based on $SB_{40\%}$		
Female spawning biomass ($SB_{40\%}$ million mt)	0.706	0.755
$SPR_{SB40\%}$	42.7%	43.5%
Exploitation fraction resulting in $SB_{40\%}$	18.5%	18.6%
Yield at $SB_{40\%}$ (million mt)	0.274	0.290
Reference points based on $F_{40\%}$		
Female spawning biomass ($SB_{F40\%}$ million mt)	0.656	0.670
$SPR_{MSY\text{-}proxy}$		40%
Exploitation fraction corresponding to SPR	20.4%	21.4%
Yield at $SB_{F40\%}$ (million mt)	0.281	0.299
Reference points based on estimated MSY		
Female spawning biomass (SB_{MSY} million mt)	0.407	0.460
SPR_{MSY}	26.5%	28.9%
Exploitation fraction corresponding to SPR_{MSY}	34.8%	33.0%
MSY (million mt)	0.301	0.317

Table 15. Select parameters, derived quantities, and reference point estimates for sensitivity analyses to priors on natural mortality (M) and the degree of recruitment variability (σ_r) for the base case. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

	Base case	M prior SD=0.2	M prior SD=0.3	σ_r est. with prior ~N (1.4,0.1)
Parameters				
R_0 (billions)	2.369	3.408	4.159	2.484
Steepness (h)	0.803	0.800	0.800	0.812
Natural mortality (M)	0.219	0.256	0.272	0.220
Acoustic catchability (Q)	NA	NA	NA	NA
Additional acoustic survey SD	0.463	0.477	0.472	0.463
Derived Quantities				
2008 recruitment	5.499	8.223	10.345	5.327
SB_0 (million mt)	1.906	2.089	2.230	1.998
2012 Depletion	34.6%	44.9%	50.1%	30.6%
2011 Fishing intensity (1-SPR/1-SPR40%)	110.1%	93.6%	83.3%	111.6%
Reference points based on $SB_{40\%}$				
Female spawning biomass ($SB_{40\%}$ million mt)	1.525	1.672	1.784	1.598
$SPR_{SB40\%}$	43.7%	43.8%	43.8%	43.5%
Exploitation fraction resulting in $SB_{40\%}$	18.6%	21.2%	22.5%	18.7%
Yield at $SB_{40\%}$ (million mt)	0.293	0.368	0.414	0.305
Reference points based on $F_{40\%}$				
Female spawning biomass ($SB_{F40\%}$ million mt)	1.361	1.472	1.550	1.402
$SPR_{MSY\text{-}proxy}$	40%	40%	40%	40%
Exploitation fraction corresponding to SPR	21.4%	24.8%	26.5%	21.5%
Yield at $SB_{F40\%}$ (million mt)	0.301	0.380	0.424	0.314
Reference points based on estimated MSY				
Female spawning biomass (SB_{MSY} million mt)	0.934	1.044	1.125	0.976
SPR_{MSY}	29.4%	29.3%	29.2%	28.8%
Exploitation fraction corresponding to SPR_{MSY}	32.3%	37.6%	40.5%	33.1%
MSY (million mt)	0.316	0.404	0.449	0.332

Table 16. Select parameters, derived quantities, and reference point estimates for CCAM sensitivity analyses to the prior for steepness. Note that recruits are age-1 and not directly comparable with the SS base-case model. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

	CCAM base case	*Gadids (no P. hake) Mean =0.717 SD =0.072*	*Merluccius (no P. hake) Mean =0.673 SD =0.067*	*Merluccius (w/ P. hake) Mean =0.585 SD =0.059*
Parameters				
R_0 (billions)	3.871	3.048	3.022	3.494
Steepness (h)	0.842	0.732	0.694	0.614
Natural mortality (M)	0.294	0.269	0.271	0.272
Acoustic catchability (Q)	1.085	1.157	1.124	1.124
Additional acoustic survey SD	NA	NA	NA	NA
Derived Quantities				
2008 recruitment	5.925	4.575	4.711	6.296
SB_0 (million mt)	2.345	2.176	2.120	2.449
2012 Depletion	44.7%	35.8%	40.7%	43.9%
2011 Fishing intensity (1-SPR/1-SPR40%)	86.1%	99.4%	95.5%	92.4%
Reference points based on $SB_{40\%}$				
Female spawning biomass ($SB_{40\%}$ million mt)	0.938	0.870	0.848	0.980
$SPR_{SB40\%}$	42.8%	45.5%	46.6%	49.5%
Exploitation fraction resulting in $SB_{40\%}$	23.8%	19.8%	19.2%	17.4%
Yield at $SB_{40\%}$ (million mt)	0.483	0.374	0.356	36.3%
Reference points based on $F_{40\%}$				
Female spawning biomass ($SB_{F40\%}$ million mt)	0.858	0.731	0.688	0.683
$SPR_{MSY\text{-}proxy}$	40%	40%	40%	40%
Exploitation fraction corresponding to SPR	26.9%	24.3%	24.6%	24.6%
Yield at $SB_{F40\%}$ (million mt)	0.498	0.390	0.371	0.367
Reference points based on estimated MSY				
Female spawning biomass (SB_{MSY} million mt)	0.539	0.582	0.595	0.768
SPR_{MSY}	26.8%	33.6%	36.2%	42.0%
Exploitation fraction corresponding to SPR_{MSY}	44.8%	30.9%	28.2%	22.9%
MSY (million mt)	0.541	0.399	0.377	0.374

Table 17. Select parameters, derived quantities, and reference point estimates for CCAM sensitivity analyses to the standard deviation of the prior for natural mortality. Note that recruits are age 1 and not directly comparable with SS. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

	CCAM est. survey selectivity	*M prior Mean =0.2 SD=0.05*	*M prior Mean =0.2 SD=0.1*	*M prior Mean =0.2 SD=0.175*
Parameters				
R_0 (billions)	3.871	1.779	2.395	2.439
Steepness (*h*)	0.842	0.865	0.857	0.852
Natural mortality (*M*)	0.294	0.210	0.245	0.243
Acoustic catchability (*Q*)	1.085	1.206	1.153	1.169
Additional acoustic survey SD	NA	NA	NA	NA
Derived Quantities				
2008 recruitment	5.925	3.808	4.615	4.499
SB_0 (million mt)	2.345	1.971	2.054	2.005
2012 Depletion	44.7%	40.4%	43.9%	43.3%
2011 Fishing intensity (1-SPR/1-SPR40%)	86.1%	111.4%	101.0%	101.6%
Reference points based on $SB_{40\%}$				
Female spawning biomass ($SB_{40\%}$ million mt)	0.938	0.788	0.821	0.802
$SPR_{SB40\%}$	42.8%	42.3%	42.5%	42.6%
Exploitation fraction resulting in $SB_{40\%}$	23.8%	17.3%	19.9%	20.1%
Yield at $SB_{40\%}$ (million mt)	0.483	0.289	0.347	0.351
Reference points based on $F_{40\%}$				
Female spawning biomass ($SB_{F40\%}$ million mt)	0.858	0.732	0.757	0.739
$SPR_{MSY\text{-}proxy}$	40%	40%	40%	40%
Exploitation fraction corresponding to SPR	26.9%	18.9%	22.0%	21.9%
Yield at $SB_{F40\%}$ (million mt)	0.498	0.296	0.357	0.360
Reference points based on estimated MSY				
Female spawning biomass (SB_{MSY} million mt)	0.539	0.440	0.460	0.452
SPR_{MSY}	26.8%	25.0%	25.5%	25.9%
Exploitation fraction corresponding to SPR_{MSY}	44.8%	34.6%	38.6%	39.3%
MSY (million mt)	0.541	0.325	0.391	0.392

Table 18. Select parameters, derived quantities, and reference point estimates for CCAM sensitivity analyses to the mean of the prior for natural mortality. Note that recruits are age 1 and not directly comparable with SS. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

	CCAM est. survey selectivity	*M prior Mean =0.175 SD=0.2*	*M prior Mean =0.225 SD=0.2*
Parameters			
R_0 (billions)	3.871	2.806	3.380
Steepness (*h*)	0.842	0.850	0.855
Natural mortality (*M*)	0.294	0.261	0.282
Acoustic catchability (*Q*)	1.085	1.143	1.075
Additional acoustic survey SD	NA	NA	NA
Derived Quantities			
2008 recruitment	5.925	4.813	5.464
SB_0 (million mt)	2.345	2.094	2.201
2012 Depletion	44.7%	43.1%	46.6%
2011 Fishing intensity (1-SPR/1-SPR40%)	86.1%	97.0%	91.5%
Reference points based on $SB_{40\%}$			
Female spawning biomass ($SB_{40\%}$ million mt)	0.938	0.837	0.880
$SPR_{SB40\%}$	42.8%	42.6%	42.5%
Exploitation fraction resulting in $SB_{40\%}$	23.8%	21.2%	23.2%
Yield at $SB_{40\%}$ (million mt)	0.483	0.384	0.446
Reference points based on $F_{40\%}$			
Female spawning biomass ($SB_{F40\%}$ million mt)	0.858	0.773	0.811
$SPR_{MSY\text{-}proxy}$	40%	40%	40%
Exploitation fraction corresponding to SPR	26.9%	23.6%	25.6%
Yield at $SB_{F40\%}$ (million mt)	0.498	0.396	0.459
Reference points based on estimated MSY			
Female spawning biomass (SB_{MSY} million mt)	0.539	0.478	0.491
SPR_{MSY}	26.8%	26.0%	25.8%
Exploitation fraction corresponding to SPR_{MSY}	44.8%	40.6%	44.8%
MSY (million mt)	0.541	0.429	0.498

Table 19. Select parameters, derived quantities, and reference point estimates for CCAM sensitivity analyses to the standard deviation of the prior for survey catchability. Note that recruits are age 1 and not directly comparable with SS. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

	CCAM est. survey selectivity	*Q prior SD=0.15*	*Q prior SD=0.25*	*Q prior SD=0.3*
Parameters				
R_0 (billions)	3.871	2.475	2.165	2.164
Steepness (*h*)	0.842	0.856	0.850	0.852
Natural mortality (*M*)	0.294	0.255	0.243	0.233
Acoustic catchability (*Q*)	1.085	1.279	1.544	1.579
Additional acoustic survey SD	NA	NA	NA	NA
Derived Quantities				
2008 recruitment	5.925	4.075	3.201	3.248
SB_0 (million mt)	2.345	2.016	1.908	1.937
2012 Depletion	44.7%	38.1%	29.9%	29.8%
2011 Fishing intensity (1-SPR/1-SPR40%)	86.1%	105.1%	115.3%	117.1%
Reference points based on $SB_{40\%}$				
Female spawning biomass ($SB_{40\%}$ million mt)	0.938	0.806	0.764	0.775
$SPR_{SB40\%}$	42.8%	42.5%	42.7%	42.6%
Exploitation fraction resulting in $SB_{40\%}$	23.8%	20.6%	19.6%	18.9%
Yield at $SB_{40\%}$ (million mt)	0.483	0.349	0.319	0.322
Reference points based on $F_{40\%}$				
Female spawning biomass ($SB_{F40\%}$ million mt)	0.858	0.741	0.703	0.715
$SPR_{MSY\text{-}proxy}$	40%	40%	40%	40%
Exploitation fraction corresponding to SPR	26.9%	23.0%	21.9%	21.0%
Yield at $SB_{F40\%}$ (million mt)	0.498	0.359	0.326	0.331
Reference points based on estimated MSY				
Female spawning biomass (SB_{MSY} million mt)	0.539	0.455	0.438	0.442
SPR_{MSY}	26.8%	25.7%	26.2%	26.0%
Exploitation fraction corresponding to SPR_{MSY}	44.8%	40.1%	37.1%	36.7%
MSY (million mt)	0.541	0.394	0.357	0.358

Table 20. Select parameters, derived quantities, and reference point estimates for retrospective analyses using the base case. Values in italics are implied by the removals after the ending year of the respective retrospective analysis. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

	Base case	-1 year	-2 years	-3 years	-4 years	-5 years
<u>Parameters</u>						
R_0 (billions)	2.369	2.921	2.956	2.869	2.886	2.724
Steepness (h)	0.8031	0.8112	0.8118	0.8088	0.8072	0.8107
Natural mortality (M)	0.2193	0.2253	0.2242	0.2240	0.2226	0.2226
Acoustic catchability (Q)	NA	NA	NA	NA	NA	NA
Additional acoustic survey SD	0.4630	0.2917	0.2998	0.3188	0.3222	0.3633
<u>Derived Quantities</u>						
2008 recruitment	5.499	15.134	1.237	0.923	*0.975*	*0.901*
SB_0 (million mt)	1.906	2.220	2.301	2.263	2.240	2.162
2012 Depletion	34.56%	*91.55%*	*48.71%*	*36.69%*	*34.35%*	*23.73%*
2011 Fishing intensity (1-SPR/1-SPR40%)	110.14%	NA	NA	NA	NA	NA
<u>Reference points based on $SB_{40\%}$</u>						
Female spawning biomass ($SB_{40\%}$ million mt)	1.525	1.776	1.841	1.811	1.792	1.729
$SPR_{SB40\%}$	43.68%	43.49%	43.48%	43.55%	43.58%	43.50%
Exploitation fraction resulting in $SB_{40\%}$	18.58%	19.04%	18.99%	19.01%	18.91%	18.92%
Yield at $SB_{40\%}$ (million mt)	0.293	0.351	0.362	0.354	0.349	0.336
<u>Reference points based on $F_{40\%}$</u>						
Female spawning biomass ($SB_{F40\%}$ million mt)	1.361	1.587	1.619	1.608	1.586	1.518
$SPR_{MSY\text{-}proxy}$						
Exploitation fraction corresponding to SPR	21.37%	21.97%	21.85%	21.81%	21.70%	21.69%
Yield at $SB_{F40\%}$ (million mt)	0.301	0.361	0.372	0.364	0.359	0.346
<u>Reference points based on estimated MSY</u>						
Female spawning biomass (SB_{MSY} million mt)	0.934	1.088	1.127	1.113	1.107	1.060
SPR_{MSY}	29.36%	28.70%	28.80%	29.00%	29.04%	28.91%
Exploitation fraction corresponding to SPR_{MSY}	32.34%	34.07%	33.50%	33.35%	33.44%	33.07%
MSY (million mt)	0.316	0.383	0.393	0.385	0.379	0.362

7. Figures

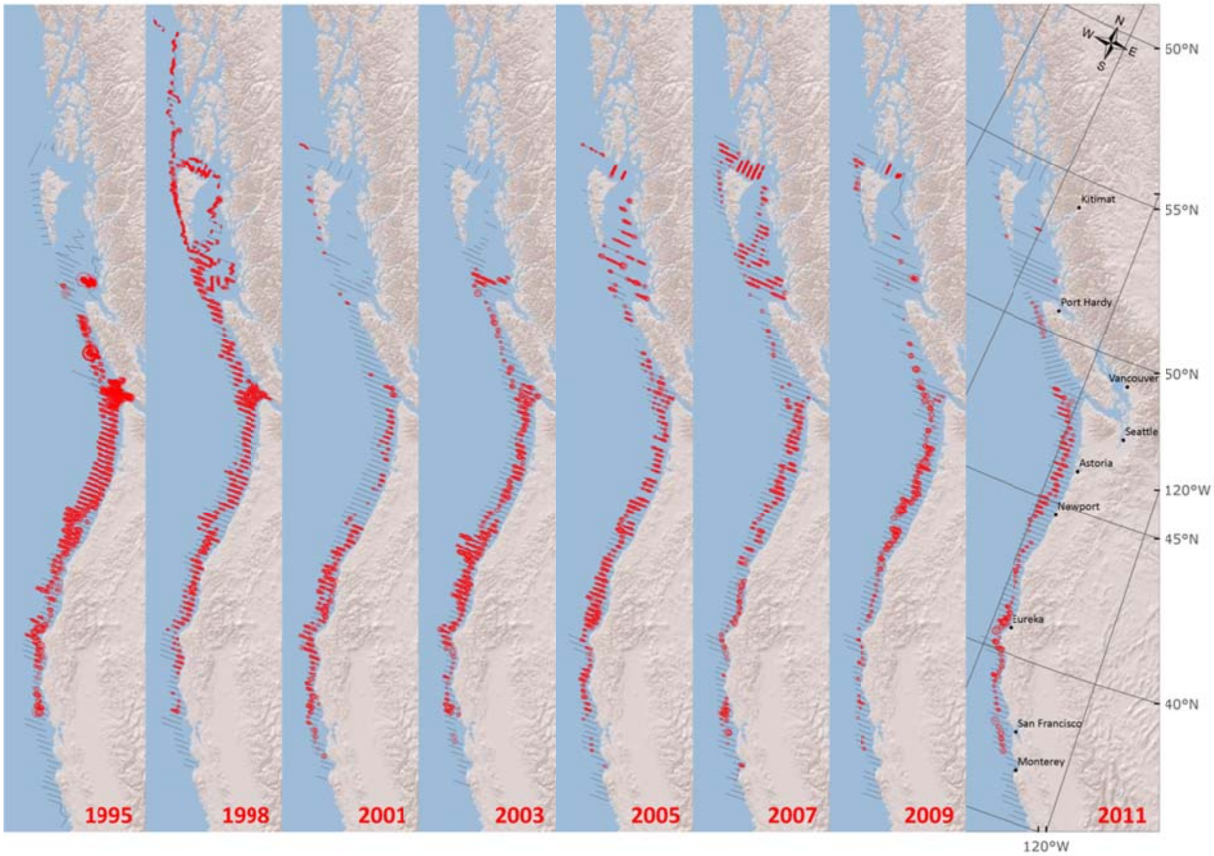


Figure 1. Spatial distribution of acoustic backscatter attributable to Pacific hake from joint US-Canada acoustic surveys 1995-2011. Area of the circles is roughly proportional to observed backscatter.

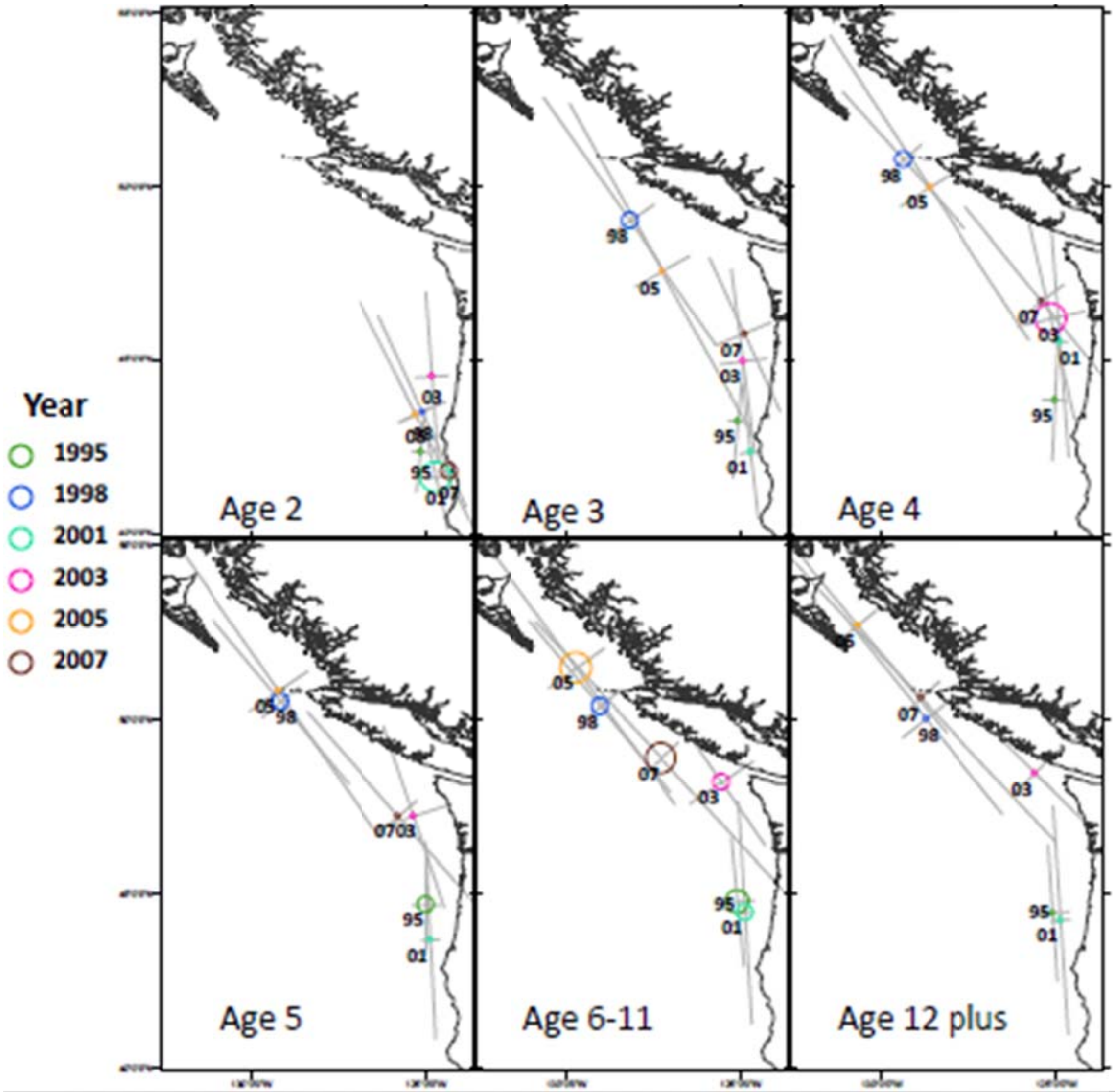


Figure 2. The mean spatial location of the hake stock (circles are proportional to biomass) and variance (grey lines) by age group and year based on acoustic survey observations 1995-2007 (Figure courtesy of O'Conner and Haltuch's ongoing Fisheries And The Environment project investigating the links between ocean conditions and Pacific hake distribution).

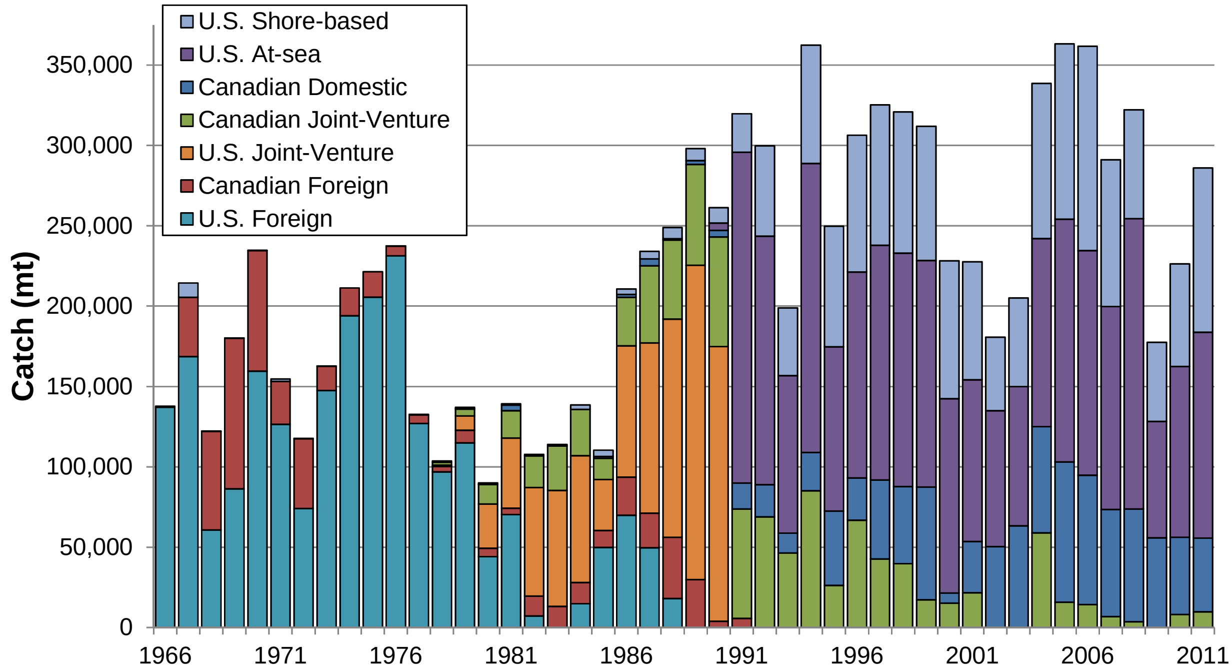


Figure 3. Total Pacific hake landings used in the assessment by sector, 1966-2011.

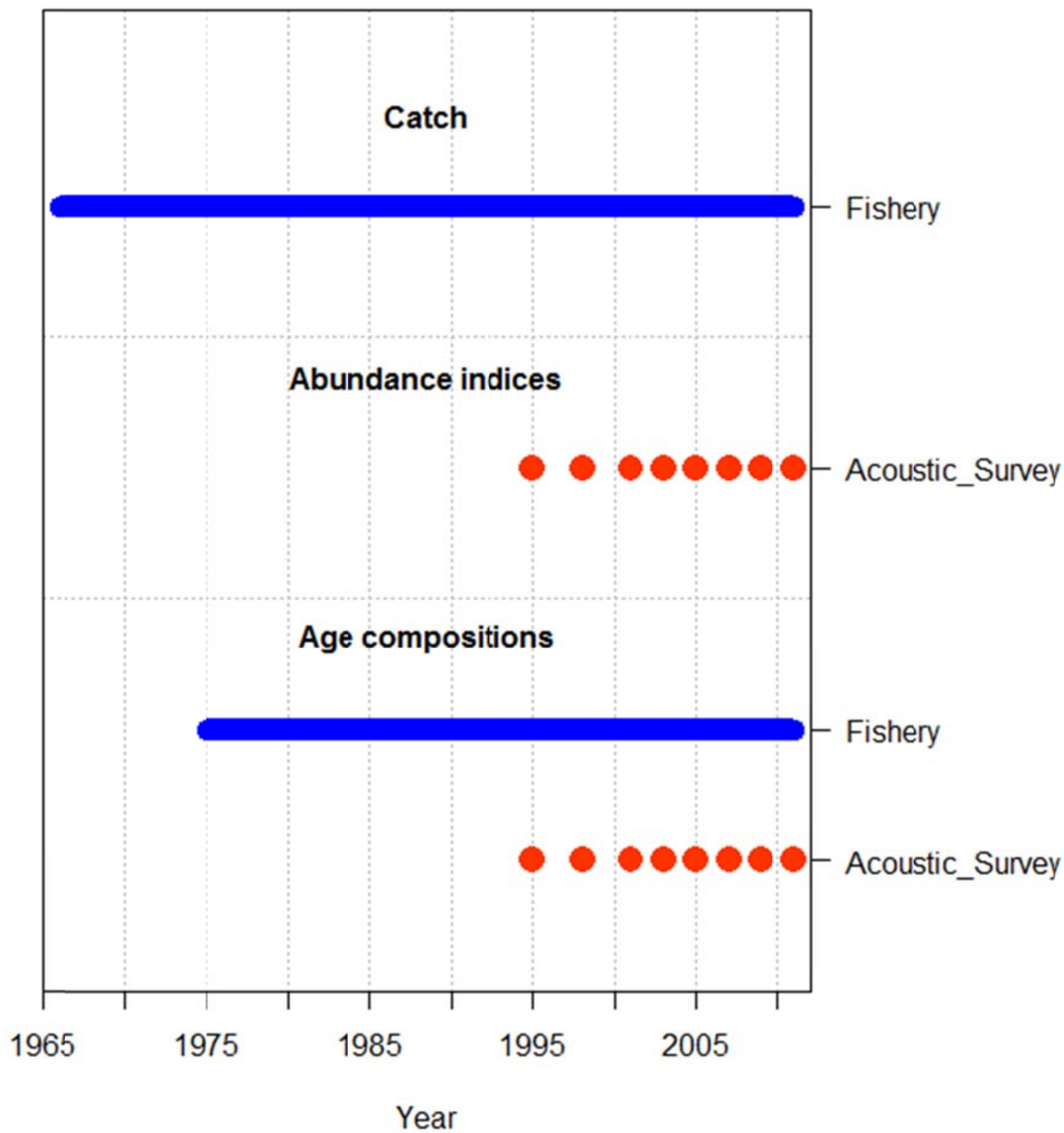


Figure 4. Overview of data used in this assessment, 1966-2011.

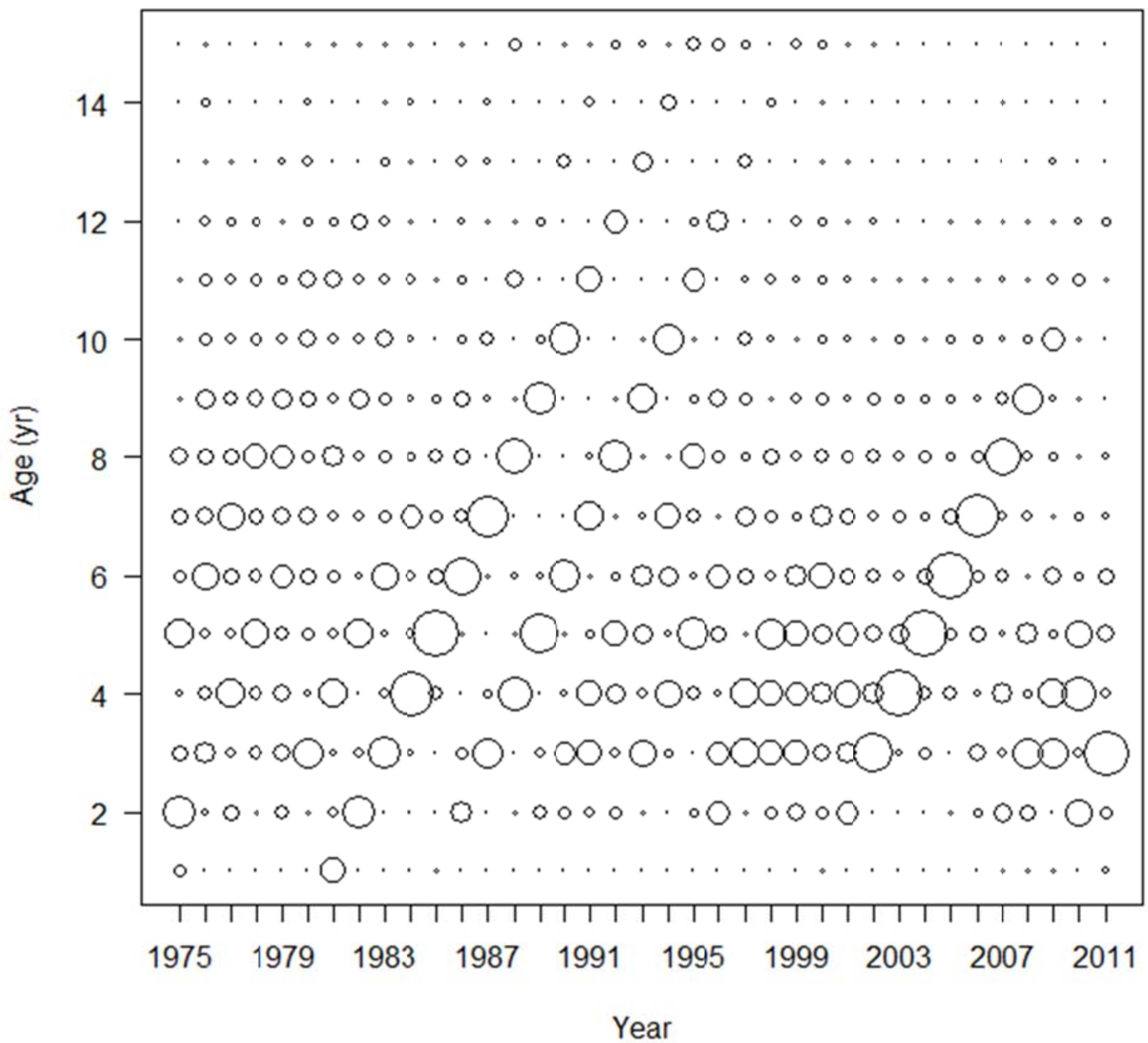


Figure 5. Aggregate fishery (all sectors combined) age compositions, 1975-2011. Proportions in each year sum to 1.0, maximum bubble size represents a value of 0.68.

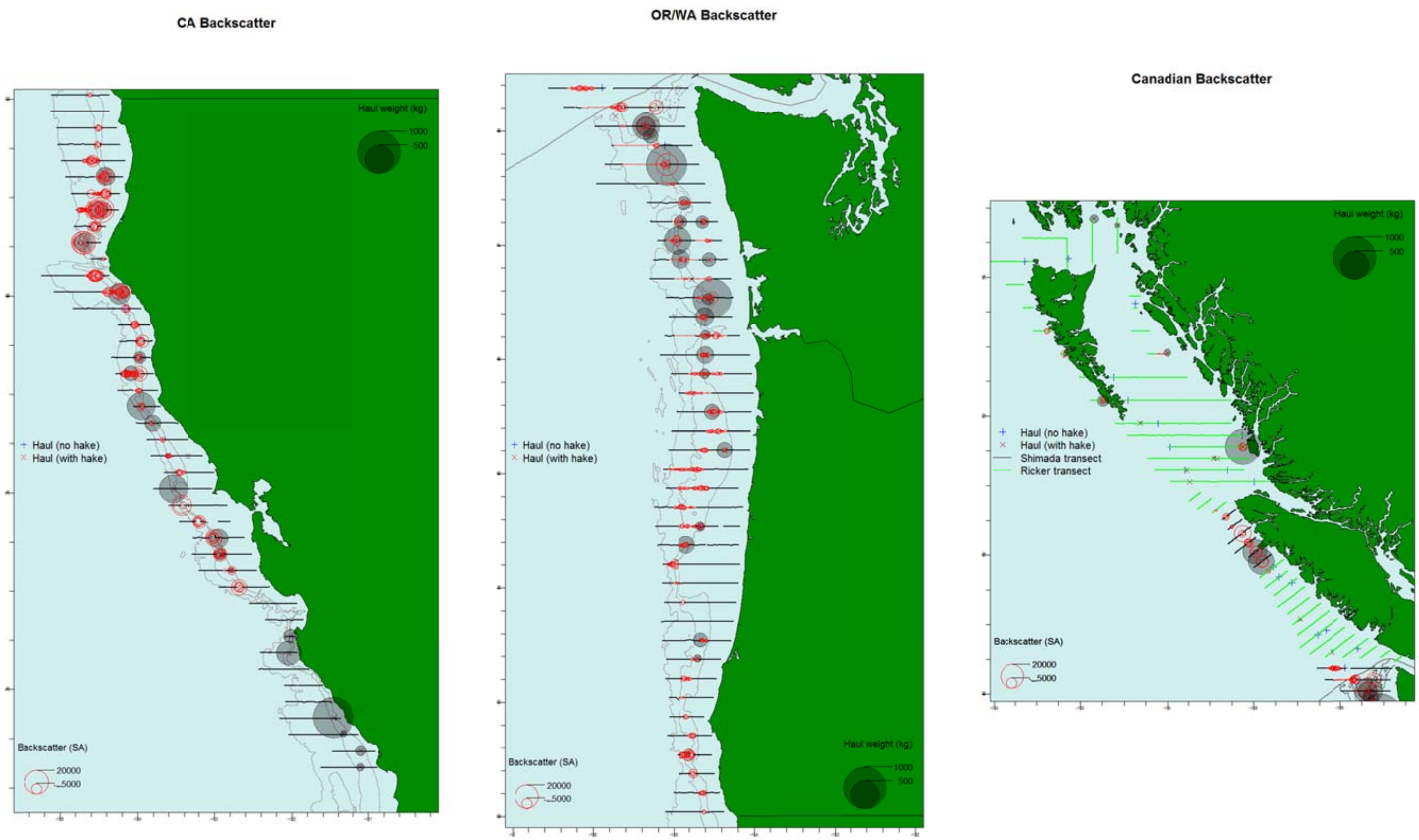


Figure 6. Acoustic survey transects surveyed in 2011, distribution of backscatter and magnitude of trawl catches of Pacific hake.

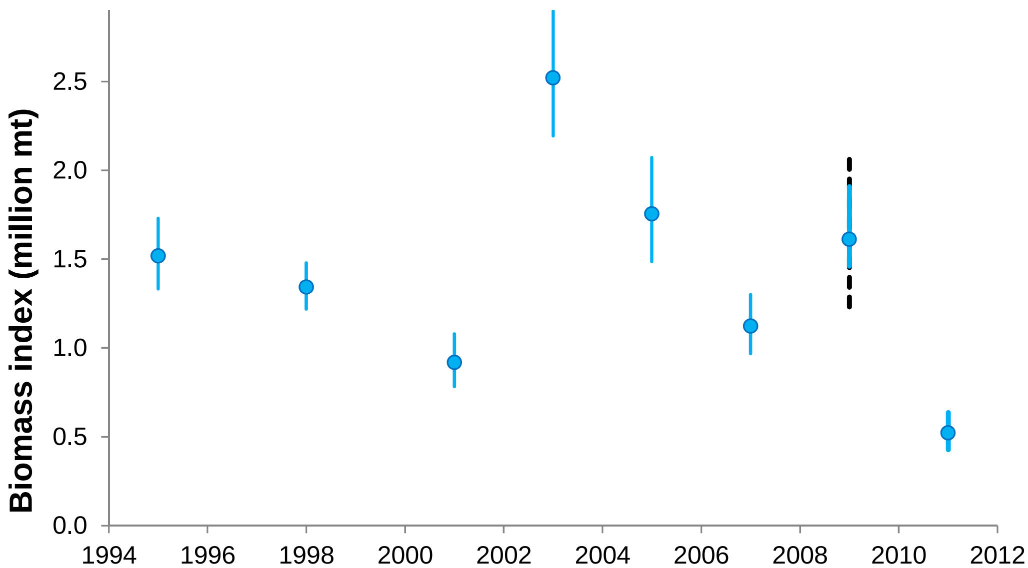


Figure 7. Acoustic survey biomass indices (millions of metric tons). Approximate 95% confidence intervals are based on only sampling variability (1995-2007, 2011) and sampling variability as well as squid/hake apportionment uncertainty (2009).

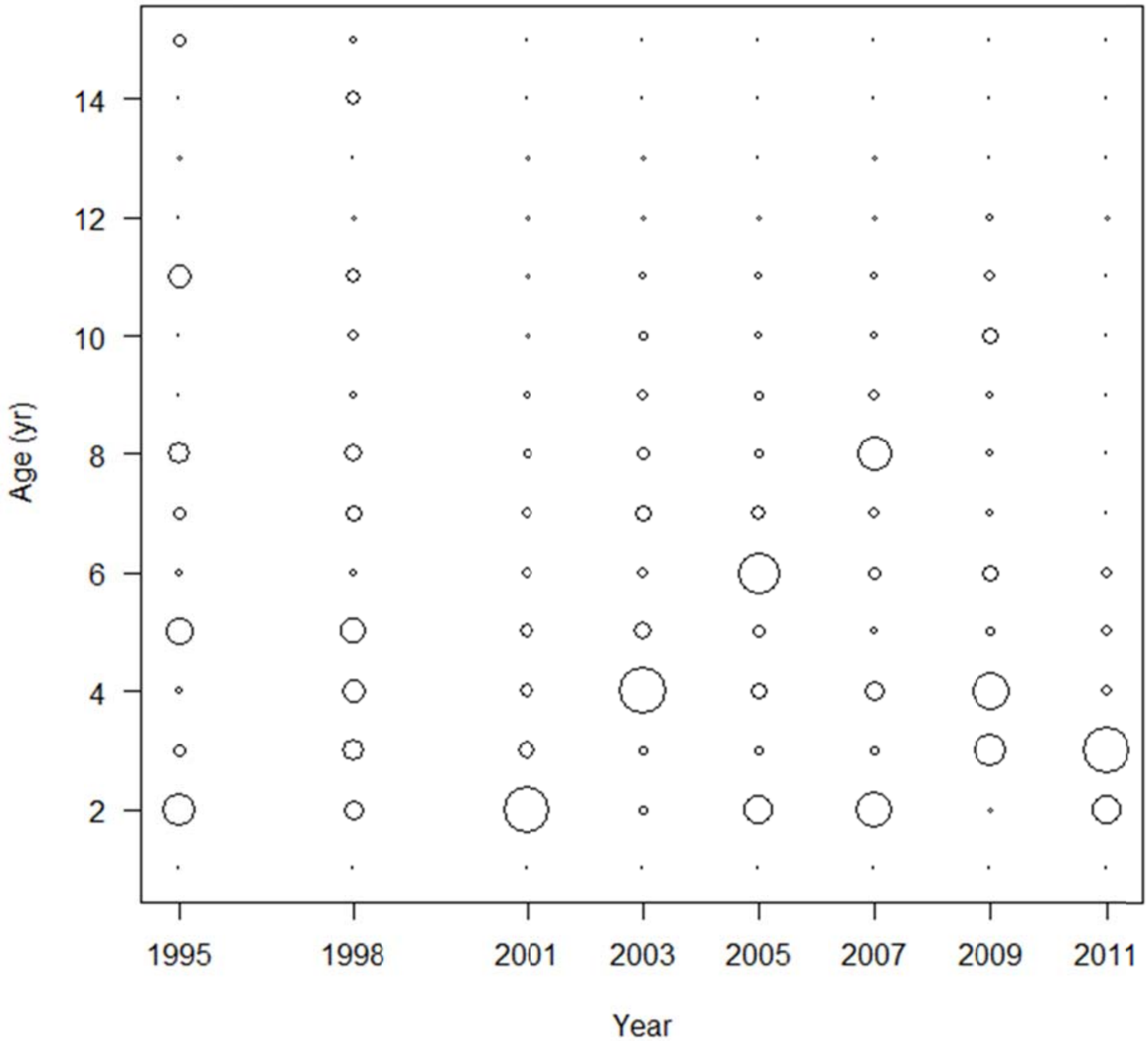


Figure 8. Acoustic survey age compositions, 1995-2009. Proportions in each year sum to 1.0, maximum bubble size represents a value of 0.63.

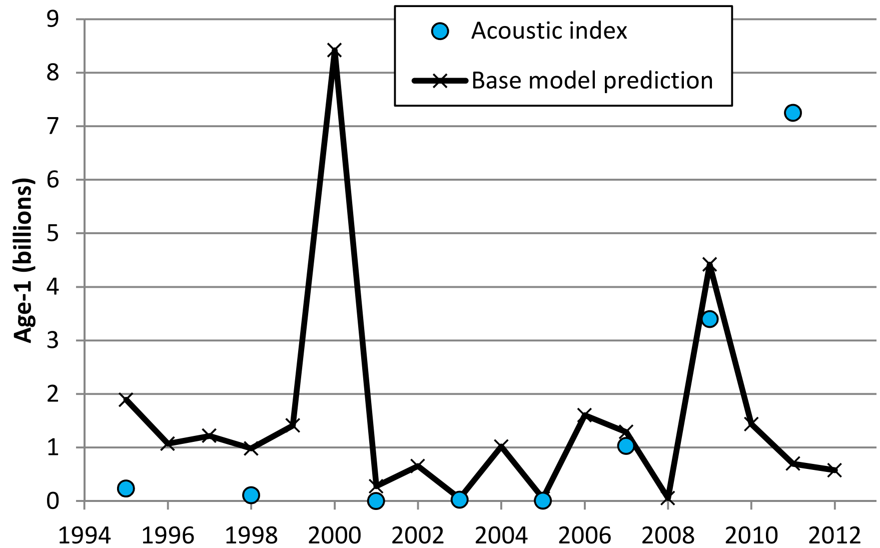


Figure 9. Preliminary acoustic survey age-1 index and base-case model predicted posterior median numbers at age-1. This figure represents a comparison with, not a fit to the preliminary data. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

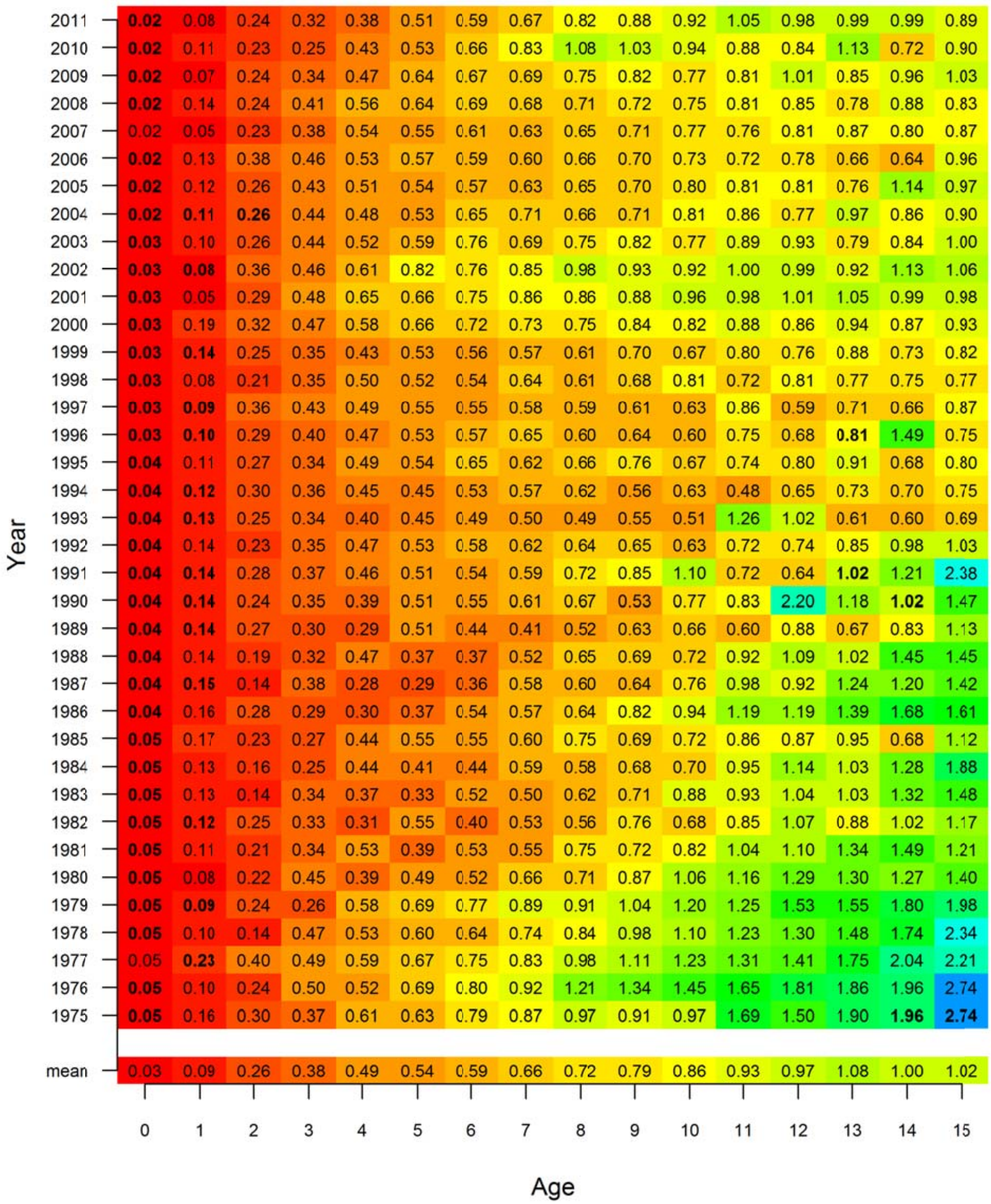


Figure 10. Interpolated matrix of weight at age (kg) used in both models.

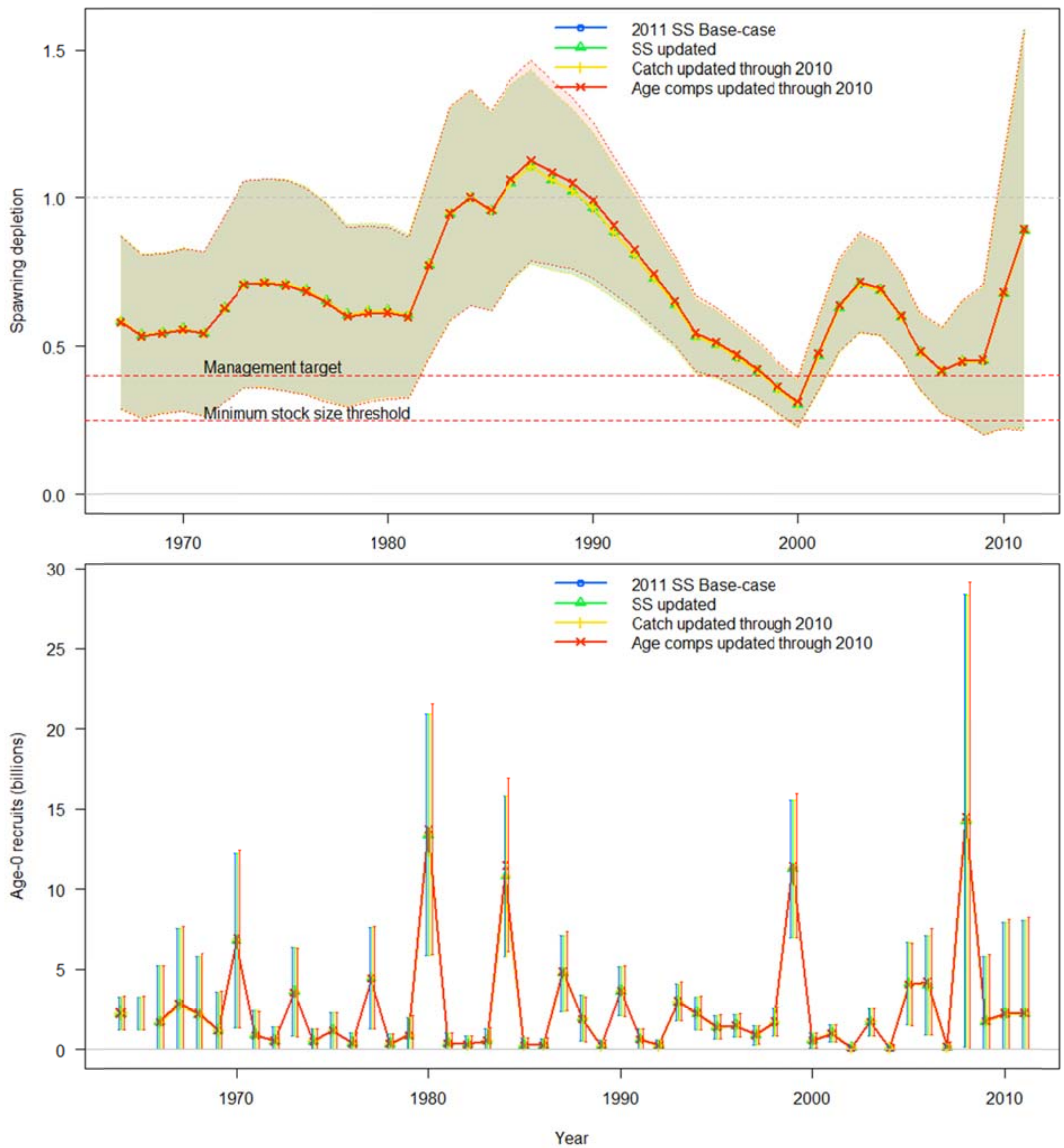


Figure 11. Results of bridging analyses updating the Stock Synthesis software, historical catch estimates (<=2010) and adding additional historical ages unavailable in 2011. Upper panel displays maximum likelihood depletion estimates, lower panel recruitment estimates, with ~95% confidence intervals.

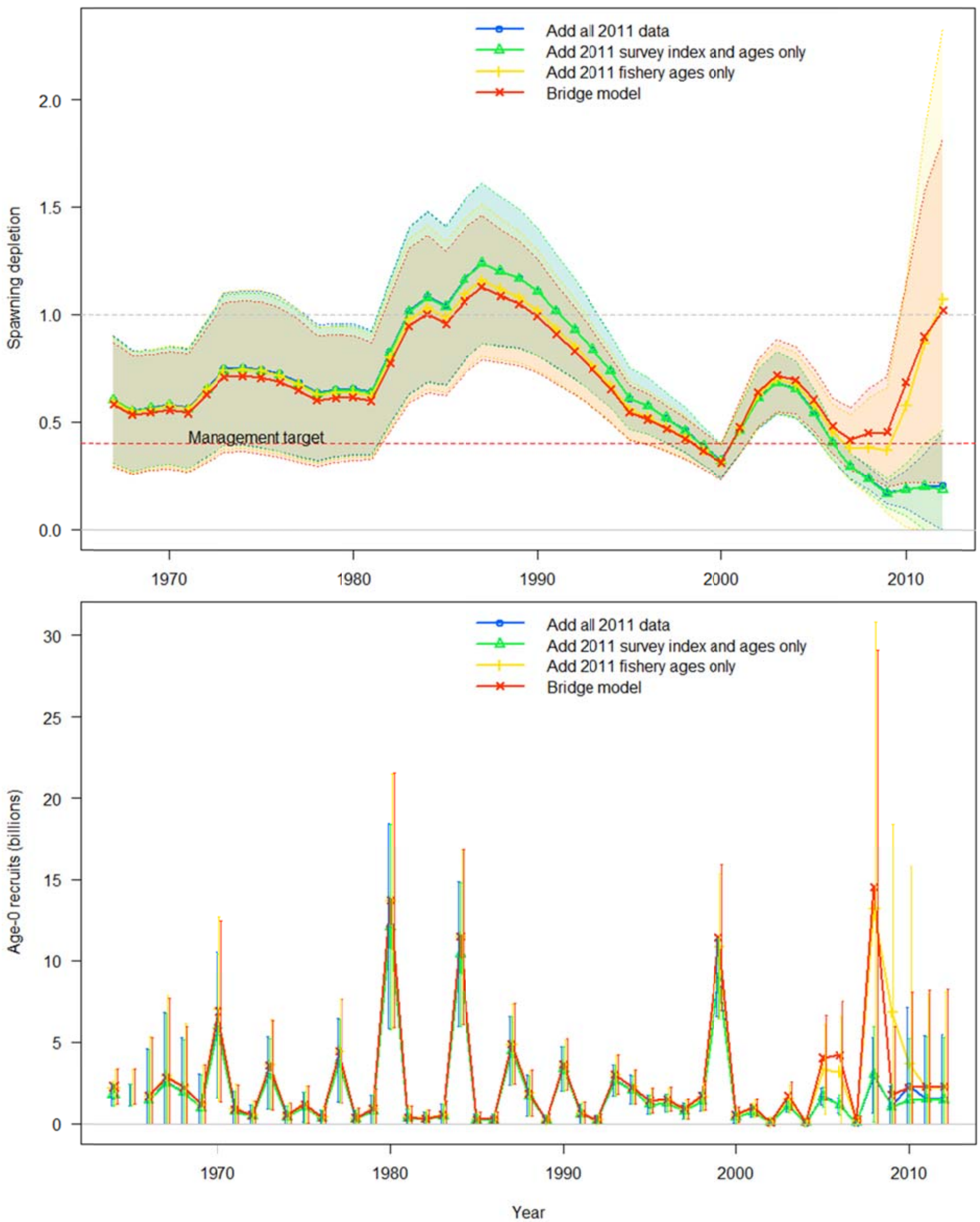


Figure 12. Results of bridging analyses adding 2011 data sources. Upper panel displays maximum likelihood depletion estimates, lower panel recruitment estimates, with ~95% confidence intervals. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

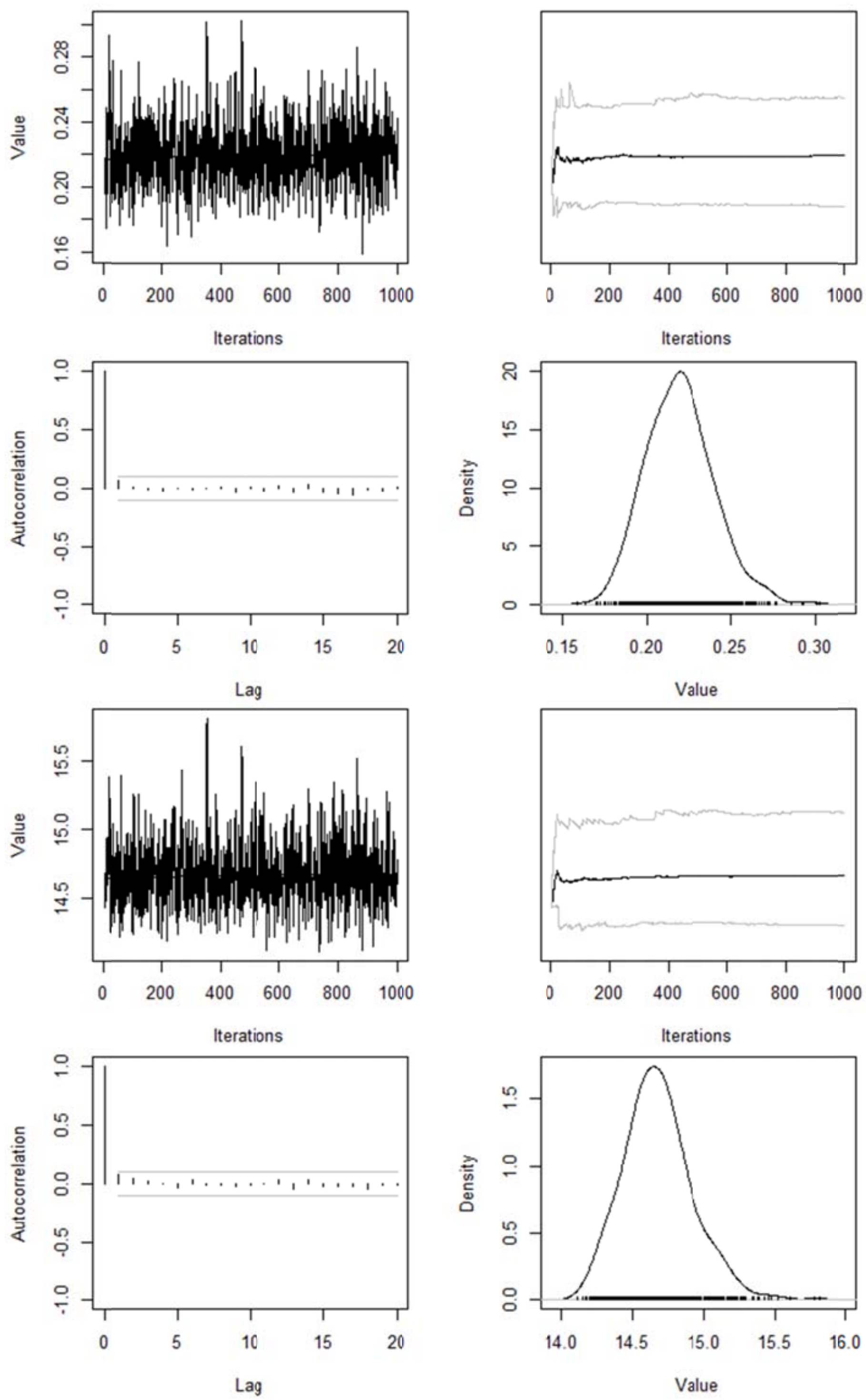


Figure 13. Summary of MCMC diagnostics for natural mortality (upper panels) and log(R_0) (lower panels) in the base-case model.

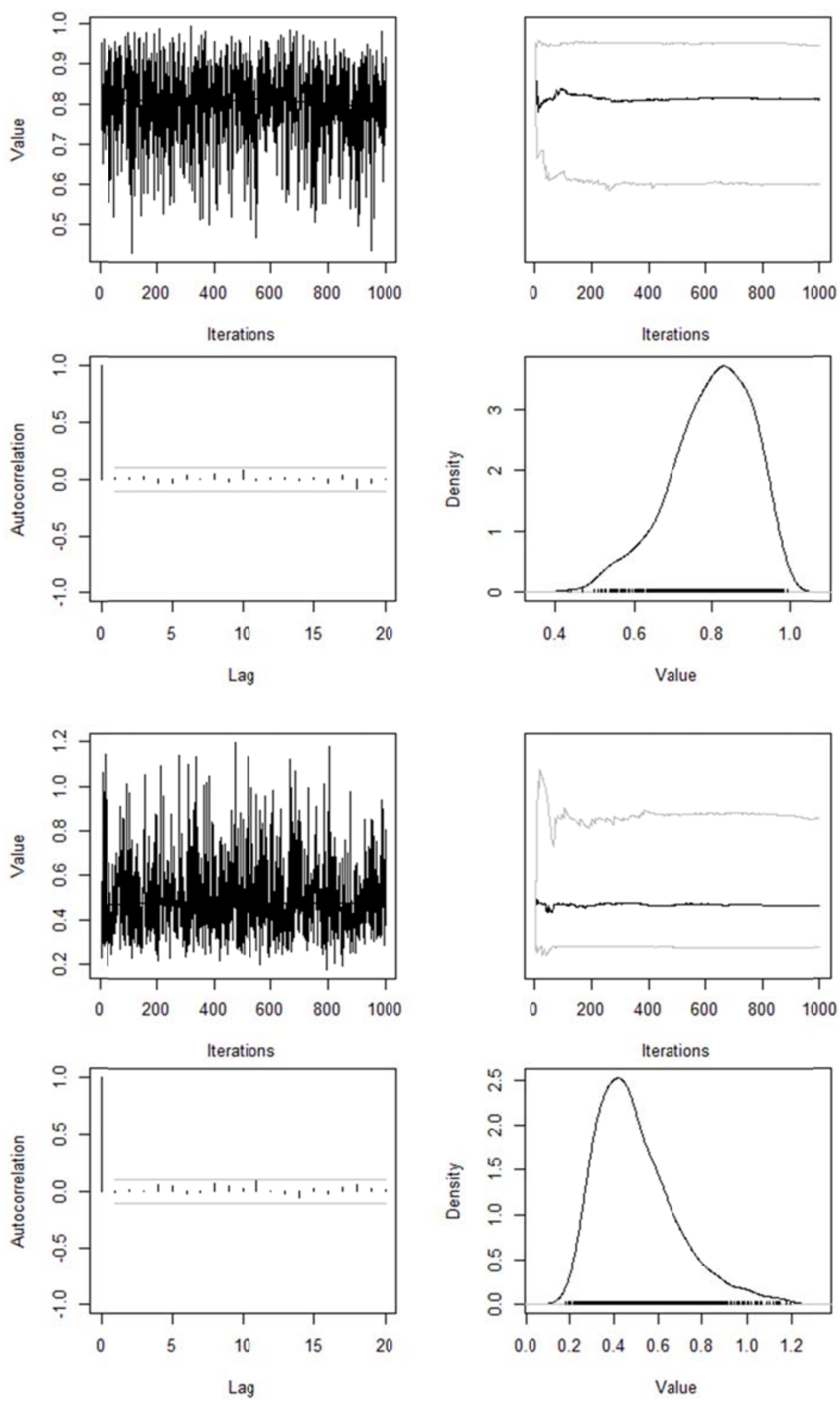


Figure 14. Summary of MCMC diagnostics for steepness (upper panels) and the additional SD for the acoustic survey index (lower panels) in the base-case model.

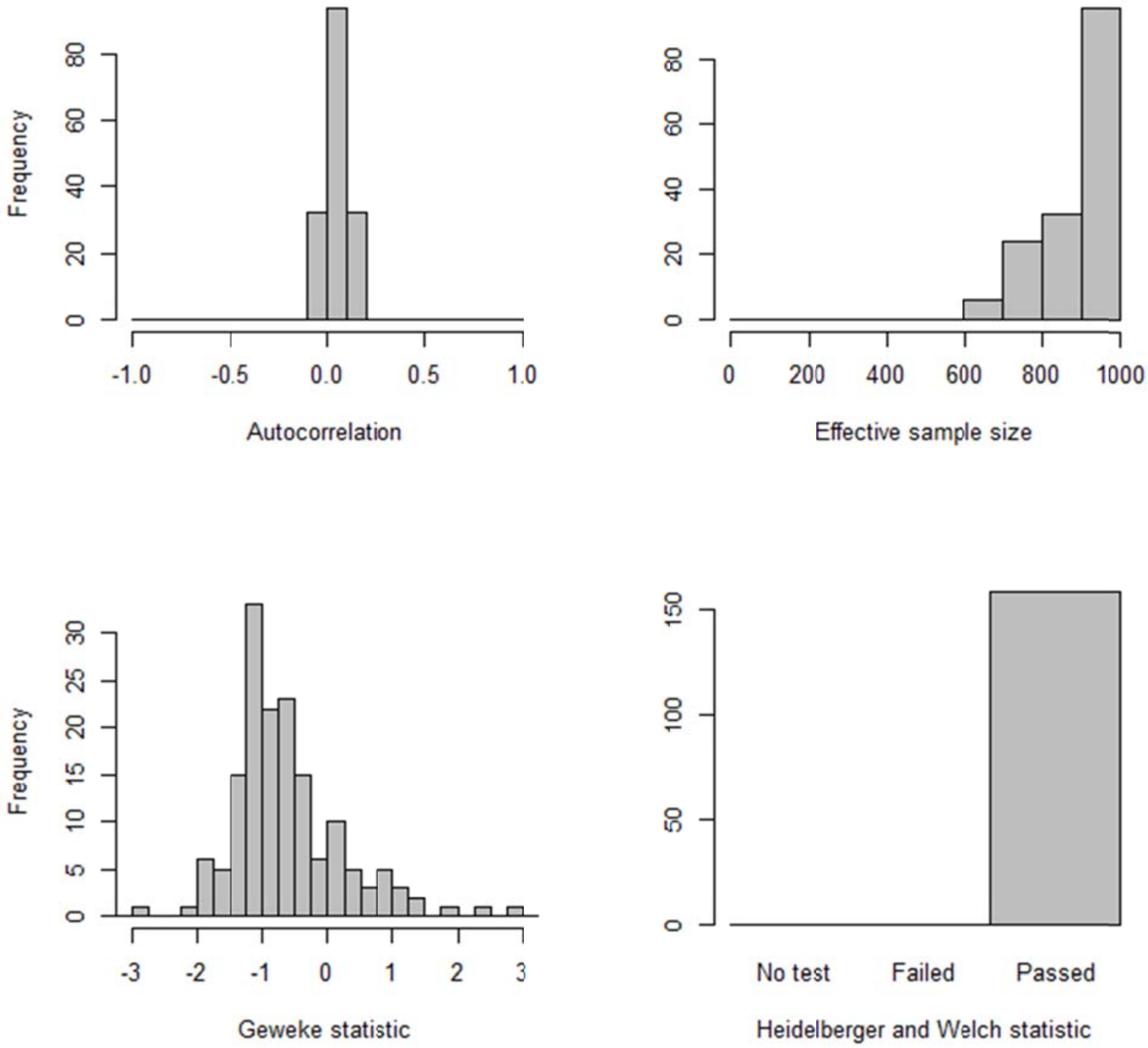


Figure 15. Summary histograms of MCMC diagnostics for all base-case model parameters and derived quantities including the recruitment, spawning biomass, and depletion time-series'.

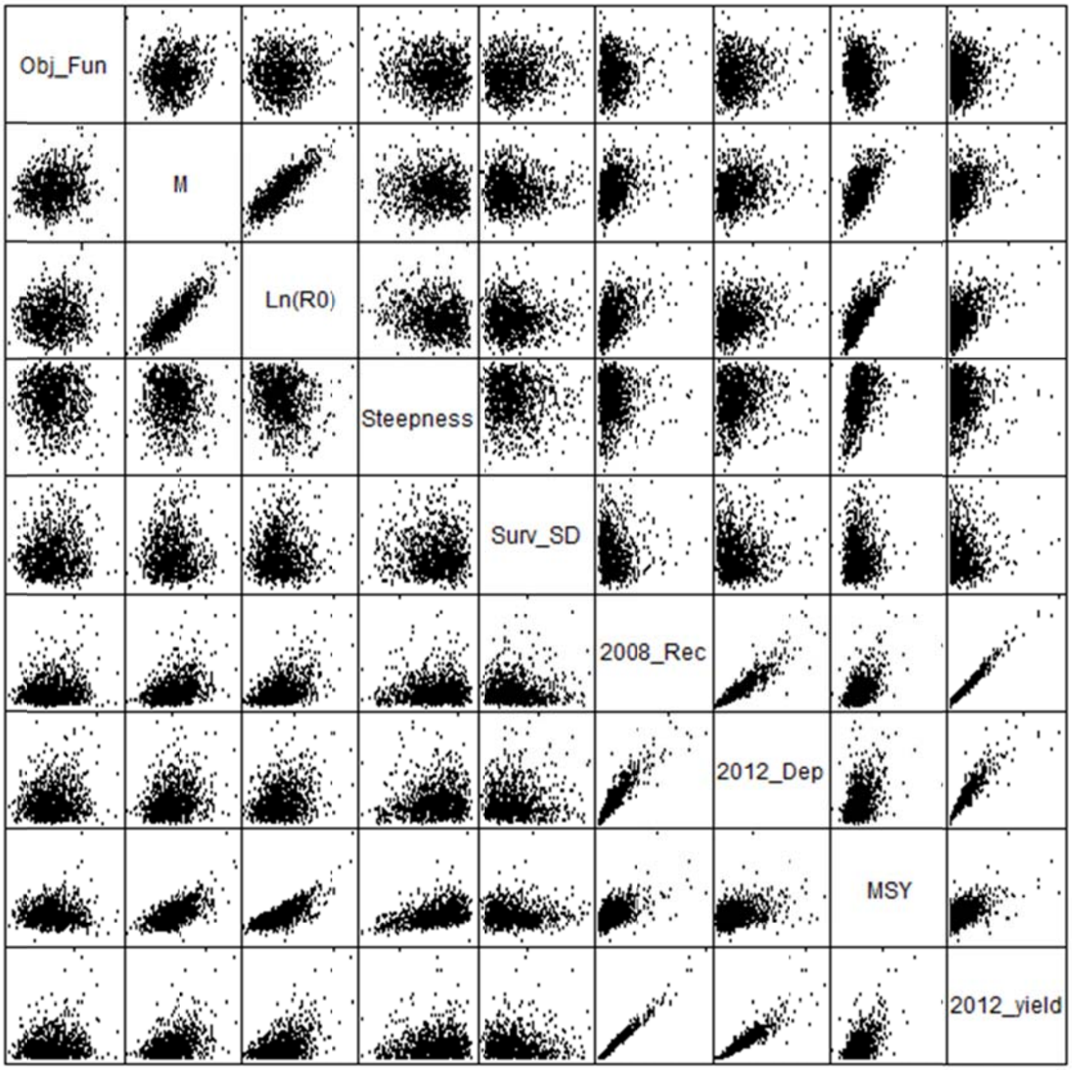


Figure 16. Posterior correlations among key base-case model parameters and derived quantities. From the top left the posteriors plotted are: objective function, natural mortality, ln(R_0), steepness, the process-error SD for the acoustic survey, the 2008 recruitment deviation, the depletion level in 2012, the estimate of MSY and the default harvest rate yield for 2012.

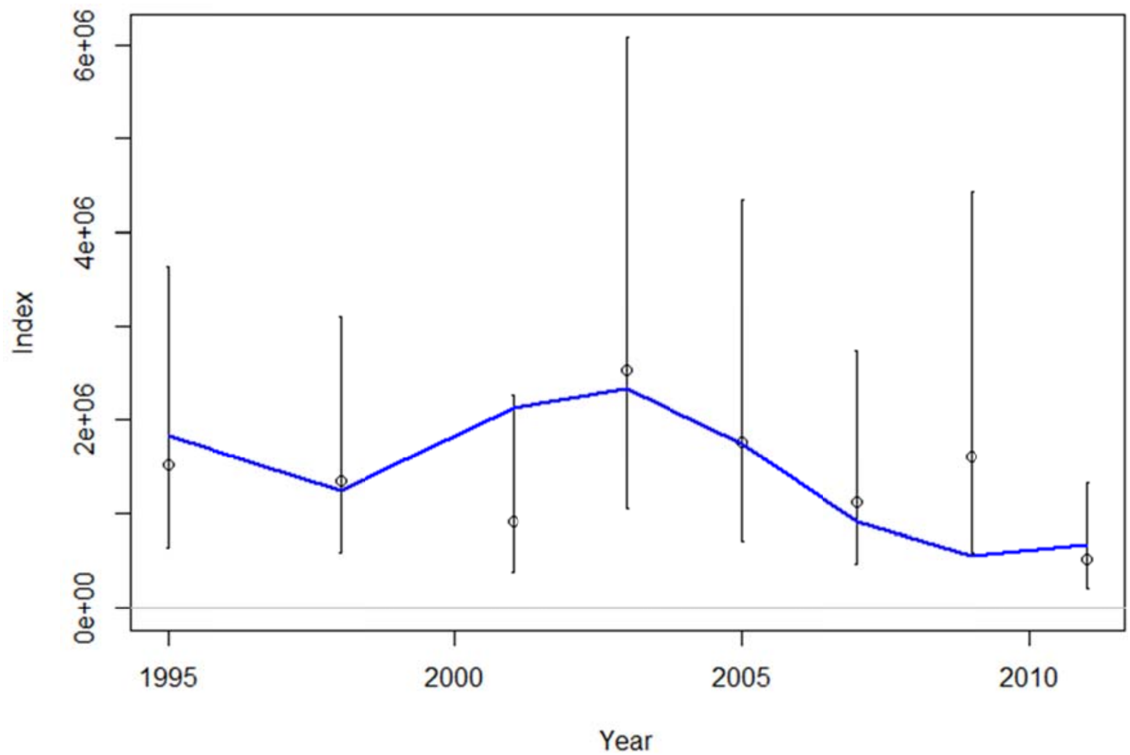


Figure 17. Predicted MLE fit to the acoustic survey biomass index.

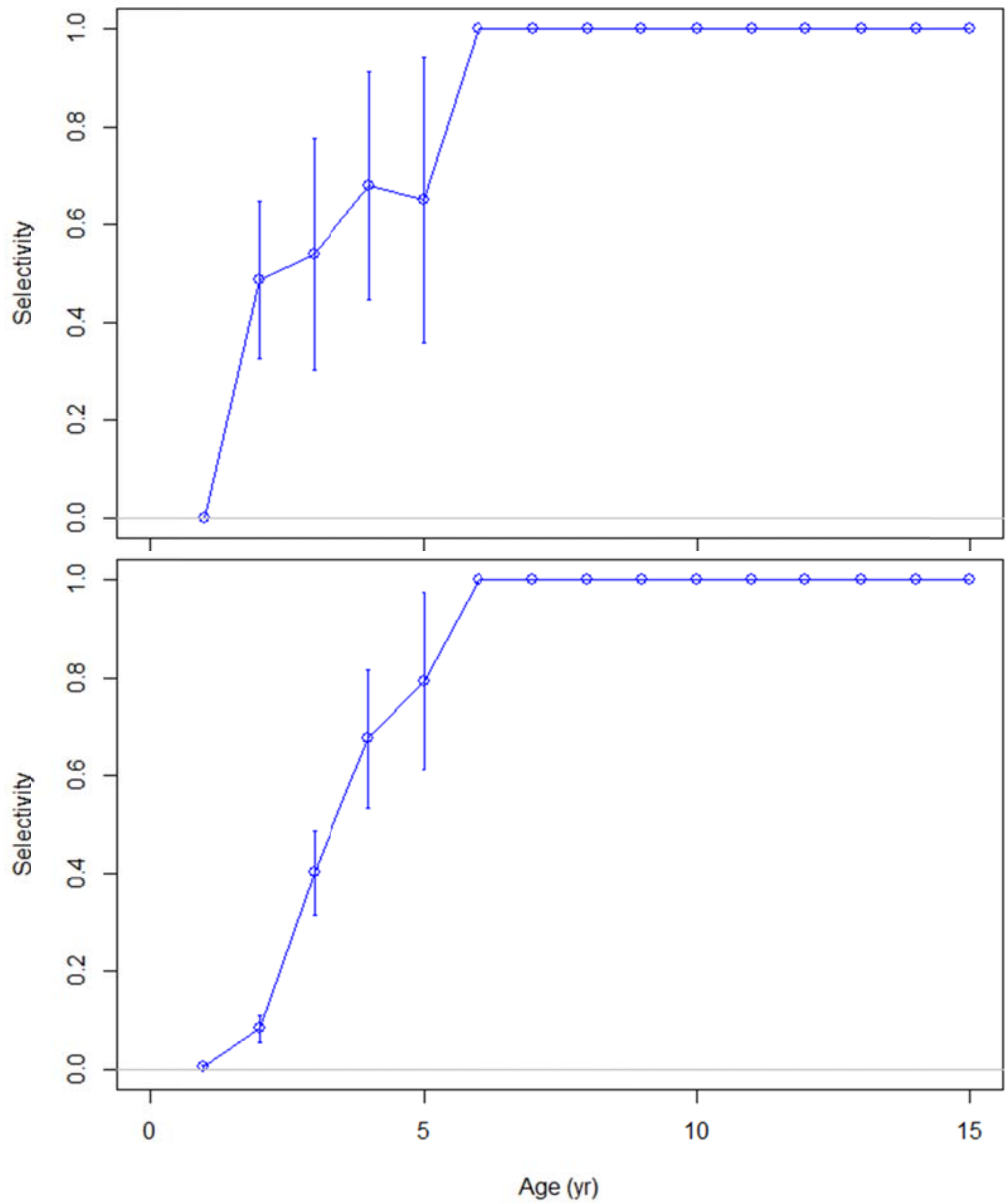


Figure 18. Estimated selectivity curves for the acoustic survey (upper panel) and fishery (lower panel) from the base-case model. Vertical bars represent 95% confidence intervals about the MLE.

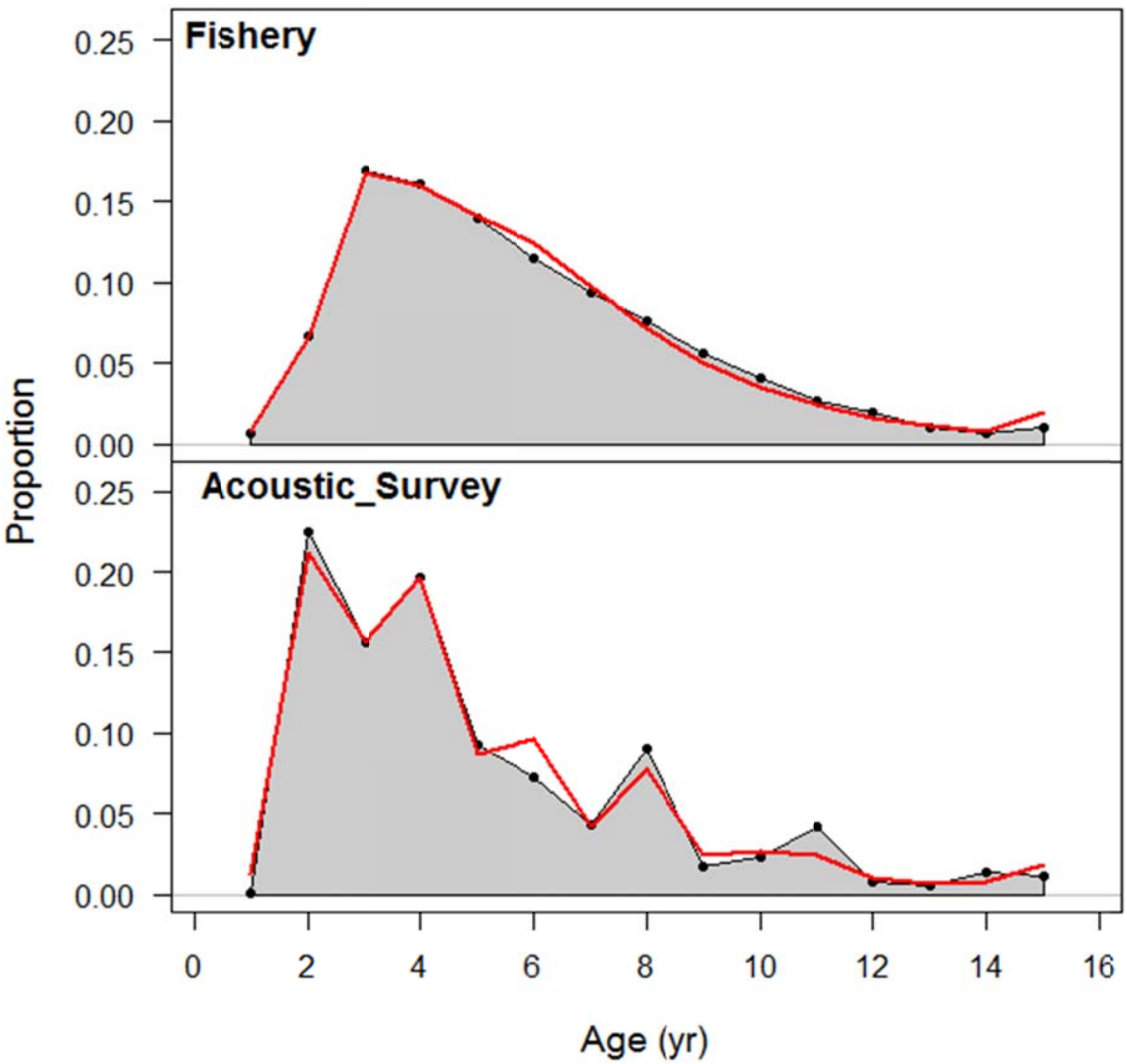


Figure 19. Base-case model fit to the aggregate fishery and acoustic age composition data.

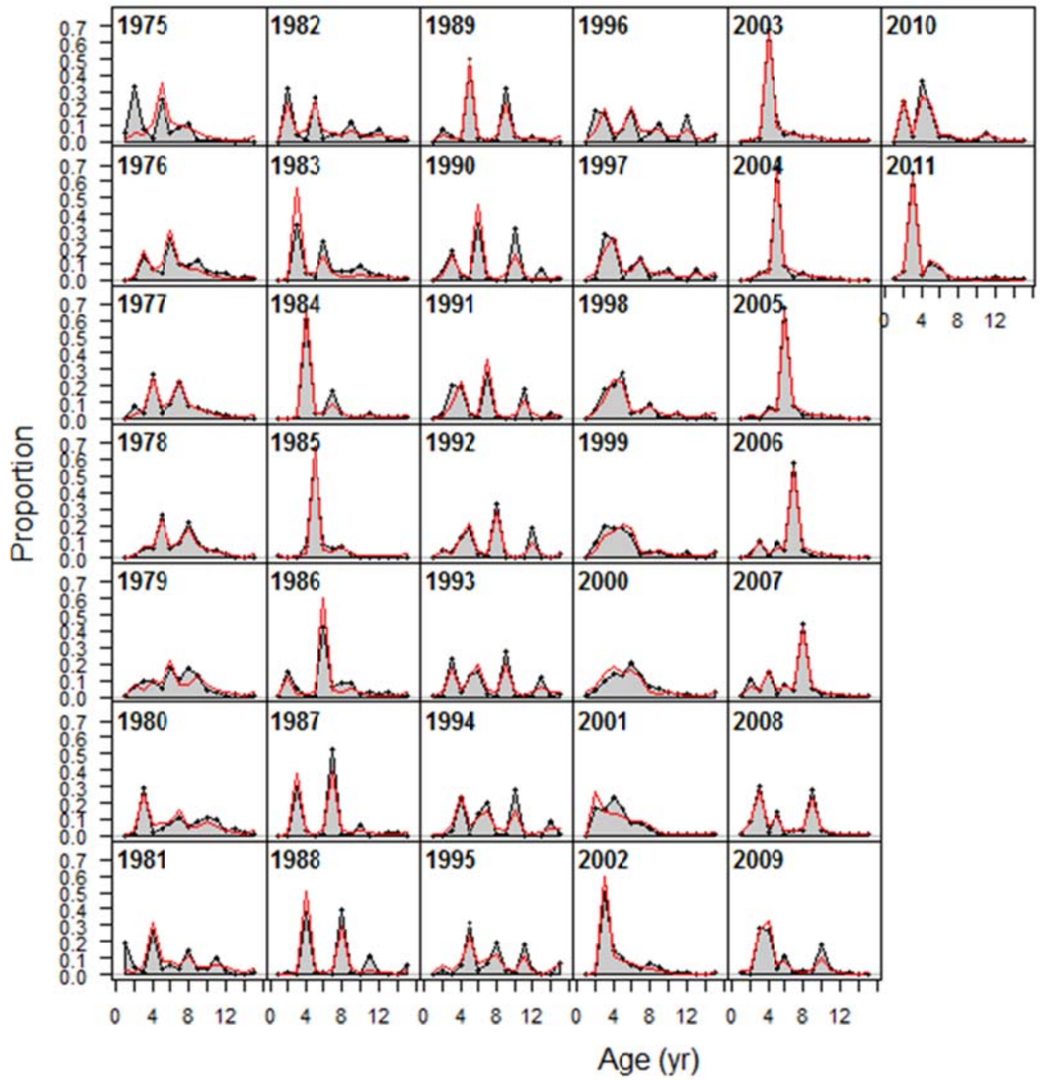


Figure 20. Base-case model fit to the observed fishery age composition data.

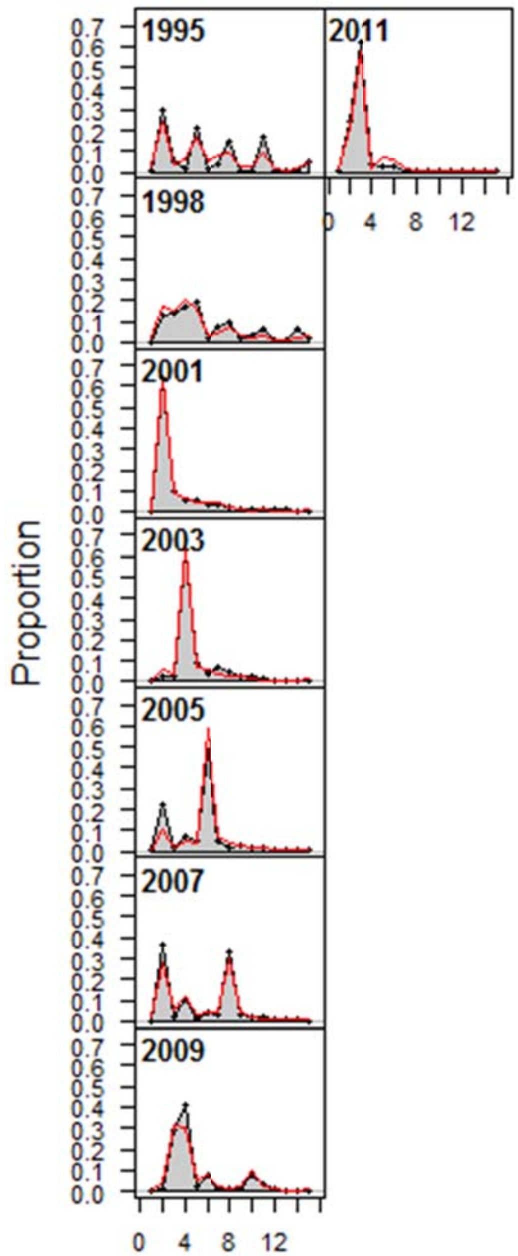


Figure 21. Base-case model fit to the observed acoustic survey age composition data.

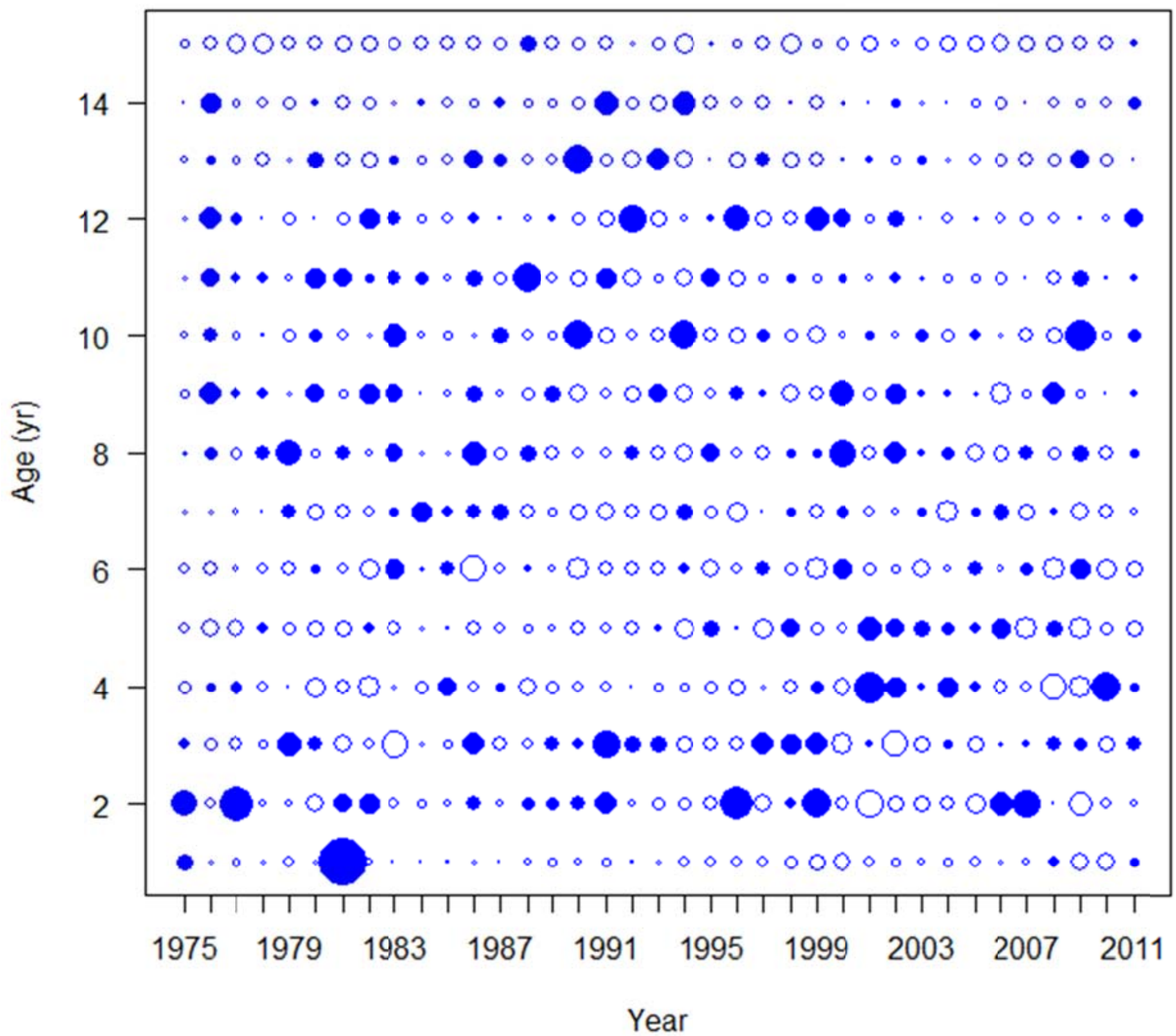


Figure 22. Pearson standardized residuals (observed - predicted) for base-case model fits to the fishery age composition data. Maximum bubble size = 5.15; filled circles represent positive values.

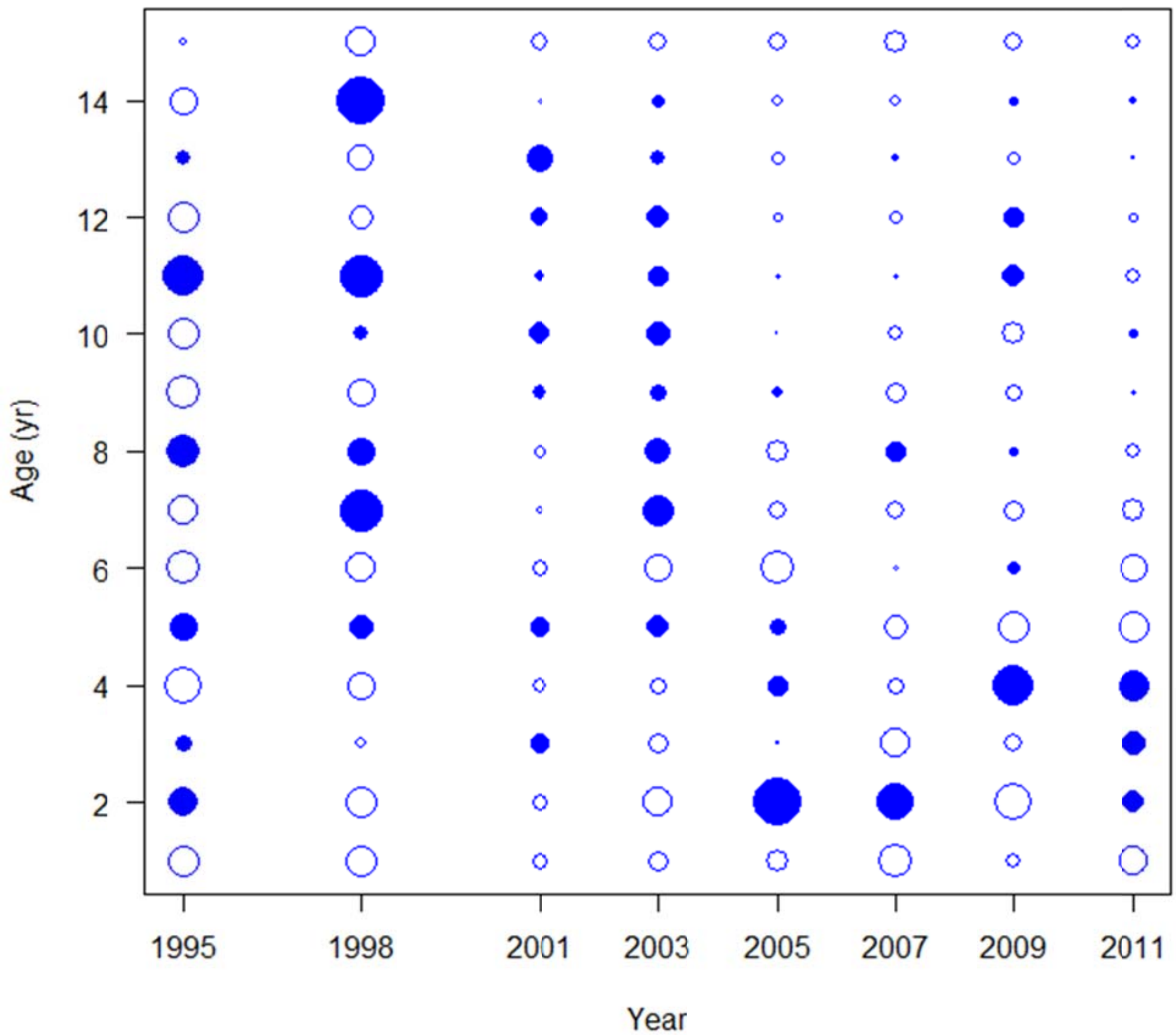


Figure 23. Pearson standardized residuals (observed - predicted) for base-case model fits to the acoustic survey age composition data. Maximum bubble size = 2.64; filled circles represent positive values.

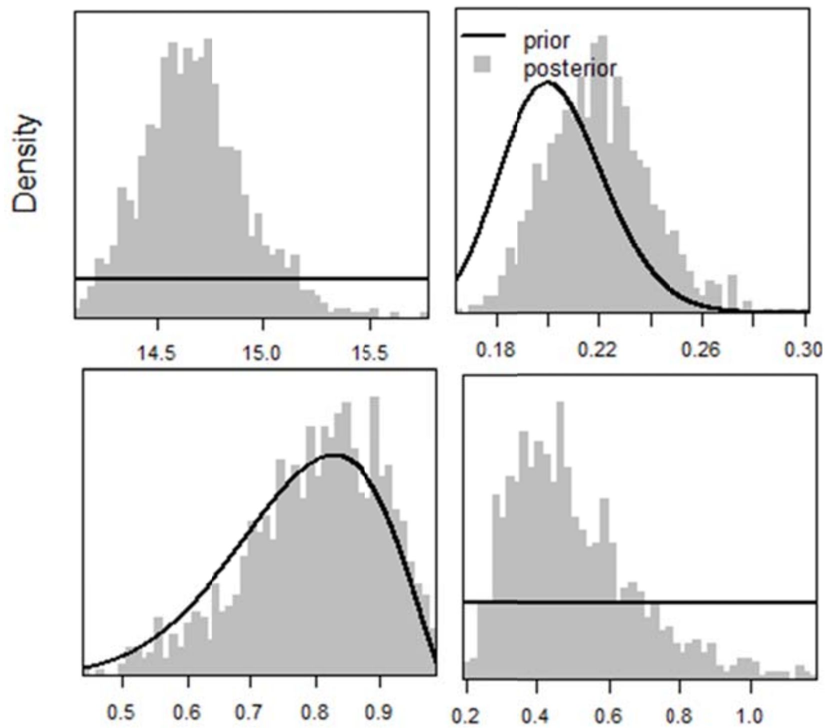


Figure 24. Prior and posterior probability distributions for key parameters in the base-case model. From the top left, the parameters are: ln(R_0), Natural mortality (M), steepness (h), and the additional process-error SD for the acoustic survey.

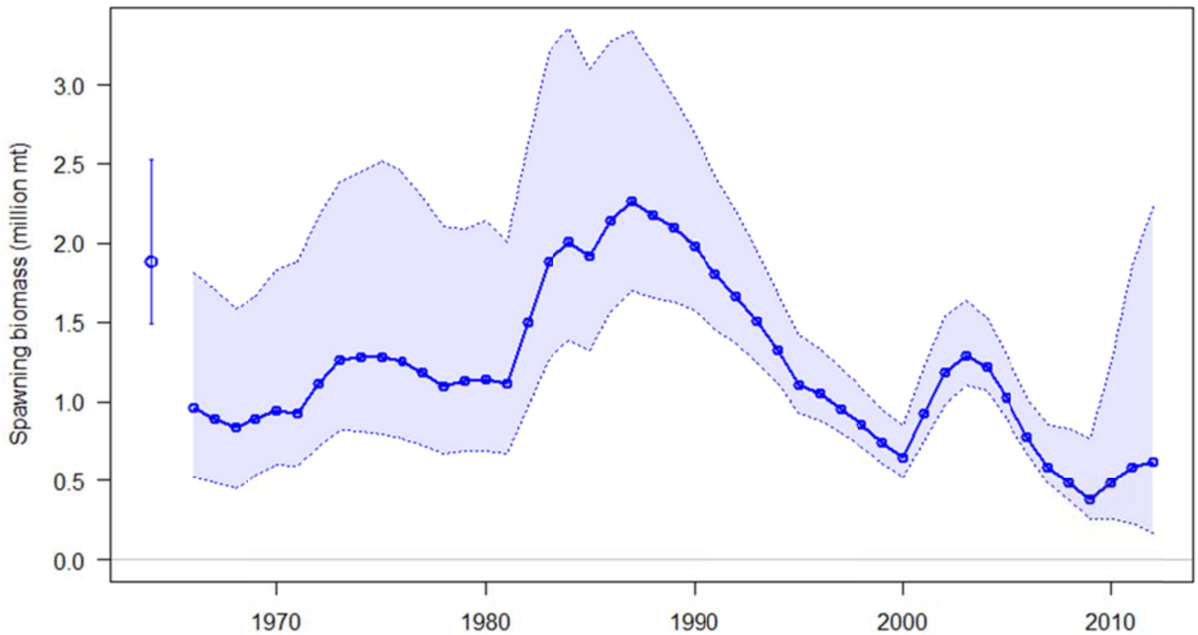


Figure 25. Posterior female spawning biomass time-series with 95% posterior credibility intervals.

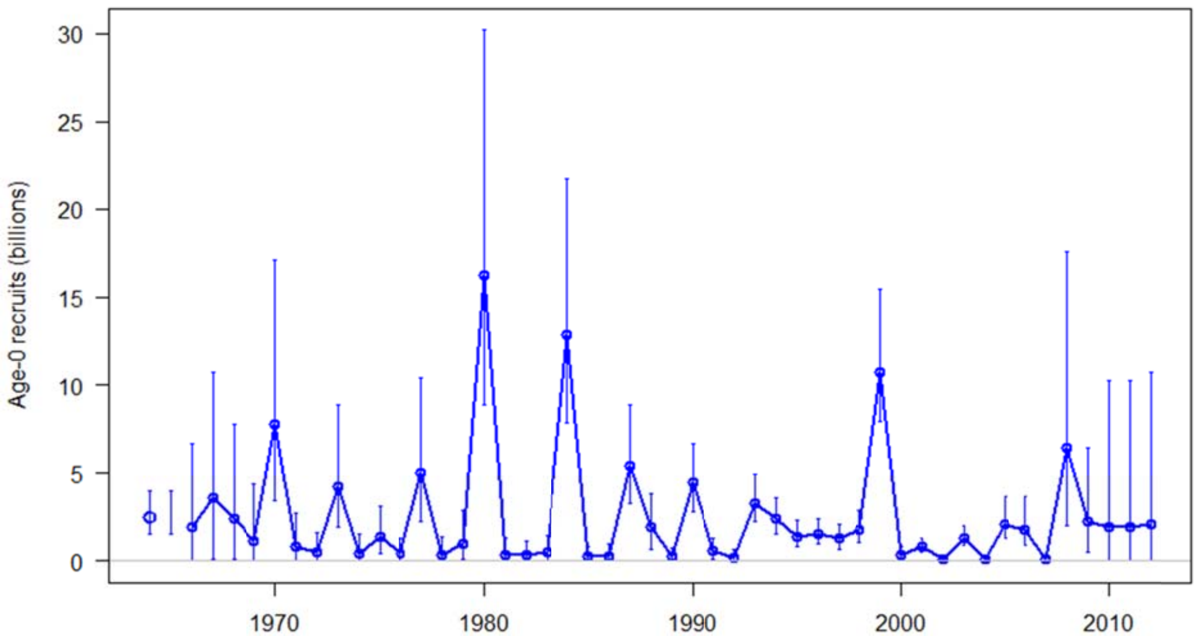


Figure 26. Posterior age-0 recruitment time-series for the base-case model with ~95% posterior credibility intervals.

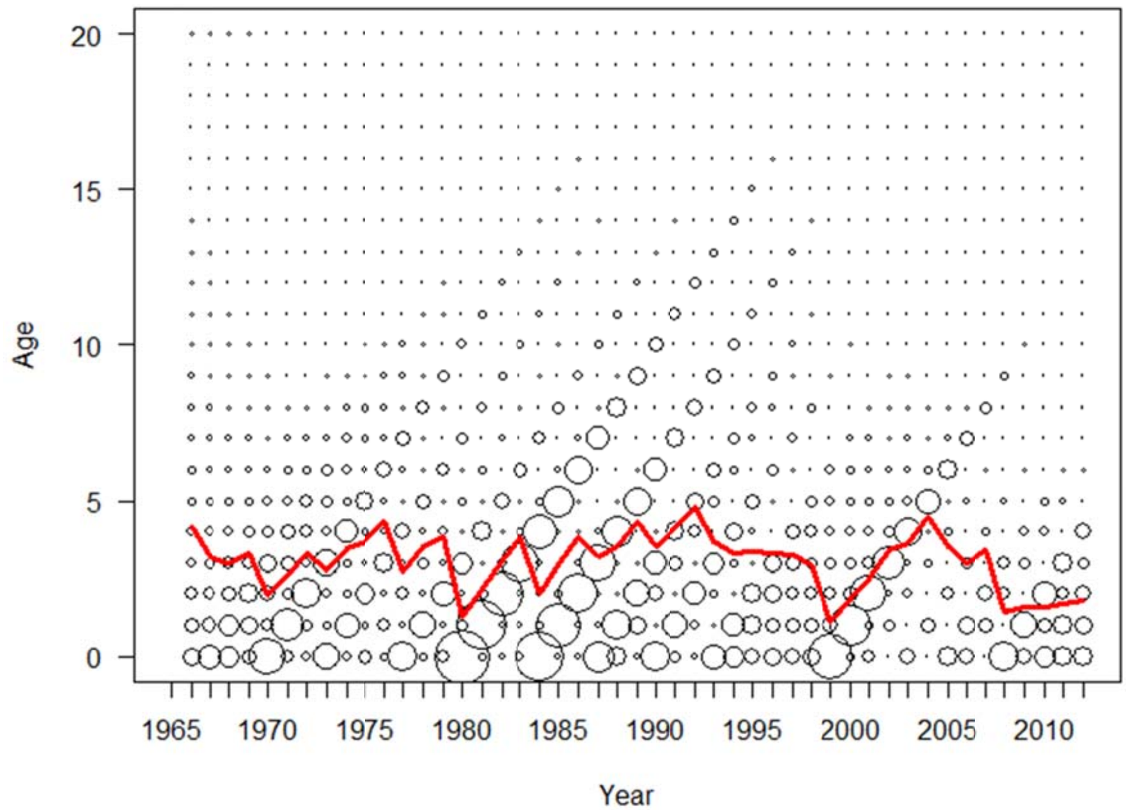


Figure 27. Estimated numbers at age (MLE) from the base-case model. Solid line indicates the average age during the time-series.

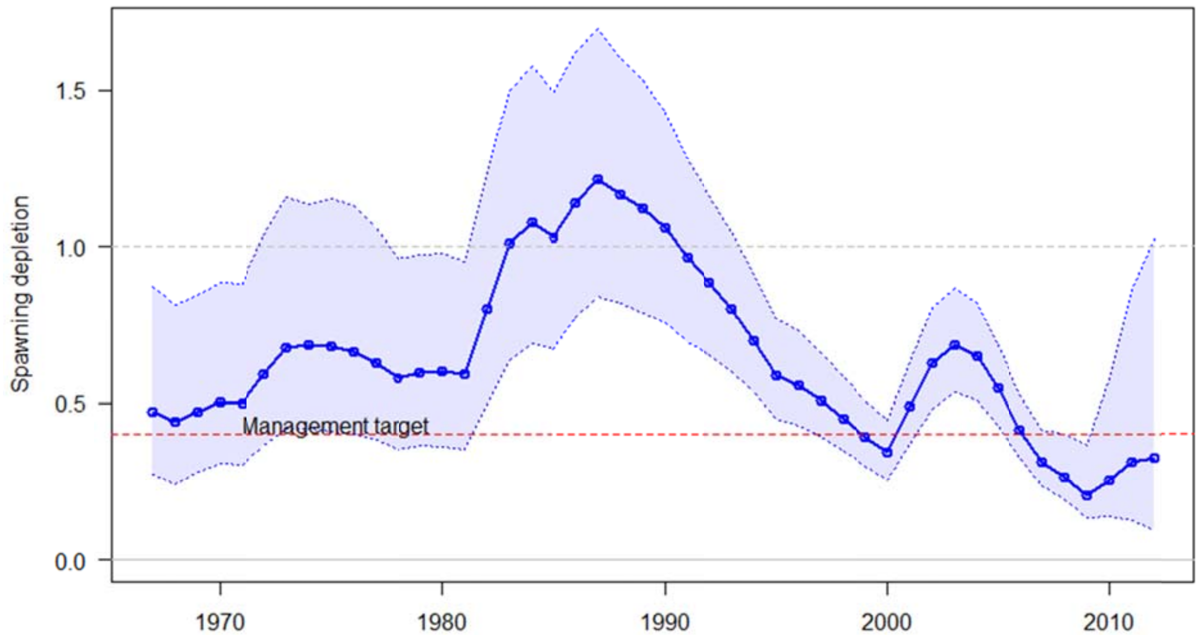


Figure 28. Time-series of posterior relative depletion for the base-case model.

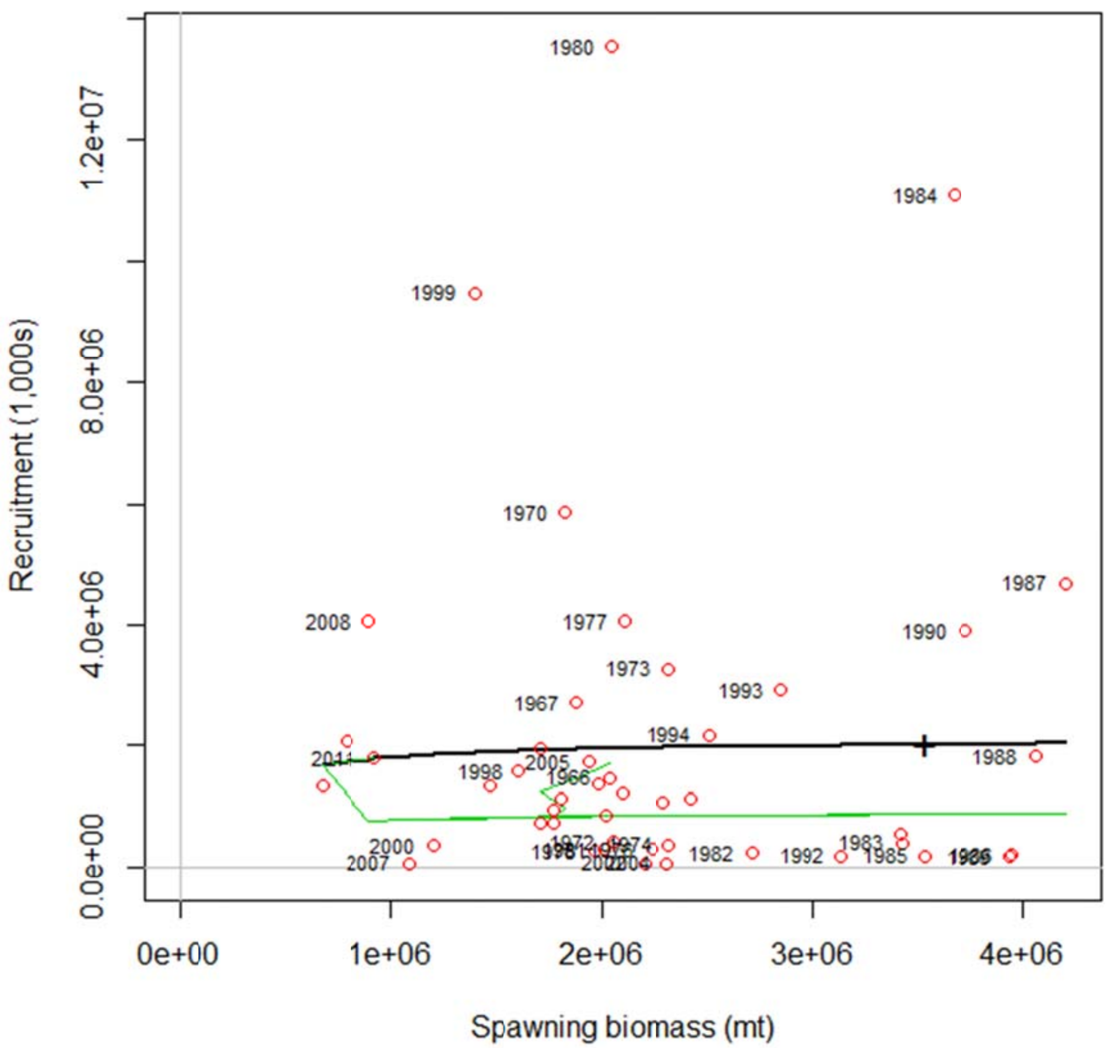


Figure 29. Estimated (MLE) stock-recruit relationship for the base-case model. The thick solid line indicates the central tendency, the thinner line the central tendency after bias correcting for the log-normal distribution.

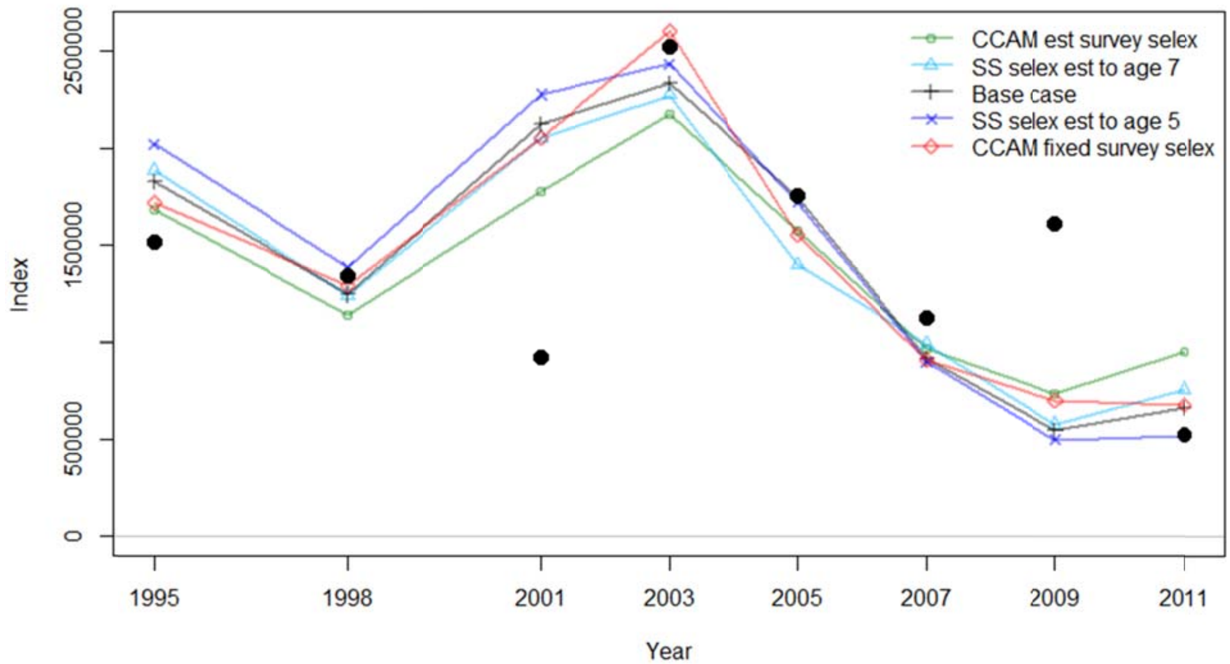


Figure 30. Comparison of fits to the acoustic survey index for alternate sensitivity models (based on MLE).

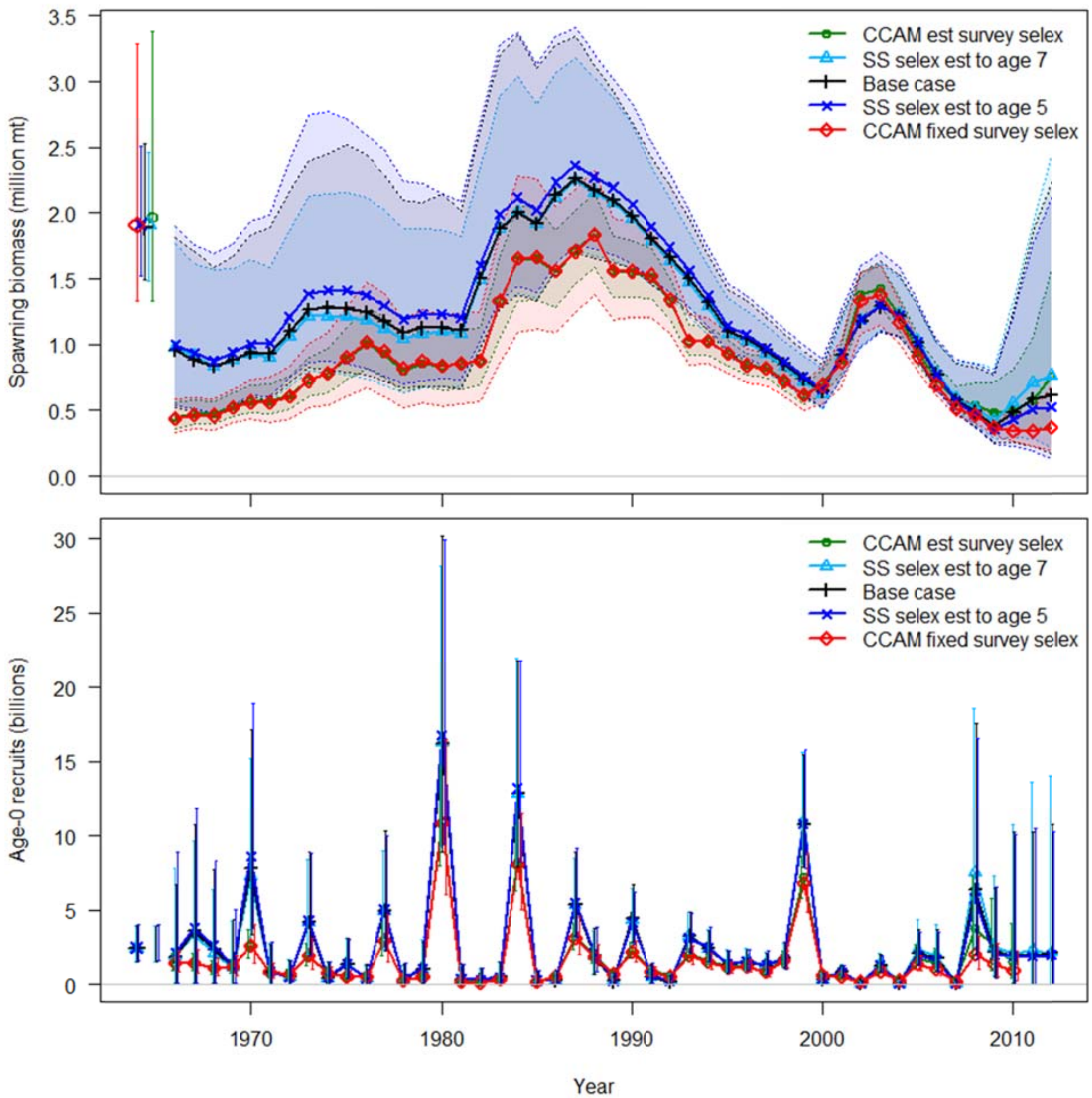


Figure 31. Comparison of results of alternate sensitivity models for spawning biomass (upper panel) and recruitment (lower panel).

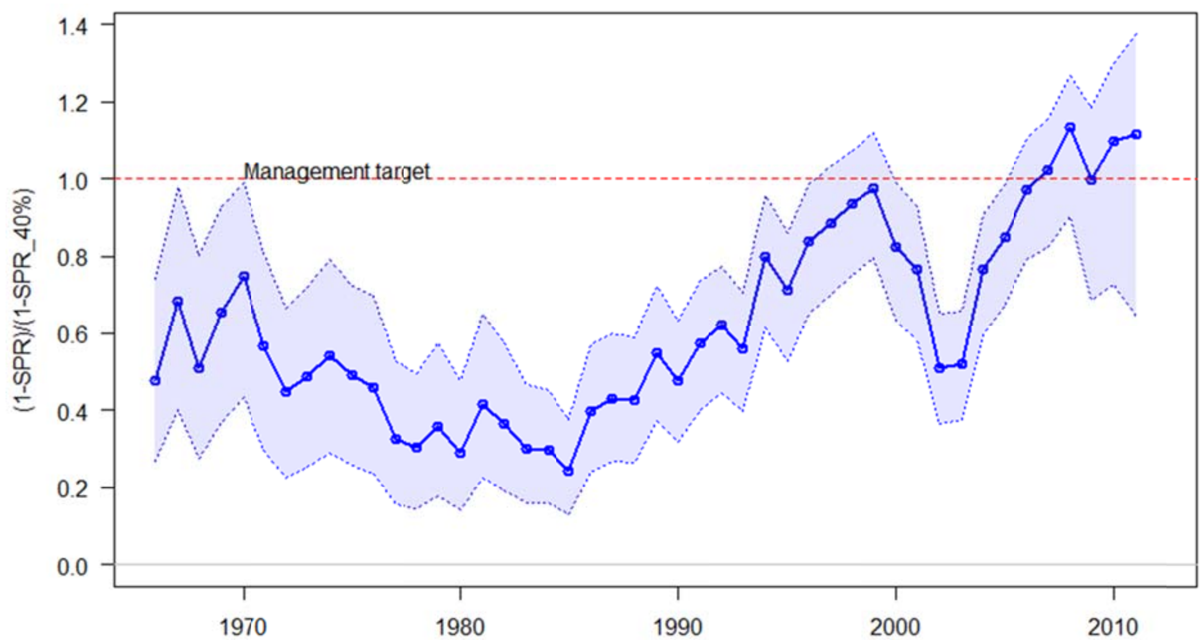


Figure 32. Trend in fishing intensity (relative SPR) through 2011.

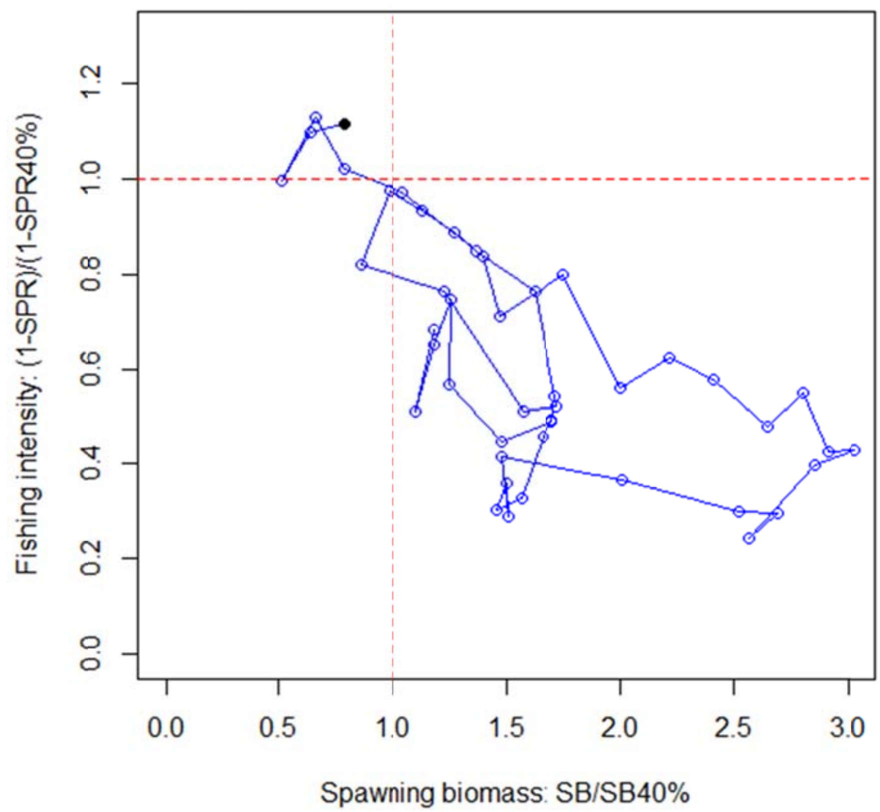


Figure 33. Temporal pattern (phase plot) of fishing intensity vs. relative spawning through 2011 for the base-case model. The filled circle denotes 2011 and the line connects years through the time-series.

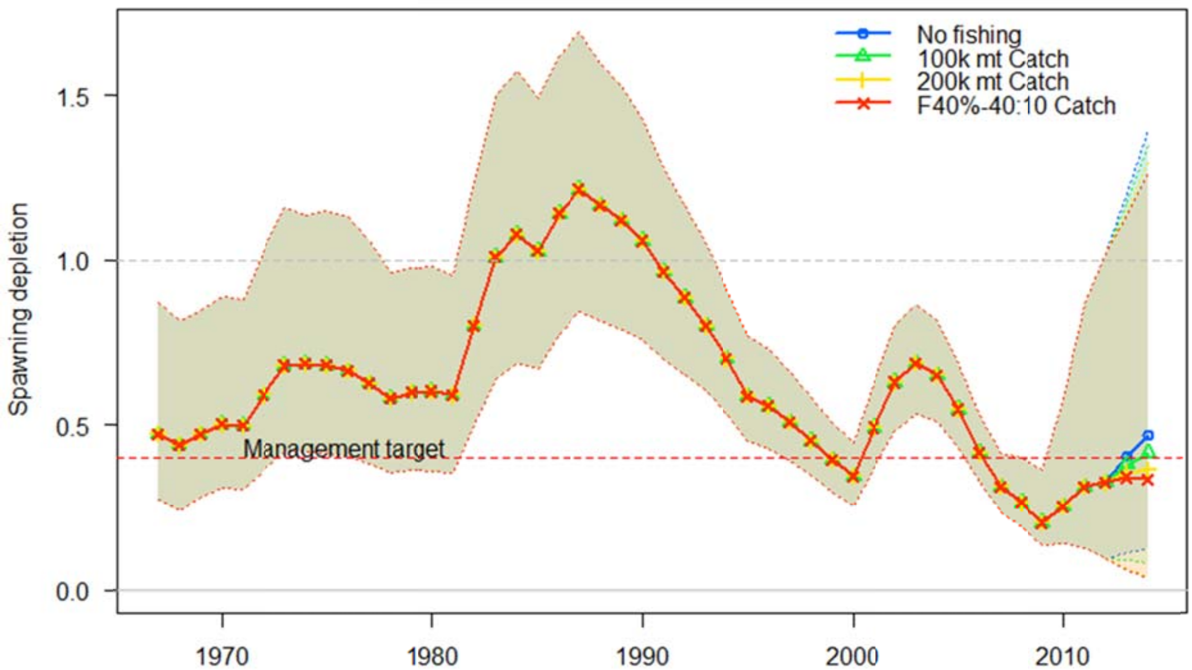


Figure 34. Time-series of estimated spawning depletion through 2012 from the base-case model, and forecast trajectories or several arbitrary management options from the decision table, with 95% posterior credibility intervals.

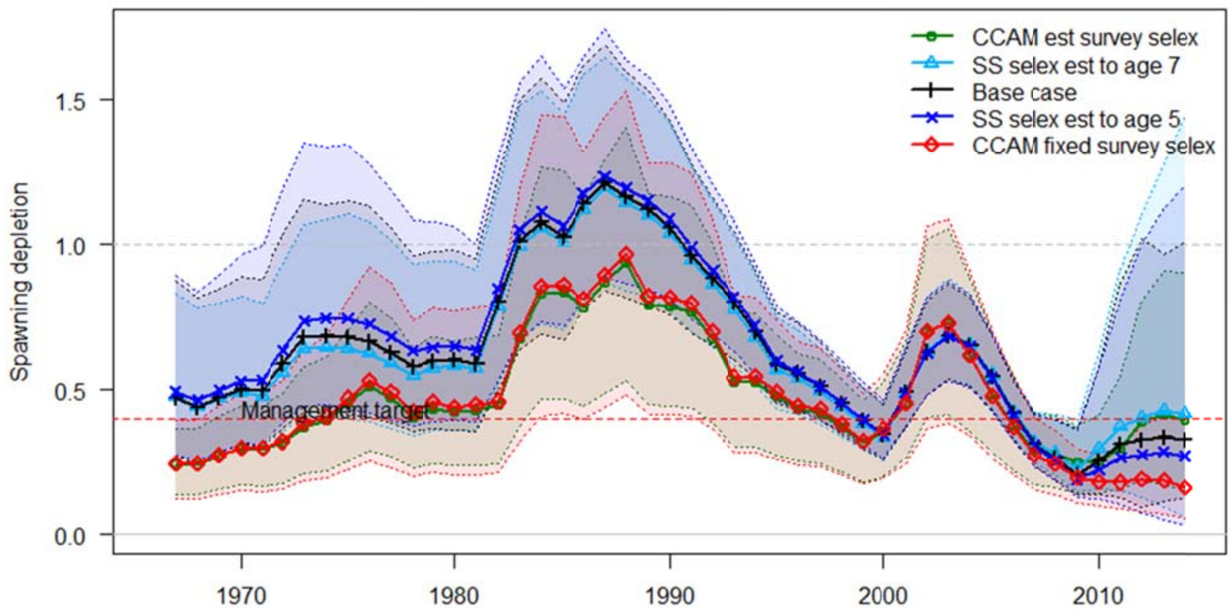


Figure 35. Time-series of estimated spawning depletion through 2012 from the base-case model, with 95% posterior credibility intervals, and among alternate sensitivity models, with forecast trajectories for the $F_{40\%}$-40:10 default harvest rate catch level from the base-case model.

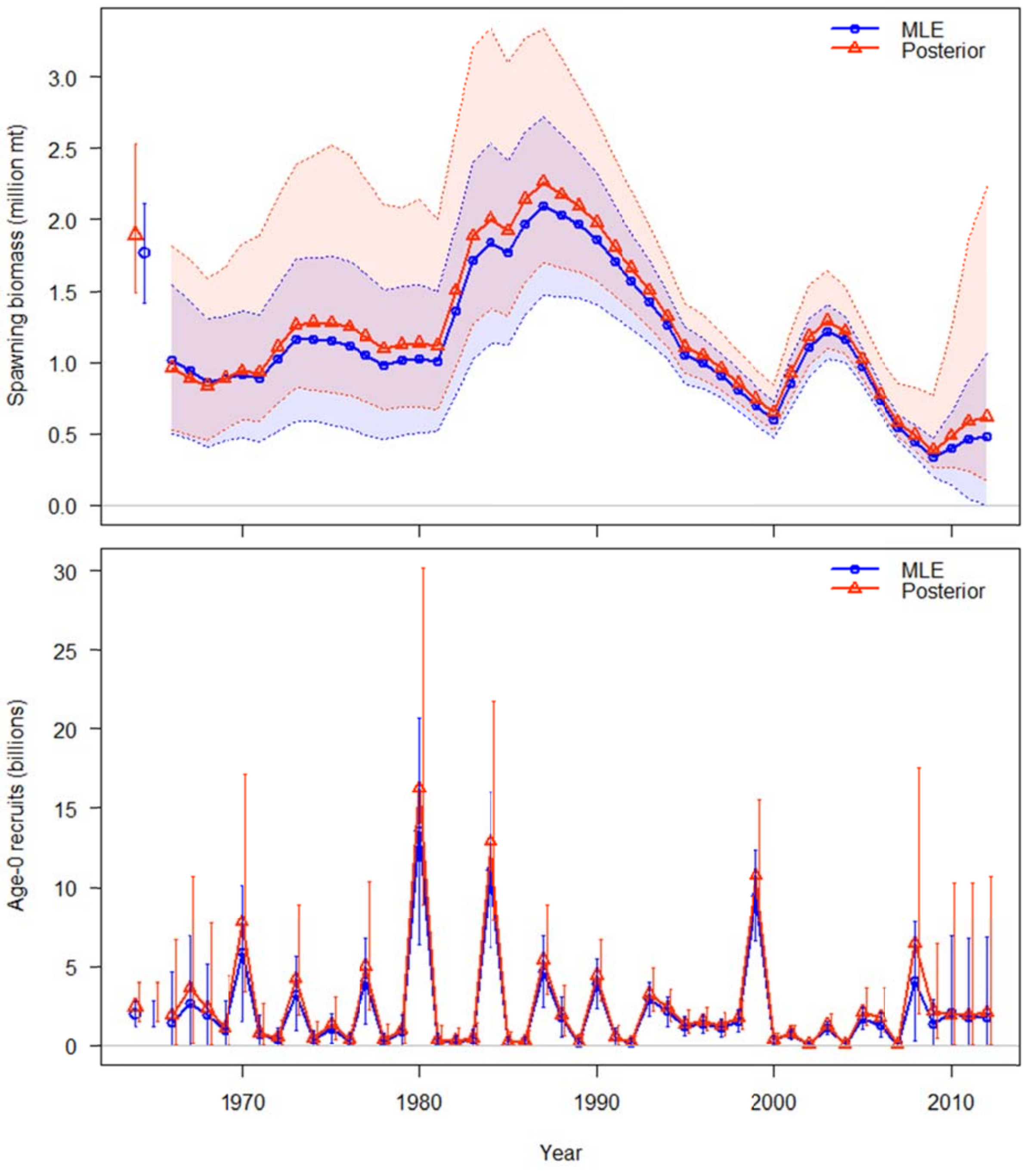


Figure 36. Comparison of maximum likelihood estimates and Bayesian posterior median results for spawning biomass (upper panel) and recruitment (lower panel) from the base-case model.

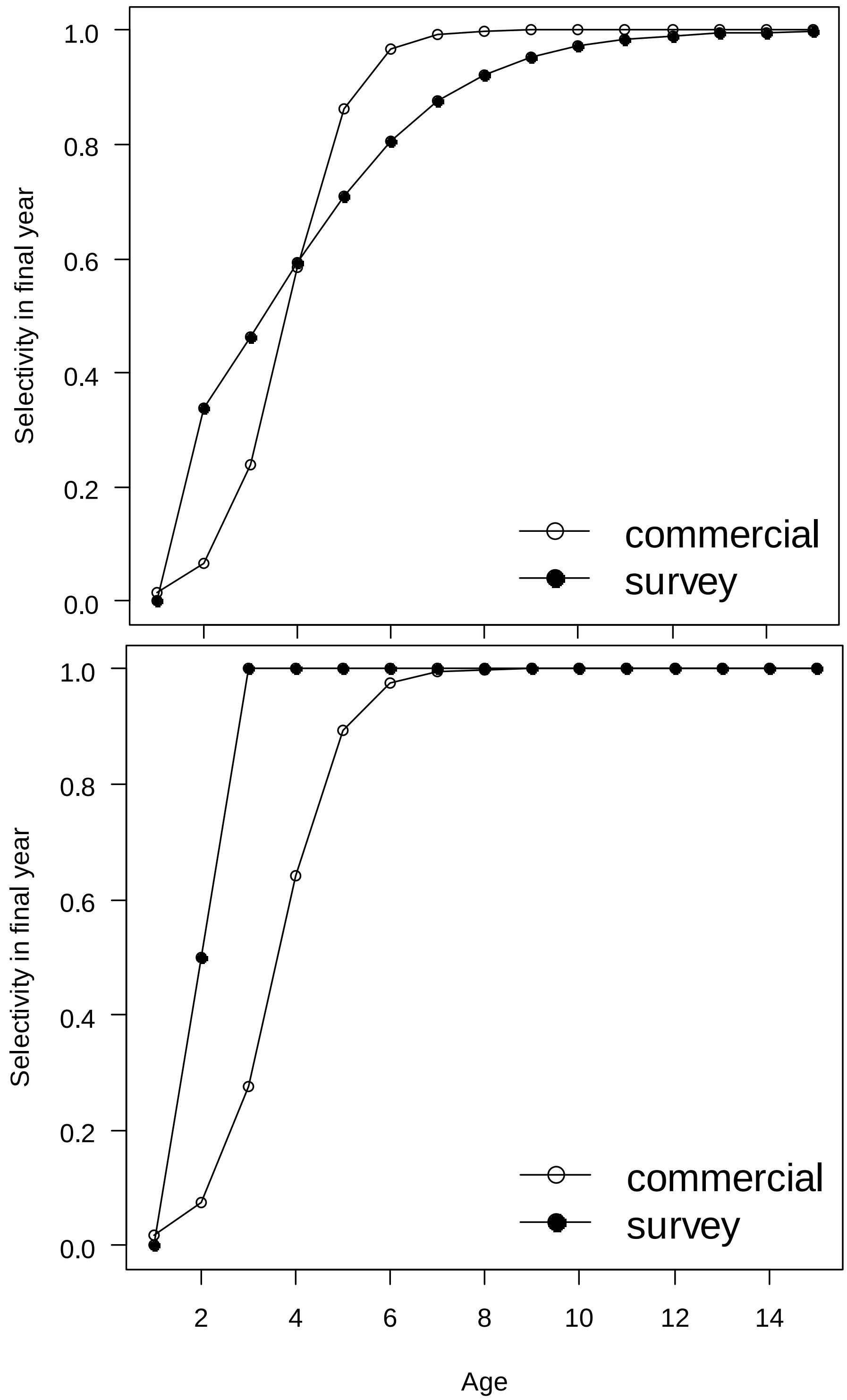


Figure 37. Selectivity curves for the alternate sensitivity models using CCAM showing: CCAM 'base case' (with survey selectivity parameters estimated; upper panel), and CCAM with survey selectivity parameters fixed (lower panel).

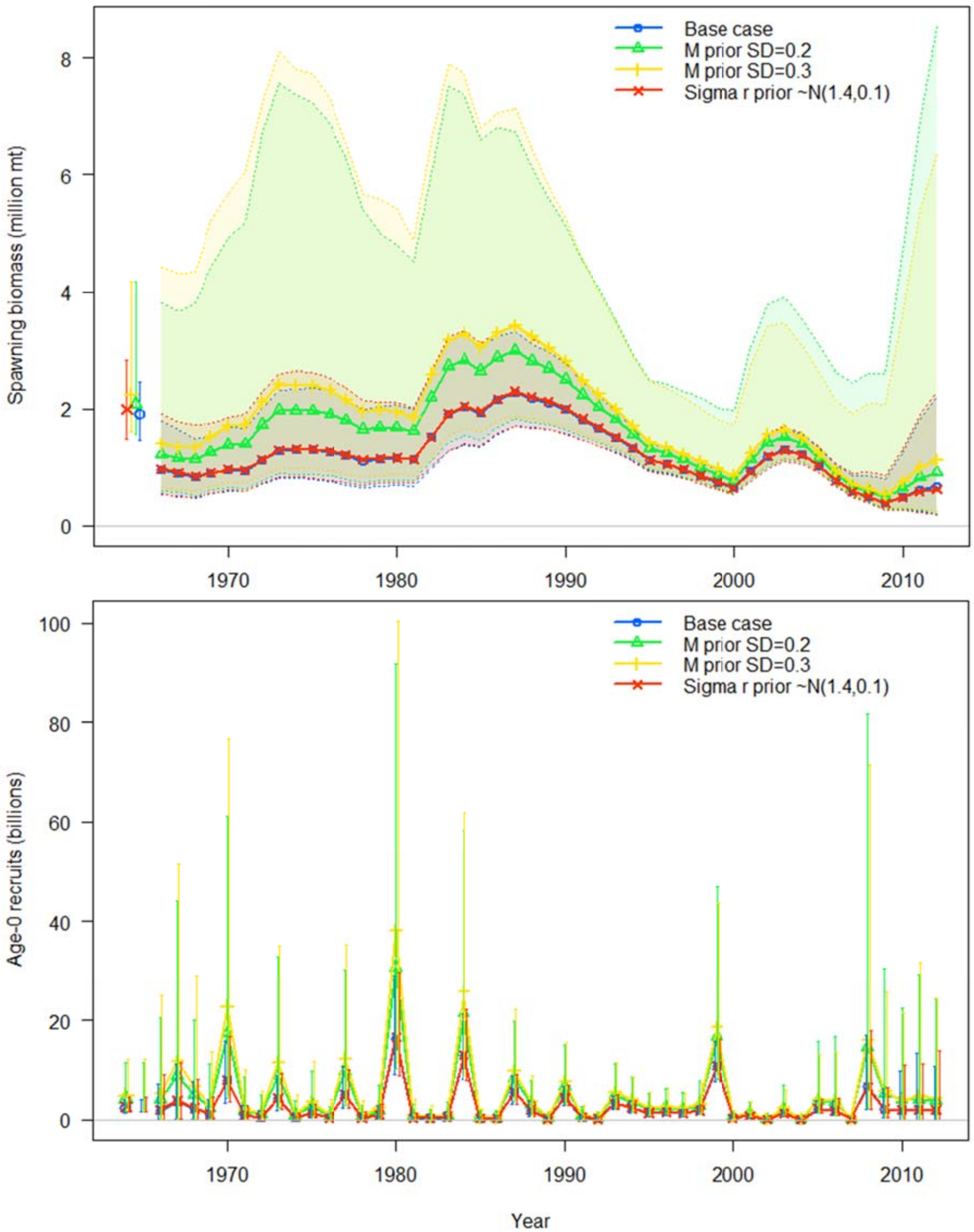


Figure 38. Results of sensitivity analysis to priors on natural mortality (*M*) and the degree of recruitment variability (σ_r). Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

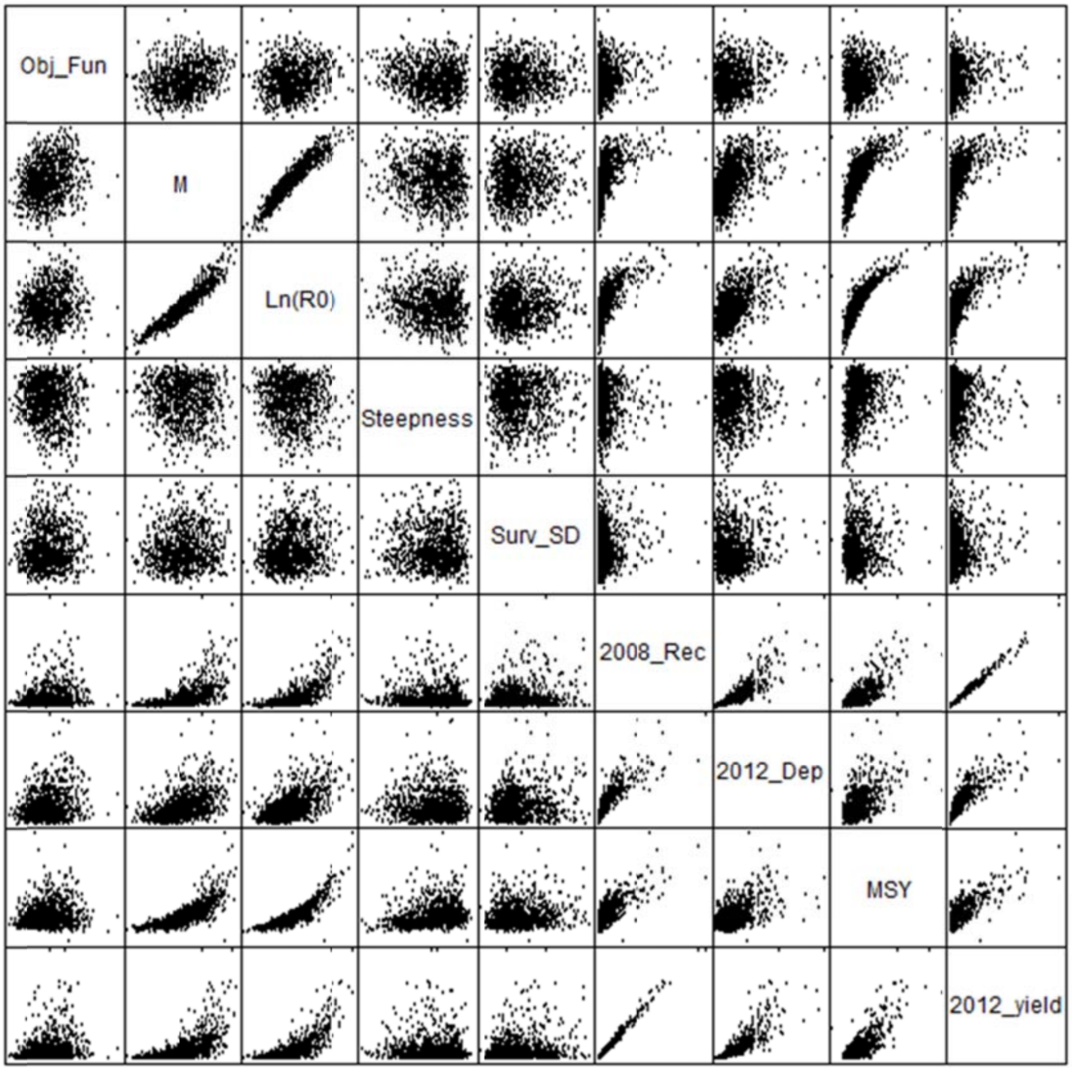


Figure 39. Posterior correlations among key model parameters and derived quantities for the sensitivity model with a weak prior (SD=0.3) on natural mortality. From the top left the posteriors plotted are: objective function, natural mortality, ln(R_0), steepness, the process-error SD for the acoustic survey, the 2008 recruitment deviation, the depletion level in 2012, the estimate of MSY and the default harvest rate yield for 2012. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

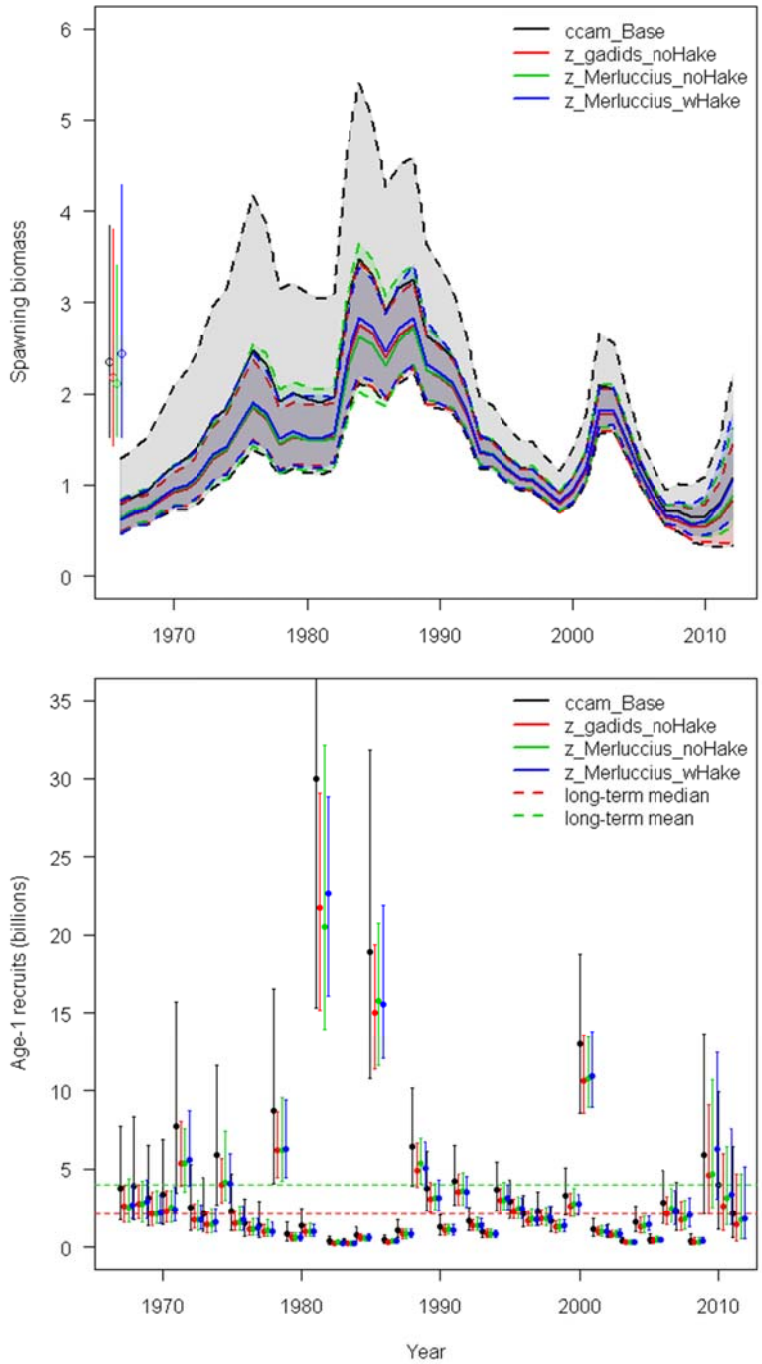


Figure 40. Results of sensitivity analysis for the CCAM model to the prior on steepness. For ccam_Base the prior was β(9.76,2.803); for z_gadids_noHake the prior was normal with mean=0.717, sd=0.0717; for z_Merluccius_NoHake the prior was normal with mean=0.673, sd=0.0673; for z_Merluccius wHake the prior was normal with mean=0.585, sd=0.0585. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

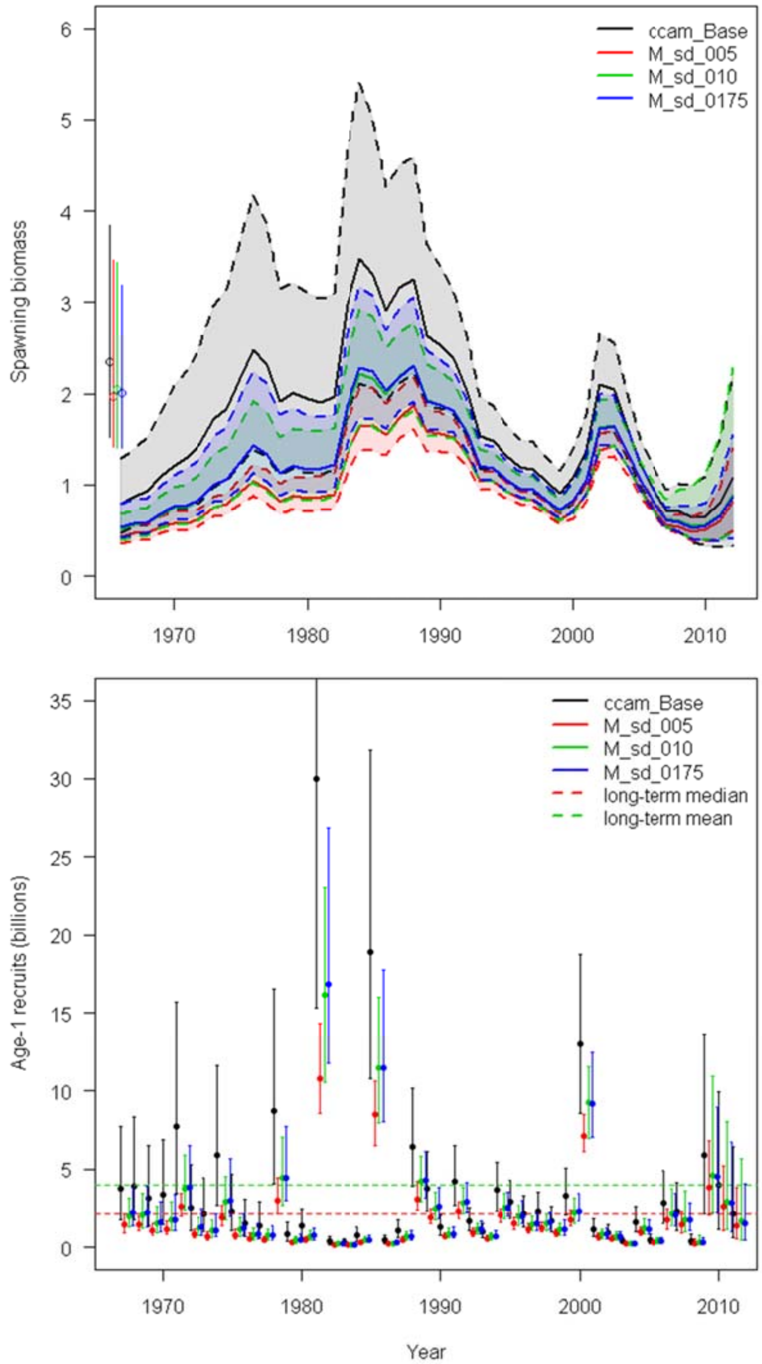


Figure 41. Results of sensitivity analysis for the CCAM model to the standard deviation of the prior on log(M) where the standard deviation on the prior for M was: 0.2 for the CCAM base case (ccam_Base), 0.05 for M_sd_005, 0.10 for M_sd_0.10 and 0.175 for M_sd_0.175. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

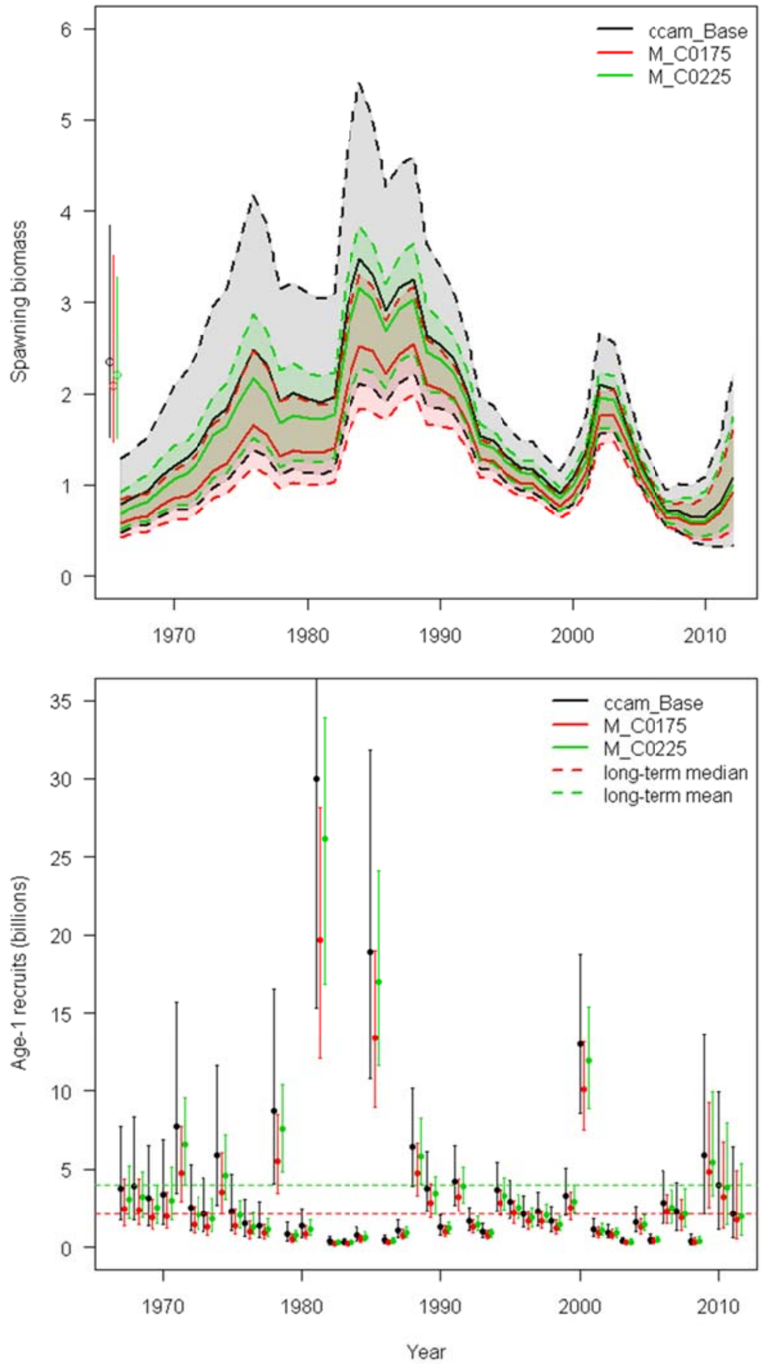


Figure 42. Results of sensitivity analysis for the CCAM model to mean of the prior on log(M) where the mean on the prior was: 0.2 for the CCAM base case (ccam_Base), 0.175 (M_C0175) and 0.225 (M_CO225). Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

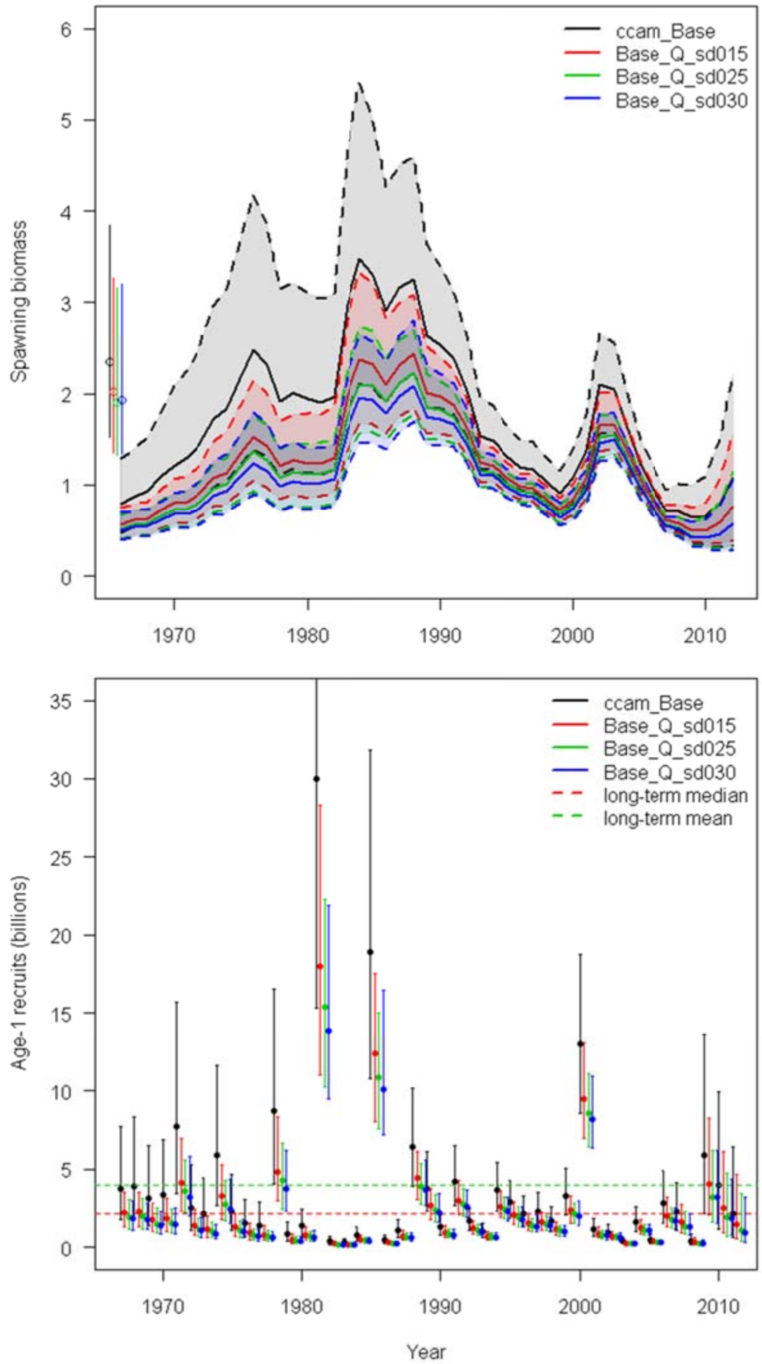


Figure 43. Results of sensitivity analysis for the CCAM model where prior standard deviation for survey q was: 0.1 for ccam_base, 0.15 for Base_Q_sd015, 0.25 for Base_Q_sd025, 0.3 for Base_Q_sd030. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting. Therefore, the CCAM base case is not reflective of the updated CCAM base case (see text).

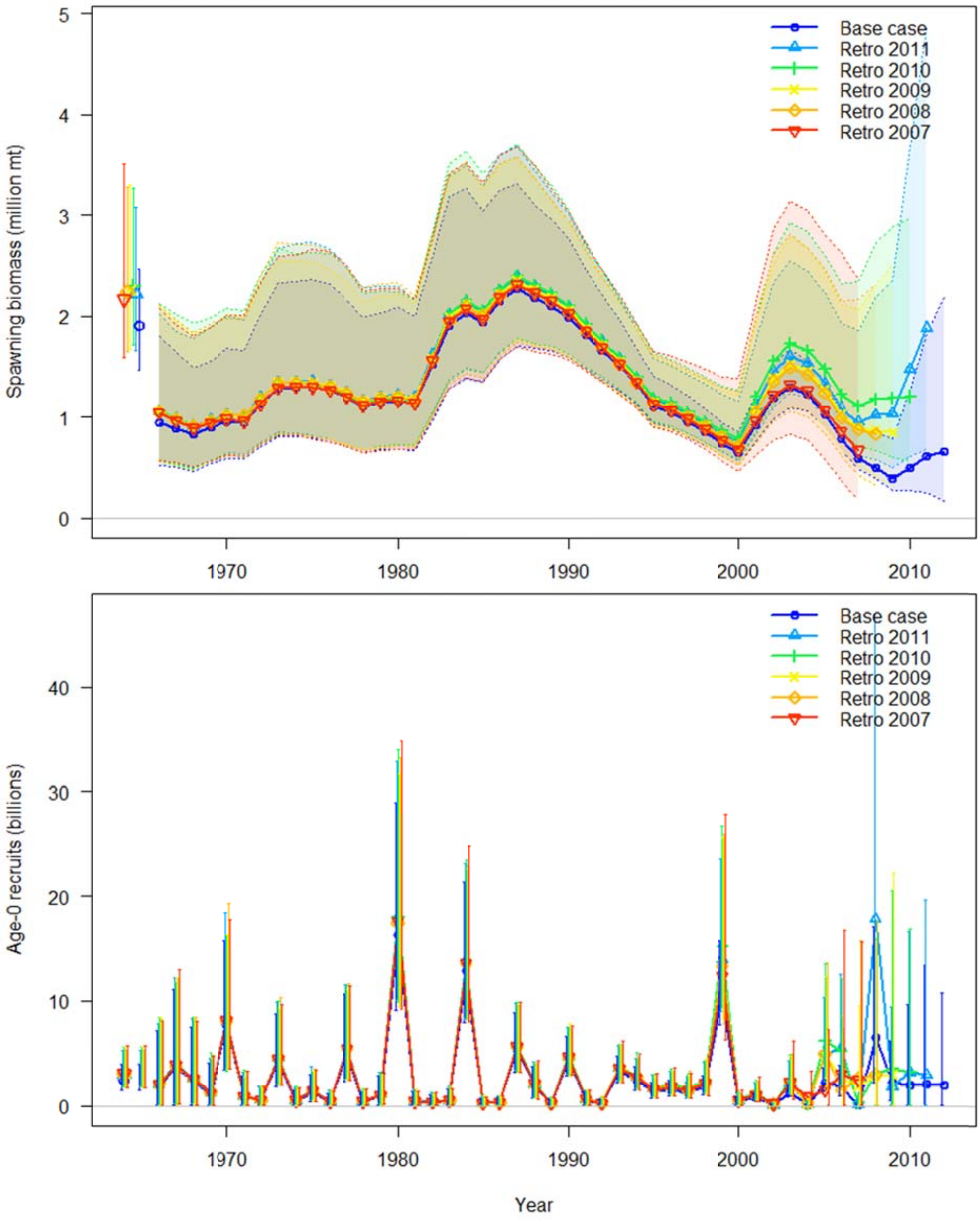


Figure 44. Retrospective pattern for the base-case model over the terminal years 2012 (base case) to 2007 as data from each terminal year are sequentially removed from the model. Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

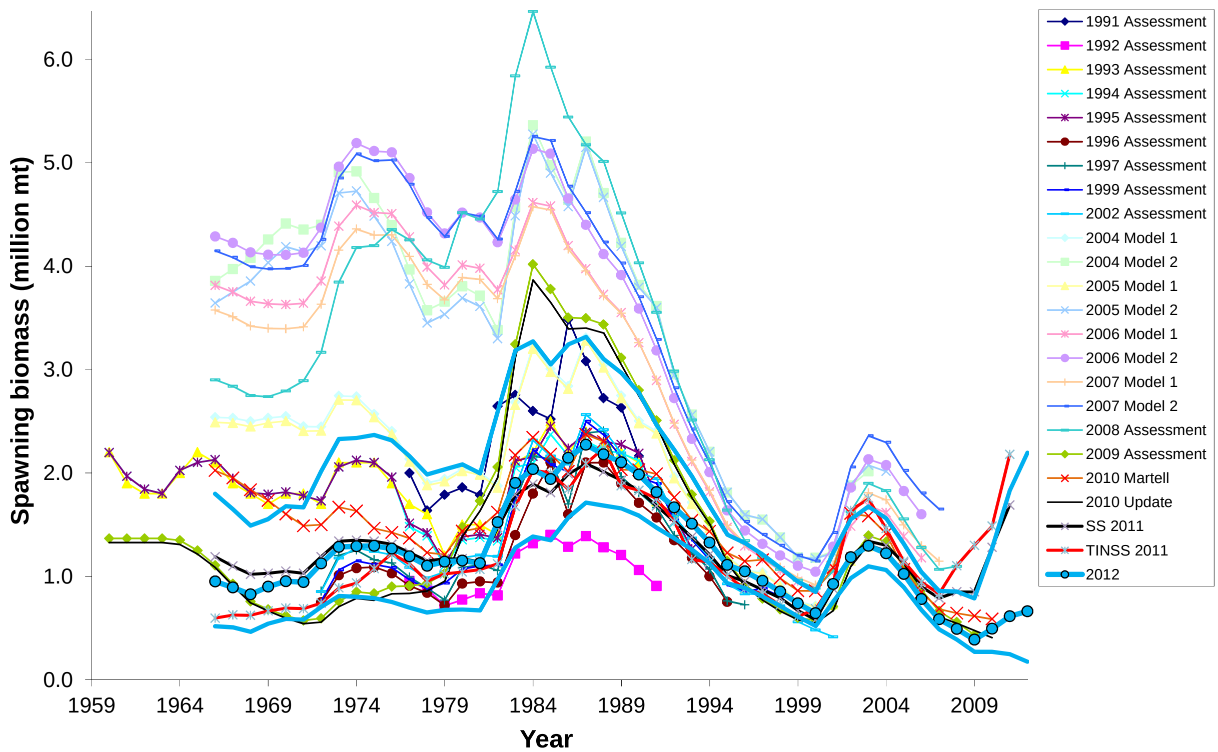


Figure 45. Posterior medians for the base-case model (thick blue line with ~95% credibility intervals) models in a retrospective comparing 2011 model results with previous stock assessments since 1991 (updates in 1998, 2000, 2001, 2003 are not included). Note that these results do not reflect the 2011 acoustic survey results revised during the SRG meeting.

8. Appendix A. List of terms and acronyms used in this document

Note: Many of these definitions are relevant to the historical management of Pacific hake and the U.S. Pacific Fishery Management Council process, and are included here only to improve interpretability of previous assessment and background documents.

40:10 Harvest control rule: The calculation leading to the ABC catch level (see below) for future years. This calculation decreases the catch linearly (given a constant age structure in the population) from the catch implied by the F_{MSY} (see below) harvest level when the stock declines below $SB_{40\%}$ (see below) to a value of 0 at $SB_{10\%}$.

40:10 Adjustment: an adjustment to the overall total allowable catch that is triggered when the biomass falls below 40% of its average equilibrium level in the absence of fishing. This adjustment reduces the total allowable catch on a straight-line basis from the 40% level such that the total allowable catch would equal zero when the stock is at 10% of its average equilibrium level in the absence of fishing.

ABC: Acceptable biological catch. See below.

Acceptable biological catch (ABC): The Acceptable biological catch is a scientific calculation of the sustainable harvest level of a fishery used historically to set the upper limit for fishery removals by the Pacific Fishery Management Council. It is calculated by applying the estimated (or proxy) harvest rate that produces maximum sustainable yield (MSY, see below) to the estimated exploitable stock biomass (the portion of the fish population that can be harvested). For Pacific hake, the calculation of the acceptable biological catch and application of the 40:10 adjustment is now replaced with the default harvest rate and the Total Allowable Catch.

Advisory Panel (AP): The advisory panel on Pacific Hake/Whiting established by the Agreement.

Agreement (“Treaty”): The Agreement between the government of the United States and the Government of Canada on Pacific hake/whiting, signed at Seattle, Washington, on November 21, 2003, and formally established in 2011.

AFSC: Alaska Fisheries Science Center (National Marine Fisheries Service)

Backscatter: The scattering by a target back in the direction of an acoustic source. Specifically, the Nautical Area Scattering Coefficient (a measure of scattering per area denoted by S_A) is frequently referred to as backscatter.

California Current Ecosystem: The waters of the continental shelf and slope off the west coast of North America; commonly referring to the area from central California to southern British Columbia.

Catchability: The parameter defining the proportionality between a relative index of stock abundance (often a fishery independent survey) and the estimated stock abundance available to that survey (as modified by selectivity) in the assessment model.

Catch-per-unit-effort: A raw or (frequently) standardized and model-based metric of fishing success based on the catch and relative effort expended to generate that catch. Catch-per-unit-effort is often used as an index of stock abundance in the absence of fishery independent indices and/or where the two are believed to be proportional. See CPUE below.

CCAM: Canadian Catch at Age Model. The model used for analysis of sensitivity to structural uncertainty. The model was developed at the University of British Columbia by Dr. Steven Martell, and customized by the JTC to calculate the outputs needed for this assessment. The model is fully described in Appendix F.

Cohort: A group of fish born in the same year. Also see recruitment and year-class.

CPUE: Catch-per-unit-effort. See above.

CV: Coefficient of variation. A measure of uncertainty defined as the standard deviation (SD, see below) divided by the mean.

Default harvest rate: The application of F-40 Percent with the 40:10 adjustment. Having considered any advice provided by the Joint Technical Committee, Scientific Review Group or Advisory Panel, the Joint Management Committee may recommend a different harvest rate if the scientific evidence demonstrates that a different rate is necessary to sustain the offshore hake/whiting resource.

Depletion: Abbreviated term for relative depletion (see below).

DFO: Fisheries and Oceans Canada. Federal organization which delivers programs and services that support sustainable use and development of Canada's waterways and aquatic resources.

DOC: United States Department of Commerce. Parent organization of the National Marine Fisheries Service (NMFS).

El Niño: Abnormally warm ocean climate conditions in the California Current Ecosystem (see above) as a result of broad changes in the Eastern Pacific Ocean across the eastern coast of Latin America (centered on Peru) often around the end of the calendar year.

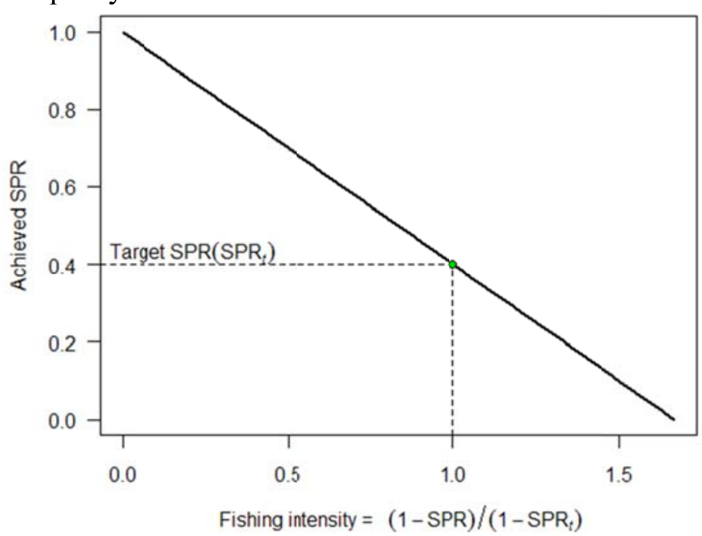
Exploitation fraction: A metric of fishing intensity that represents the total annual catch divided by the estimated population biomass over a range of ages assumed to be vulnerable to the fishery. This value is not equivalent to the instantaneous rate of fishing mortality (see below) or the Spawning Potential Ratio (*SPR*, see below).

F: Instantaneous rate of fishing mortality (or fishing mortality rate, see below).

$F_{40\%}$ (F-40 Percent): The rate of fishing mortality estimated to reduce the spawning potential ratio (SPR, see below) to 40%.

Female spawning biomass: The biomass of mature female fish at the beginning of the year. Occasionally, especially in reference points, this term is used to mean spawning output (expected egg production, see below) when this is not proportional to spawning biomass. See also spawning biomass.

Fishing intensity: A measure of the magnitude of fishing relative to a specified target. In this assessment it is defined as: relative SPR, or the ratio of (1-SPR) to (1-$SPR_{xx\%}$), where "*xx*" is the 40% proxy.



Fishing mortality rate, or instantaneous rate of fishing mortality (*F*): A metric of fishing intensity that is usually reported in reletion to the most highly selected ages(s) or length(s), or occasionally as an average over an age range that is vulnerable to the fishery. Because it is an instantaneous rate operating simultaneously with natural mortality, it is *not* equivalent to exploitation fraction (or percent annual removal; see above) or the Spawning Potential Ratio (*SPR*, see below).

F_{MSY}: The rate of fishing mortality estimated to produce the maximum sustainable yield from the stock.

Joint Management Committee (JMC): The joint management committee established by the Agreement.

Joint Technical Committee (JTC): The joint technical committee established by the Agreement.

Kt: Knots (nautical miles per hour).

Magnuson-Stevens Fishery Conservation and Management Act: The MSFCMA, sometimes known as the "Magnuson-Stevens Act," established the 200-mile fishery conservation zone, the regional fishery management council system, and other provisions of U.S. marine fishery law.

Maximum sustainable yield (*MSY*): An estimate of the largest average annual catch that can be continuously taken over a long period of time from a stock under prevailing ecological and environmental conditions.

MCMC: Markov-Chain Monte-Carlo. A numerical method used to sample from the posterior distribution (see below) of parameters and derived quantities in a Bayesian analysis.

MSY: Maximum sustainable yield. See above.

Mt: Metric ton(s). A unit of mass (often referred to as weight) equal to 1000 kilograms or 2,204.62 pounds.

NA: Not available.

National Marine Fisheries Service: A division of the U.S. Department of Commerce, National Ocean and Atmospheric Administration (NOAA). NMFS is responsible for conservation and management of offshore fisheries (and inland salmon).

NMFS: National Marine Fisheries Service. See above.

NOAA: National Oceanic and Atmospheric Administration. The parent agency of the National Marine Fisheries Service.

NORPAC: North Pacific Database Program. A database storing U.S. fishery observer data collected at sea.

NWFSC : Northwest Fisheries Science Center. A division of the NMFS located primarily in Seattle, Washington, but also in Newport, Oregon and other locations.

Optimum yield: The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems. The OY is developed based on the acceptable biological catch from the fishery, taking into account relevant economic, social, and ecological factors. In the case of overfished fisheries, the OY provides for rebuilding to the target stock abundance.

OY: Optimum yield. See above.

PacFIN: Pacific Coast Fisheries Information Network. A database that provides a central repository for commercial fishery information from Washington, Oregon, and California.

PBS: Pacific Biological Station of Fisheries and Oceans Canada (DFO, see above).

Pacific Fishery Management Council (PFMC): The U.S. organization under which historical stock assessments for Pacific hake were conducted.

Pacific hake/whiting ("Pacific hake"): The stock of *Merluccius productus* located in the offshore waters of the United States and Canada (not including smaller stocks located in Puget Sound and the Strait of Georgia).

Posterior distribution: The probability distribution for parameters or derived quantities from a Bayesian model representing the prior probability distributions (see below) updated by the observed data via the likelihood equation. For stock assessments posterior distributions are approximated via numerical methods; one frequently employed method is MCMC (see above).

Prior distribution: Probability distribution for a parameter in a Bayesian analysis that represents the information available before evaluating the observed data via the likelihood equation. For some parameters noninformative priors can be constructed which allow the data to dominate the posterior distribution (see above). For others, informative priors can be constructed based on auxiliary information and/or expert knowledge or opinions.

q: Catchability. See above.

R_0: Estimated average level of annual recruitment occurring at SB_0 (see below).

Recruits/recruitment: A group of fish born in the same year or the estimated production of new members to a fish population of the same age. Recruitment is reported at a specific life stage, often age 0 or 1, but sometimes corresponding to the age at which the fish first become vulnerable to the fishery. See also cohort and year-class.

Recruitment deviation: The offset of the recruitment in a given year relative to the stock-recruit function; values occur on a log scale.

Relative depletion: The ratio of the estimated beginning of the year female spawning biomass to estimated average unfished equilibrium female spawning biomass (SB_0, see below).

Relative SPR: A measure of fishing intensity transformed to have an interpretation more like *F*: as fishing increases the metric increases. Relative SPR is the ratio of (1-SPR) to (1-$SPR_{xx\%}$), where "*xx*" is the proxy or estimated SPR rate that produces MSY.

SB_0: The estimated average unfished equilibrium female spawning biomass or spawning output if not directly proportional to spawning biomass.

$SB_{10\%}$: The level of female spawning biomass (output) corresponding to 10% of average unfished equilibrium female spawning biomass (SB_0, size of fish stock without fishing; see below). For many groundfish (including hake), this is the level at which the calculated catch based on the 40:10 harvest control rule (see above) is equal to 0.

$SB_{25\%}$: The level of female spawning biomass (output) corresponding to 25% of average unfished equilibrium female spawning biomass (SB_0, size of fish stock without fishing; see below). For many groundfish (including hake), this is the threshold below which the stock is designated as overfished.

$SB_{40\%}$: The level of female spawning biomass (output) corresponding to 40% of average unfished equilibrium female spawning biomass (SB_0, size of fish stock without fishing; see below). For many groundfish (including hake) this is the management target stock size and the proxy for SB_{MSY} (see below). This is also the Pacific Fishery Management Council's threshold for declaring a stock rebuilt if it has previously been designated as overfished.

SB_{MSY}: The estimated female spawning biomass (output) that produces the maximum sustainable yield (*MSY*). Also see $SB_{40\%}$.

Scientific Review Group (SRG): The scientific review group established by the Agreement.

Scientific and Statistical Committee (SSC): The scientific advisory committee to the PFMC. The Magnuson-Stevens Act requires that each council maintain an SSC to assist in gathering and analyzing statistical, biological, ecological, economic, social, and other scientific information that is relevant to the management of council fisheries.

SD: Standard deviation. A measure of uncertainty within a sample.

Spawning biomass: Abbreviated term for female spawning biomass (see above).

Spawning output: The total production of eggs (or possibly viable egg equivalents if egg quality is taken into account) given the number of females at age (and maturity and fecundity at age).

Spawning potential ratio (SPR): A metric of fishing intensity. The ratio of the spawning output per recruit under a given level of fishing to the estimated spawning output per recruit in the absence of fishing. It achieves a value of 1.0 in the absence of fishing and declines toward 0.0 as fishing intensity increases.

Spawning stock biomass (SSB): Alternative term for female spawning biomass (see above).

SPR: Spawning potential ratio. See above.

SPR_{MSY}: The estimated spawning potential ratio that produces the largest sustainable harvest (*MSY*).

$SPR_{40\%}$: The estimated spawning potential ratio that stabilizes the female spawning biomass at the MSY-proxy target of $SB_{40\%}$. Also referred to as $SPR_{MSY\text{-}proxy}$.

SS: One of two age-structured stock assessment models applied in this stock assessment analysis (Stock Synthesis; see also TINSS).

SSC: Scientific and Statistical Committee (see above).

STAR Panel: Stock Assessment Review Panel. A panel set up to provide independent review of all stock assessments used by the Pacific Fishery Management Council.

STAT: Stock Assessment Team. The individuals preparing the scientific analysis leading to, and including, stock assessments submitted to the Pacific Fishery Management Council's review process.

Steepness (*h*): A stock-recruit relationship parameter representing the proportion of R_0 expected (on average) when the female spawning biomass is reduced to 20% of SB_0 (i.e., when relative depletion is equal to 20%). This parameter can be thought of one important component to the productivity of the stock.

Target strength: The amount of backscatter from an individual acoustic target.

TINSS: One of two age-structured stock assessment models applied in the 2011 stock assessment analysis (This Is Not Stock Synthesis; see also SS).

Total Allowable Catch (TAC): The maximum fishery removal under the terms of the Agreement.

Total Biomass: Aggregate biomass of all individual fish in the stock regardless of age or sex.

U.S./Canadian allocation: The division of the total allowable catch of - 73.88% as the United States' share and 26.12% as the Canadian share.

Vulnerable biomass: The demographic portion of the stock available for harvest by the fishery.

Year-class: A group of fish born in the same year. See also cohort and recruitment.

9. Appendix B. List of all estimated parameters in the SS model

Parameter	Posterior median
NatM_p_1_Fem_GP_1	0.22
SR_R0	14.66
SR_steep	0.81
Early_InitAge_20	-0.20
Early_InitAge_19	-0.04
Early_InitAge_18	-0.01
Early_InitAge_17	-0.02
Early_InitAge_16	-0.04
Early_InitAge_15	-0.15
Early_InitAge_14	-0.12
Early_InitAge_13	-0.13
Early_InitAge_12	-0.17
Early_InitAge_11	-0.17
Early_InitAge_10	-0.27
Early_InitAge_9	-0.30
Early_InitAge_8	-0.31
Early_InitAge_7	-0.31
Early_InitAge_6	-0.45
Early_InitAge_5	-0.34
Early_InitAge_4	-0.38
Early_InitAge_3	-0.36
Early_InitAge_2	-0.09
Early_InitAge_1	0.20
Early_RecrDev_1966	0.42
Early_RecrDev_1967	1.33
Early_RecrDev_1968	0.84
Early_RecrDev_1969	-0.01
Main_RecrDev_1970	2.17
Main_RecrDev_1971	-0.26
Main_RecrDev_1972	-0.74
Main_RecrDev_1973	1.50
Main_RecrDev_1974	-0.89
Main_RecrDev_1975	0.37
Main_RecrDev_1976	-1.02
Main_RecrDev_1977	1.69
Main_RecrDev_1978	-1.19
Main_RecrDev_1979	-0.02
Main_RecrDev_1980	2.91
Main_RecrDev_1981	-1.15
Main_RecrDev_1982	-1.30

Parameter	Posterior median
Main_RecrDev_1983	-0.83
Main_RecrDev_1984	2.64
Main_RecrDev_1985	-1.66
Main_RecrDev_1986	-1.52
Main_RecrDev_1987	1.78
Main_RecrDev_1988	0.74
Main_RecrDev_1989	-1.63
Main_RecrDev_1990	1.59
Main_RecrDev_1991	-0.56
Main_RecrDev_1992	-1.61
Main_RecrDev_1993	1.30
Main_RecrDev_1994	1.01
Main_RecrDev_1995	0.47
Main_RecrDev_1996	0.59
Main_RecrDev_1997	0.40
Main_RecrDev_1998	0.76
Main_RecrDev_1999	2.58
Main_RecrDev_2000	-0.81
Main_RecrDev_2001	-0.03
Main_RecrDev_2002	-2.58
Main_RecrDev_2003	0.40
Main_RecrDev_2004	-2.60
Main_RecrDev_2005	0.88
Main_RecrDev_2006	0.71
Main_RecrDev_2007	-2.40
Late_RecrDev_2008	1.99
Late_RecrDev_2009	0.94
Late_RecrDev_2010	0.26
Late_RecrDev_2011	0.00
Q_extraSD_2_Acoustic_Survey	0.46
AgeSel_1P_3_Fishery	2.98
AgeSel_1P_4_Fishery	1.60
AgeSel_1P_5_Fishery	0.53
AgeSel_1P_6_Fishery	0.16
AgeSel_1P_7_Fishery	0.23
AgeSel_2P_4_Acoustic_Survey	0.08
AgeSel_2P_5_Acoustic_Survey	0.27
AgeSel_2P_6_Acoustic_Survey	-0.08
AgeSel_2P_7_Acoustic_Survey	0.45

10. Appendix C. SS model input files

```
# 2012 Hake data file

########################################

### Global model specifications ###
1966        # Start year
2011        # End year
1           # Number of seasons/year
12          # Number of months/season
1           # Spawning occurs at beginning of season
1           # Number of fishing fleets
1           # Number of surveys
1           # Number of areas
Fishery%Acoustic_Survey
0.5 0.5 # fleet timing_in_season
1 1         # Area of each fleet
1           # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01        # SE of log(catch) by fleet for equilibrium and continuous options
1           # Number of genders
20          # Number of ages in population dynamics

### Catch section ###
0  # Initial equilibrium catch (landings + discard) by fishing fleet

46 # Number of lines of catch
# Catch Year Season
137700  1966    1
214370  1967    1
122180  1968    1
180130  1969    1
234590  1970    1
154620  1971    1
117540  1972    1
162640  1973    1
211260  1974    1
221350  1975    1
237520  1976    1
132690  1977    1
103640  1978    1
137110  1979    1
89930   1980    1
139120  1981    1
107741  1982    1
113931  1983    1
138492  1984    1
110399  1985    1
210616  1986    1
234148  1987    1
248840  1988    1
298079  1989    1
261286  1990    1
319710  1991    1
299687  1992    1
198924  1993    1
362422  1994    1
249644  1995    1
306383  1996    1
325257  1997    1
320815  1998    1
311844  1999    1
228214  2000    1
227531  2001    1
180698  2002    1
205177  2003    1
```

338654	2004	1
363157	2005	1
361761	2006	1
291129	2007	1
322145	2008	1
177459	2009	1
226202	2010	1
286055	2011	1

8 # Number of index observations
Units: 0=numbers,1=biomass,2=F; Errortype: -1=normal,0=lognormal,>0=T
Fleet Units Errortype
1 1 0 # Fishery
2 1 0 # Acoustic Survey

Year seas index obs se(log)
Acoustic survey

1995	1	2	1517948	0.0666
1998	1	2	1342740	0.0492
2001	1	2	918622	0.0823
2003	1	2	2520641	0.0709
2005	1	2	1754722	0.0847
2007	1	2	1122809	0.0752
2009	1	2	1612027	0.1375
2011	1	2	521476	0.1015

0 #_N_fleets_with_discard
0 #_N_discard_obs
0 #_N_meanbodywt_obs
30 #_DF_for_meanbodywt_T-distribution_like

Population size structure
2 # Length bin method: 1=use databins; 2=generate from binwidth,min,max below;
2 # Population length bin width
10 # Minimum size bin
70 # Maximum size bin

-1 # Minimum proportion for compressing tails of observed compositional data
0.001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number

26 # Number of Data Length Bins
Lower edge of bins
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70
0 #_N_Length_obs

15 #_N_age_bins
Age bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

39 # N_ageerror_definitions
Annual keys with cohort effect

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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				

0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.1810831	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.19080435		0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813
	0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.2027476	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.2174216	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.1810831	0.346917	0.368632	0.395312	0.2354495	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.19080435		0.368632	0.395312	0.42809	0.2575991	0.517841	0.57863	0.653316	0.745076	0.857813
	0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.2027476	0.395312	0.42809	0.468362	0.28481255		0.57863	0.653316	0.745076	0.857813
	0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.368632	0.2174216	0.42809	0.468362	0.517841	0.3182465	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.2354495	0.468362	0.517841	0.57863	0.3593238	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.2575991	0.517841	0.57863	0.653316	0.4097918	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.28481255		0.57863	0.653316	0.745076	
	0.47179715		0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388	
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.3182465	0.653316	0.745076	0.857813	0.5479771
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				

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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.3593238	0.745076	0.857813	0.996322
	0.641575	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.4097918	0.857813	0.996322
	1.1665	0.7565635	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.47179715	
	0.996322	1.1665	1.37557	0.897842	1.858	2.172	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.5479771
	1.1665	1.37557	1.63244	1.0219	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	0.641575	1.37557	1.63244	1.858	1.1946	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	0.7565635	1.63244	1.858	2.172	1.3915	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	0.897842	1.858	2.172	2.53	1.6137	3.388				
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				
0.329242	0.1810831	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.0219	2.172	2.53	2.934	1.8634				
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				
0.329242	0.329242	0.19080435		0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813
	0.996322	1.1665	1.37557	1.63244	1.858	1.1946	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.2027476	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	1.3915	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.2174216	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	1.6137	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.2354495	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	1.8634				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.2575991	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.28481255		0.57863	0.653316	0.745076	0.857813
	0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388			
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.3182465	0.653316	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.3593238	0.745076	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				

0.329242	0.1810831	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.4097918	0.857813	0.996322
	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388				
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				
0.329242	0.329242	0.19080435		0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	
	0.47179715		0.996322	1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388	
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				
0.329242	0.329242	0.346917	0.202748	0.395312	0.428090	0.468362	0.517841	0.578630	0.653316	0.745076	0.471797	0.547977
	1.166500	1.375570	1.632440	1.858000	2.172000	2.530000	2.934000	3.388000				

45	# Number of age comp observations
1	# Length bin refers to: 1=population length bin indices; 2=data length bin indices
0	#_combine males into females at or below this bin number

Acoustic survey ages (N=8)

1995	1	2	0	0	23	-1	-1	68	0.000	0.304	0.048	0.014
	0.209	0.012	0.042	0.144	0.003	0.001	0.165	0.001	0.007	0.000	0.051	
1998	1	2	0	0	26	-1	-1	103	0.000	0.125	0.144	0.168
	0.191	0.016	0.076	0.093	0.014	0.028	0.061	0.005	0.003	0.061	0.015	
2001	1	2	0	0	29	-1	-1	57	0.000	0.641	0.104	0.054
	0.060	0.030	0.037	0.022	0.011	0.010	0.008	0.008	0.010	0.002	0.004	
2003	1	2	0	0	31	-1	-1	71	0.000	0.024	0.023	0.635
	0.092	0.031	0.070	0.042	0.028	0.026	0.011	0.007	0.005	0.004	0.004	
2005	1	2	0	0	33	-1	-1	47	0.000	0.229	0.021	0.069
	0.048	0.492	0.053	0.020	0.027	0.016	0.013	0.007	0.002	0.001	0.002	
2007	1	2	0	0	35	-1	-1	70	0.000	0.366	0.022	0.108
	0.013	0.044	0.030	0.334	0.034	0.017	0.014	0.007	0.007	0.003	0.001	
2009	1	2	0	0	37	-1	-1	66	0.000	0.006	0.299	0.421
	0.023	0.082	0.012	0.016	0.015	0.073	0.032	0.013	0.003	0.004	0.002	
2011	1	2	0	0	39	-1	-1	59	0.000	0.244	0.631	0.039
	0.029	0.030	0.004	0.004	0.003	0.002	0.001	0.007	0.003	0.001	0.000	

Aggregate marginal fishery ages (N=37)

1975	1	1	0	0	3	-1	-1	13	0.046	0.338	0.074	0.012
	0.254	0.055	0.080	0.105	0.010	0.006	0.009	0.005	0.000	0.005	0.000	
1976	1	1	0	0	4	-1	-1	142	0.001	0.013	0.145	0.067
	0.041	0.246	0.098	0.089	0.121	0.054	0.043	0.041	0.011	0.024	0.007	
1977	1	1	0	0	5	-1	-1	320	0.000	0.084	0.037	0.275
	0.036	0.091	0.227	0.076	0.065	0.040	0.036	0.023	0.006	0.003	0.001	
1978	1	1	0	0	6	-1	-1	341	0.005	0.011	0.065	0.063
	0.264	0.061	0.089	0.215	0.098	0.047	0.047	0.023	0.005	0.004	0.003	
1979	1	1	0	0	7	-1	-1	116	0.000	0.065	0.102	0.094
	0.057	0.177	0.103	0.174	0.128	0.042	0.029	0.010	0.016	0.000	0.004	
1980	1	1	0	0	8	-1	-1	221	0.001	0.006	0.298	0.019
	0.045	0.081	0.112	0.050	0.089	0.112	0.096	0.026	0.039	0.016	0.011	
1981	1	1	0	0	9	-1	-1	154	0.194	0.041	0.014	0.267
	0.039	0.055	0.034	0.147	0.038	0.032	0.103	0.023	0.005	0.002	0.007	
1982	1	1	0	0	10	-1	-1	170	0.000	0.321	0.035	0.005
	0.273	0.015	0.037	0.039	0.118	0.033	0.036	0.076	0.002	0.003	0.007	
1983	1	1	0	0	11	-1	-1	117	0.000	0.000	0.341	0.040
	0.018	0.235	0.051	0.056	0.053	0.094	0.039	0.031	0.023	0.011	0.007	
1984	1	1	0	0	12	-1	-1	123	0.000	0.000	0.014	0.619
	0.036	0.039	0.168	0.029	0.015	0.012	0.033	0.009	0.006	0.014	0.006	
1985	1	1	0	0	13	-1	-1	56	0.009	0.001	0.003	0.070
	0.675	0.084	0.055	0.069	0.020	0.005	0.007	0.002	0.000	0.000	0.000	
1986	1	1	0	0	14	-1	-1	120	0.000	0.157	0.055	0.005
	0.008	0.432	0.068	0.081	0.083	0.022	0.028	0.018	0.032	0.005	0.006	
1987	1	1	0	0	15	-1	-1	56	0.000	0.000	0.297	0.029
	0.001	0.010	0.531	0.004	0.013	0.071	0.000	0.008	0.019	0.018	0.000	
1988	1	1	0	0	16	-1	-1	81	0.000	0.009	0.000	0.381
	0.010	0.015	0.001	0.395	0.010	0.005	0.112	0.009	0.000	0.000	0.053	
1989	1	1	0	0	17	-1	-1	77	0.000	0.073	0.032	0.003
	0.501	0.016	0.003	0.001	0.321	0.023	0.001	0.023	0.001	0.000	0.000	
1990	1	1	0	0	18	-1	-1	163	0.000	0.053	0.180	0.017
	0.006	0.345	0.003	0.002	0.000	0.321	0.003	0.001	0.060	0.000	0.009	
1991	1	1	0	0	19	-1	-1	160	0.000	0.036	0.209	0.199
	0.025	0.008	0.273	0.012	0.001	0.002	0.188	0.004	0.000	0.037	0.007	

1992	1	1	0	0	20	-1	-1	243	0.005	0.043	0.042	0.131
	0.187	0.022	0.011	0.339	0.008	0.001	0.003	0.180	0.004	0.000	0.024	
1993	1	1	0	0	21	-1	-1	175	0.000	0.011	0.236	0.032
	0.129	0.157	0.015	0.008	0.276	0.007	0.001	0.000	0.116	0.001	0.013	
1994	1	1	0	0	22	-1	-1	234	0.000	0.000	0.030	0.232
	0.012	0.132	0.197	0.010	0.003	0.283	0.001	0.003	0.000	0.088	0.008	
1995	1	1	0	0	23	-1	-1	147	0.002	0.025	0.005	0.058
	0.315	0.018	0.072	0.189	0.024	0.006	0.179	0.030	0.005	0.001	0.071	
1996	1	1	0	0	24	-1	-1	186	0.000	0.184	0.161	0.015
	0.077	0.184	0.009	0.052	0.108	0.004	0.003	0.157	0.000	0.001	0.044	
1997	1	1	0	0	25	-1	-1	222	0.000	0.008	0.278	0.253
	0.009	0.082	0.129	0.022	0.047	0.065	0.014	0.002	0.063	0.005	0.022	
1998	1	1	0	0	26	-1	-1	243	0.000	0.053	0.188	0.204
	0.283	0.032	0.050	0.091	0.010	0.017	0.037	0.003	0.001	0.026	0.005	
1999	1	1	0	0	27	-1	-1	514	0.000	0.095	0.199	0.181
	0.187	0.136	0.028	0.034	0.036	0.009	0.014	0.040	0.004	0.003	0.035	
2000	1	1	0	0	28	-1	-1	529	0.010	0.044	0.094	0.147
	0.134	0.210	0.137	0.067	0.047	0.027	0.020	0.022	0.011	0.008	0.024	
2001	1	1	0	0	29	-1	-1	541	0.000	0.167	0.153	0.236
	0.174	0.081	0.078	0.048	0.012	0.013	0.012	0.007	0.007	0.005	0.009	
2002	1	1	0	0	30	-1	-1	450	0.000	0.000	0.500	0.148
	0.104	0.057	0.039	0.064	0.046	0.007	0.007	0.012	0.002	0.004	0.009	
2003	1	1	0	0	31	-1	-1	457	0.000	0.001	0.012	0.691
	0.115	0.035	0.049	0.031	0.026	0.022	0.007	0.003	0.005	0.002	0.003	
2004	1	1	0	0	32	-1	-1	501	0.000	0.000	0.046	0.061
	0.690	0.084	0.022	0.044	0.025	0.011	0.009	0.003	0.002	0.002	0.001	
2005	1	1	0	0	33	-1	-1	613	0.000	0.006	0.004	0.066
	0.053	0.690	0.083	0.023	0.028	0.022	0.011	0.010	0.002	0.001	0.002	
2006	1	1	0	0	34	-1	-1	720	0.003	0.028	0.105	0.018
	0.089	0.052	0.588	0.054	0.015	0.022	0.011	0.008	0.004	0.001	0.001	
2007	1	1	0	0	35	-1	-1	629	0.008	0.114	0.037	0.152
	0.015	0.071	0.039	0.450	0.057	0.019	0.018	0.008	0.003	0.006	0.003	
2008	1	1	0	0	36	-1	-1	794	0.008	0.090	0.303	0.023
	0.150	0.011	0.037	0.033	0.286	0.030	0.010	0.008	0.004	0.003	0.004	
2009	1	1	0	0	37	-1	-1	686	0.007	0.005	0.287	0.270
	0.030	0.109	0.010	0.024	0.019	0.181	0.034	0.008	0.012	0.002	0.003	
2010	1	1	0	0	38	-1	-1	873	0.000	0.240	0.032	0.368
	0.216	0.025	0.030	0.007	0.007	0.011	0.049	0.012	0.001	0.001	0.002	
2011	1	1	0	0	39	-1	-1	802	0.013	0.054	0.654	0.032
	0.097	0.074	0.017	0.012	0.005	0.004	0.006	0.021	0.004	0.003	0.003	

0 # No Mean size-at-age data
0 # Total number of environmental variables
0 # Total number of environmental observations
0 # No Weight frequency data
0 # No tagging data
0 # No morph composition data

999 # End data file

##
2012 Hake control file
##

1 # N growth patterns
1 # N sub morphs within patterns
0 # Number of block designs for time varying parameters

Mortality and growth specifications
0.5 # Fraction female (birth)
0 # M setup: 0=single parameter,1=breakpoints,2=Lorenzen,3=age-specific;4=age-specific,seasonal interpolation
1 # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
1 # Age for growth Lmin
20 # Age for growth Lmax
0.0 # Constant added to SD of LAA (0.1 mimics SS2v1 for compatibility only)
0 # Variability of growth: 0=CV~f(LAA), 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)

```
5	#_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity; 5=read
fec and wt from wtatage.ss
2	# First age allowed to mature
1	# Fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0	# Hermaphroditism option:  0=none; 1=age-specific fxn
1	# MG parm offset option: 1=none, 2= M,G,CV_G as offset from GP1, 3=like SS2v1
1	# MG parm env/block/dev_adjust_method: 1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no bound
check

# Lo	Hi	Init	Prior	Prior	Prior	Param	Env	Use	Dev	Dev	Dev	Block
	block
# bnd	bnd value mean	type	SD	phase	var	dev	minyr	maxyr	SD	design	switch
 0.05 0.4 0.2	-1.609438 3	0.1	4	0	0	0	0	0	0	0
	# M

### Growth parameters ignored in empirical input approach
2	15	5	32	-1	99	-5	0	0	0	0	0	0
	0	# A0
45	60	53.2	50	-1	99	-3	0	0	0	0	0	0
	0	# Linf
0.2	0.4	0.30	0.3	-1	99	-3	0	0	0	0	0	0
	0	# VBK
0.03	0.16	0.066	0.1	-1	99	-5	0	0	0	0	0	0
	0	# CV of length at age 0
0.03	0.16	0.062	0.1	-1	99	-5	0	0	0	0	0	0
	0	# CV of length at age inf
# W-L, maturity and fecundity parameters
# Female placeholders
-3	3	7.0E-06	7.0E-06	-1	99	-50	0	0	0	0	0	0
	0	# F W-L slope
-3	3	2.9624	2.9624	-1	99	-50	0	0	0	0	0	0
	0	# F W-L exponent
# Maturity from 2010 assessment
-3	43	36.89	36.89	-1	99	-50	0	0	0	0	0	0
	0	# L at 50% maturity
-3	3	-0.48	-0.48	-1	99	-50	0	0	0	0	0	0
	0	# F Logistic maturity slope
# No fecundity relationship
-3	3	1.0	1.0	-1	99	-50	0	0	0	0	0	0
	0	# F Eggs/gm intercept
-3	3	0.0	0.0	-1	99	-50	0	0	0	0	0	0
	0	# F Eggs/gm slope
# Unused recruitment interactions
0	2	1	1	-1	99	-50	0	0	0	0	0	0
	0	# placeholder only
0	2	1	1	-1	99	-50	0	0	0	0	0	0
	0	# placeholder only
0	2	1	1	-1	99	-50	0	0	0	0	0	0
	0	# placeholder only
0	2	1	1	-1	99	-50	0	0	0	0	0	0
	0	# placeholder only
0 0 0 0 0 0 0 0 0 0 # Unused MGparm_seas_effects

# Spawner-recruit parameters
3 # S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no steepness or bias adjustment
# Lo	Hi	Init	Prior	Prior	Prior	Param
# bnd	bnd	value	mean	type	SD	phase
13	17	15.9	15	-1	99	1	# Ln(R0)
0.2	1	0.88	0.777	2	0.113	4	# Steepness with Myers' prior
1.0	1.6	1.4	1.1	-1	99	-6	# Sigma-R
-5	5	0	0	-1	99	-50	# Env link coefficient
-5	5	0	0	-1	99	-50	# Initial equilibrium recruitment offset
 0	2	0	1	-1	99	-50	# Autocorrelation in rec devs
0 # index of environmental variable to be used
0 # SR environmental target: 0=none;1=devs;_2=R0;_3=steepness
1 # Recruitment deviation type: 0=none; 1=devvector; 2=simple deviations
```

```
# Recruitment deviations
1970        # Start year standard recruitment devs
2007        # End year standard recruitment devs
1           # Rec Dev phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
1946        # Start year for early rec devs
3           # Phase for early rec devs
5           # Phase for forecast recruit deviations
1           # Lambda for forecast recr devs before endyr+1
1965        # Last recruit dev with no bias_adjustment
1971        # First year of full bias correction (linear ramp from year above)
2008        # Last year for full bias correction in_MPD
2009        # First_recent_yr_nobias_adj_in_MPD
0.86        # Maximum bias adjustment in MPD
0           # Period of cycles in recruitment (N parms read below)
-6          # Lower bound rec devs
6           # Upper bound rec devs
0           # Read init values for rec devs

# Fishing mortality setup
0.1         # F ballpark for tuning early phases
-1999       # F ballpark year
1           # F method:  1=Pope's; 2=Instan. F; 3=Hybrid
0.95        # Max F or harvest rate (depends on F_Method)

# Init F parameters by fleet
#LO    HI    INIT    PRIOR    PR_type    SD    PHASE
0      1     0.0     0.01     -1         99     -50

# Catchability setup
# A=do power: 0=skip, survey is prop. to abundance, 1= add par for non-linearity
# B=env. link: 0=skip, 1= add par for env. effect on Q
# C=extra SD: 0=skip, 1= add par. for additive constant to input SE (in ln space)
# D=type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean unbiased, 2=estimate par for ln(Q)
#             3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
# A B C D
# Create one par for each entry > 0 by row in cols A-D
0      0      0      0      # US_Foreign
0      0      1      0      # Acoustic_Survey

#LO       HI       INIT     PRIOR    PR_type    SD     PHASE
0.05 1.2  0.0755   0.0755   -1       0.1         4 # additive value for acoustic survey

#_SELEX_&_RETENTION_PARAMETERS
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes
# D=Extra input (#)
# A B C D
# Size selectivity
0      0      0      0  # Fishery
0      0      0      0  # Acoustic_Survey
# Age selectivity
17     0      0      20  # Fishery
17     0      0      20  # Acoustic_Survey

# Selectivity parameters
# Lo    Hi     Init    Prior   Prior   Prior   Param   Env   Use   Dev     Dev     Dev   Block
        block
# bnd   bnd    value   mean    type    SD      phase   var   dev   minyr   maxyr   SD    design
        switch
# Fishery age-based
 -1002  3      -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 0
 -1     1       0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Age 1 is Reference
 -5     9       2.8    -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 2
```

```
 -5      9       0.1     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 3
 -5      9       0.1     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 4
 -5      9       0.1     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 5
 -5      9       0.0     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 6
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 7
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 8
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 9
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 10
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 11
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 12
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 13
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 14
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 15
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 16
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 17
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 18
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 19
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 20

# Acoustic survey - nonparametric age-based selectivity
# Acoustic Survey double non-parametric age-based selectivity
 -1002   3       -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 0
 -1002   3       -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 1
 -1      1       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Age 2 is reference
 -5      9       0.1     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 3
 -5      9       0.1     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 4
 -5      9       0.0     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 5
 -5      9       0.0     -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 6
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 7
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 8
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 9
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 10
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 11
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 12
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 13
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 14
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 15
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 16
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 17
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 18
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 19
 -5      9       0.0     -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 20

0 # Tagging flag: 0=no tagging parameters,1=read tagging parameters

### Likelihood related quantities ###
1 # Do variance/sample size adjustments by fleet (1)
# # Component
 0    0   # Constant added to index CV
 0    0   # Constant added to discard SD
 0    0   # Constant added to body weight SD
 1    1   # multiplicative scalar for length comps
 0.12 0.94 # multiplicative scalar for agecomps
 1    1   # multiplicative scalar for length at age obs


1          # Lambda phasing: 1=none, 2+=change beginning in phase 1
1          # Growth offset likelihood constant for Log(s): 1=include, 2=not
0 # N changes to default Lambdas = 1.0
# Component codes:
#  1=Survey, 2=discard, 3=mean body weight
#  4=length frequency, 5=age frequency, 6=Weight frequency
#  7=size at age, 8=catch, 9=initial equilibrium catch
#  10=rec devs, 11=parameter priors, 12=parameter devs
#  13=Crash penalty
# Component fleet/survey  phase  value  wtfreq_method
```

```
1	# Extra SD reporting switch
2  2 -1 15 # selex type (fleet), len=1/age=2, year, N selex bins (4 values)
1  1	# Growth pattern, N growth ages (2 values)
1 -1  1	# NatAge_area(-1 for all), NatAge_yr, N Natages (3 values)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 # placeholder for vector of selex bins to be reported
-1 # growth ages
-1 # NatAges

999 # End control file

# 2012 hake model forecast file

1	# Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2	# MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.4	# SPR target (e.g. 0.40)
0.4	# Biomass target (e.g. 0.40)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
-999 -999 -999 -999 -999 -999 # Bmark_years: beg_bio end_bio beg_selex end_selex beg_alloc end_alloc
2	# Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
1	# Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (use first-last alloc yrs); 5=input annual F
3	# N forecast years
1.0	# F scalar (only used for Do_Forecast==5)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
2006 2011 2006 2011 # Fcast_years:  beg_selex end_selex beg_alloc end_alloc
1	# Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4	# Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1	# Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1.0	# Control rule target as fraction of Flimit (e.g. 0.75)
3	# N forecast loops (1-3) (fixed at 3 for now)
3	# First forecast loop with stochastic recruitment (fixed at 3 for now)
-1	# Forecast loop control #3 (reserved)
0	#_Forecast loop control #4 (reserved for future bells&whistles)
0	#_Forecast loop control #5 (reserved for future bells&whistles)
2011	# FirstYear for caps and allocations (should be after any fixed inputs)
0.0	# stddev of log(realized catch/target catch) in forecast
0	# Do West Coast gfish rebuilder output (0/1)
1999	# Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2002	# Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
1	# fleet relative F:  1=use first-last alloc year; 2=read seas(row) x fleet(col) below
2	# basis for fcast catch tuning and for fcast catch caps and allocation  (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
-1	# max totalcatch by fleet (-1 to have no max)
-1	# max totalcatch by area (-1 to have no max)
1	# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
# assign fleets to groups
1.0
# allocation fraction for each of: 2 allocation groups
3 # Number of forecast catch levels to input (else calc catch from forecast F)
2 # basis for input Fcast catch:  2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits; note new codes in SSV3.20)
2012	1	1	274024
2013	1	1	282668
2014	1	1	283845
999 # verify end of input

# 2012 hake starter file

2012_hake_data.SS    # Data file
2012_hake_control.SS # Control file

0	# Read initial values from .par file: 0=no,1=yes
0	# DOS display detail: 0,1,2
2	# Report file detail: 0,1,2
0	# Detailed checkup.sso file (0,1)
0	# Write parameter iteration trace file during minimization
0	# Write cumulative report: 0=skip,1=short,2=full
0	# Include prior likelihood for non-estimated parameters
0	# Use Soft Boundaries to aid convergence (0,1) (recommended)
1	# N bootstrap datafiles to create
```

```
25        # Last phase for estimation
1         # MCMC burn-in
1         # MCMC thinning interval
0         # Jitter initial parameter values by this fraction
-1        # Min year for spbio sd_report (neg val = styr-2, virgin state)
-2        # Max year for spbio sd_report (neg val = endyr+1)
0         # N individual SD years
0.00001 # Ending convergence criteria
0         # Retrospective year relative to end year
3         # Min age for summary biomass
1         # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1.0       # Fraction (X) for Depletion denominator (e.g. 0.4)
1         # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1         # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0         # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker
```

11. Appendix D. CCAM model input files

CCAM data input file for all model cases.

```
#NB The data herein were taken from the 2010 Pacific Hake Assessment using TINSS.
## ________________________
## ____Model Dimensions____
1966			#first year of data
2011			#last year of data
1				#age of youngest age class
15				#age of plus group
2				#number of gears (ngear)
## Allocation for fishery selectivity (1) or survey (0) in ngears
1	0
## ________________________
#
## ________________________
#Age-schedule and population parameters
#natural mortality rate (m)
0.23
#growth parameters (linf,k,to)
52.948, 0.334, 0
#length-weight allometry (a,b)
6.5359e-6, 2.98684
#ah and gh: maturity at age (am=log(3)/k) & gm=std for logistic
2.721, 0.488
## ________________________

#Time series data
#Observed catch (1977-2009, 1,000,000 metric t)
#yr	commercial survey
1966	0.137700	0
1967	0.214370	0
1968	0.122180	0
1969	0.180130	0
1970	0.234590	0
1971	0.154620	0
1972	0.117540	0
1973	0.162640	0
1974	0.211260	0
1975	0.221350	0
1976	0.237520	0
1977	0.132690	0
1978	0.103640	0
1979	0.137110	0
1980	0.089930	0
1981	0.139120	0
1982	0.107741	0
1983	0.113931	0
1984	0.138492	0
1985	0.110399	0
1986	0.210616	0
1987	0.234148	0
1988	0.248840	0
1989	0.298079	0
1990	0.261286	0
1991	0.319710	0
1992	0.299687	0
1993	0.198924	0
1994	0.362422	0
1995	0.249644	0
1996	0.306383	0
1997	0.325257	0
1998	0.320815	0
1999	0.311844	0
2000	0.228214	0
2001	0.227531	0
```

```
2002	0.180698	0
2003	0.205177	0
2004	0.338654	0
2005	0.363157	0
2006	0.361761	0
2007	0.291129	0
2008	0.322145	0
2009	0.177459	0
2010	0.226202	0
2011	0.286055	0
#
#Relative Abundance index from fisheries independent survey (it) 1970-2008
#nit
1
#nit_nobs
8
#survey type
## 1 = survey is proportional to vulnerable numbers
## 2 = survey is proportional to vulnerable biomass
## 3 = survey is proportional to spawning biomass (e.g., herring spawn survey)
2
#iyr	it	gear it_wt survey timing
1995	1.517948	2	0.7376	0.5
1998	1.342740	2	1.0000	0.5
2001	0.918622	2	0.5971	0.5
2003	2.520641	2	0.6930	0.5
2005	1.754722	2	0.5795	0.5
2007	1.122809	2	0.6534	0.5
2009	1.612027	2	0.3562	0.5
2011	0.553991	2	0.5125	0.5
##Note about survey it_wt
##it_wt is the inverse of the relative CV in the survey index (relative to the 1998 (smallest) CV)
##relative CVs in survey index points assumed multiplicative
##iscam estimates varphi and rho
##varphi is the inverse of the total standard deviation (observation error in index of abundance + process error)
##rho is the proportion of total sd that is observation error
##sig = standard deviation of log residuals in survey index (residuals modelled as lognormal)
##tau = standard deviation of log recruitment residuals (residuals modelled as lognormal)
##sig = (rho/varphi)/it_wt;
##tau = (1.-rho)/varphi;
#
#Age composition data by year, gear (ages 2-15+)
#na_gears
2
#na_nobs
37	8
#a_sage
1	2
#a_page
15	15
#comm catch age - not normalised
#yr	gear	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14
1975	1	0.0460	0.3380	0.0740	0.0120	0.2540	0.0550	0.0800	0.1050	0.0100	0.0060	0.0090
	0.0050	0.0000	0.0050	0.0000
1976	1	0.0010	0.0130	0.1450	0.0670	0.0410	0.2460	0.0980	0.0890	0.1210	0.0540	0.0430
	0.0410	0.0110	0.0240	0.0070
1977	1	0.0000	0.0840	0.0370	0.2750	0.0360	0.0910	0.2270	0.0760	0.0650	0.0400	0.0360
	0.0230	0.0060	0.0030	0.0010
1978	1	0.0050	0.0110	0.0650	0.0630	0.2640	0.0610	0.0890	0.2150	0.0980	0.0470	0.0470
	0.0230	0.0050	0.0040	0.0030
1979	1	0.0000	0.0650	0.1020	0.0940	0.0570	0.1770	0.1030	0.1740	0.1280	0.0420	0.0290
	0.0100	0.0160	0.0000	0.0040
1980	1	0.0010	0.0060	0.2980	0.0190	0.0450	0.0810	0.1120	0.0500	0.0890	0.1120	0.0960
	0.0260	0.0390	0.0160	0.0110
1981	1	0.1940	0.0410	0.0140	0.2670	0.0390	0.0550	0.0340	0.1470	0.0380	0.0320	0.1030
	0.0230	0.0050	0.0020	0.0070
```

1982	1	0.0000	0.3210	0.0350	0.0050	0.2730	0.0150	0.0370	0.0390	0.1180	0.0330	0.0360
	0.0760	0.0020	0.0030	0.0070								
1983	1	0.0000	0.0000	0.3410	0.0400	0.0180	0.2350	0.0510	0.0560	0.0530	0.0940	0.0390
	0.0310	0.0230	0.0110	0.0070								
1984	1	0.0000	0.0000	0.0140	0.6190	0.0360	0.0390	0.1680	0.0290	0.0150	0.0120	0.0330
	0.0090	0.0060	0.0140	0.0060								
1985	1	0.0090	0.0010	0.0030	0.0700	0.6750	0.0840	0.0550	0.0690	0.0200	0.0050	0.0070
	0.0020	0.0000	0.0000	0.0000								
1986	1	0.0000	0.1570	0.0550	0.0050	0.0080	0.4320	0.0680	0.0810	0.0830	0.0220	0.0280
	0.0180	0.0320	0.0050	0.0060								
1987	1	0.0000	0.0000	0.2970	0.0290	0.0010	0.0100	0.5310	0.0040	0.0130	0.0710	0.0000
	0.0080	0.0190	0.0180	0.0000								
1988	1	0.0000	0.0090	0.0000	0.3810	0.0100	0.0150	0.0010	0.3950	0.0100	0.0050	0.1120
	0.0090	0.0000	0.0000	0.0530								
1989	1	0.0000	0.0730	0.0320	0.0030	0.5010	0.0160	0.0030	0.0010	0.3210	0.0230	0.0010
	0.0230	0.0010	0.0000	0.0000								
1990	1	0.0000	0.0530	0.1800	0.0170	0.0060	0.3450	0.0030	0.0020	0.0000	0.3210	0.0030
	0.0010	0.0600	0.0000	0.0090								
1991	1	0.0000	0.0360	0.2090	0.1990	0.0250	0.0080	0.2730	0.0120	0.0010	0.0020	0.1880
	0.0040	0.0000	0.0370	0.0070								
1992	1	0.0050	0.0430	0.0420	0.1310	0.1870	0.0220	0.0110	0.3390	0.0080	0.0010	0.0030
	0.1800	0.0040	0.0000	0.0240								
1993	1	0.0000	0.0110	0.2360	0.0320	0.1290	0.1570	0.0150	0.0080	0.2760	0.0070	0.0010
	0.0000	0.1160	0.0010	0.0130								
1994	1	0.0000	0.0000	0.0300	0.2320	0.0120	0.1320	0.1970	0.0100	0.0030	0.2830	0.0010
	0.0030	0.0000	0.0880	0.0080								
1995	1	0.0020	0.0250	0.0050	0.0580	0.3150	0.0180	0.0720	0.1890	0.0240	0.0060	0.1790
	0.0300	0.0050	0.0010	0.0710								
1996	1	0.0000	0.1840	0.1610	0.0150	0.0770	0.1840	0.0090	0.0520	0.1080	0.0040	0.0030
	0.1570	0.0000	0.0010	0.0440								
1997	1	0.0000	0.0080	0.2780	0.2530	0.0090	0.0820	0.1290	0.0220	0.0470	0.0650	0.0140
	0.0020	0.0630	0.0050	0.0220								
1998	1	0.0000	0.0530	0.1880	0.2040	0.2830	0.0320	0.0500	0.0910	0.0100	0.0170	0.0370
	0.0030	0.0010	0.0260	0.0050								
1999	1	0.0000	0.0950	0.1990	0.1810	0.1870	0.1360	0.0280	0.0340	0.0360	0.0090	0.0140
	0.0400	0.0040	0.0030	0.0350								
2000	1	0.0100	0.0440	0.0940	0.1470	0.1340	0.2100	0.1370	0.0670	0.0470	0.0270	0.0200
	0.0220	0.0110	0.0080	0.0240								
2001	1	0.0000	0.1670	0.1530	0.2360	0.1740	0.0810	0.0780	0.0480	0.0120	0.0130	0.0120
	0.0070	0.0070	0.0050	0.0090								
2002	1	0.0000	0.0000	0.5000	0.1480	0.1040	0.0570	0.0390	0.0640	0.0460	0.0070	0.0070
	0.0120	0.0020	0.0040	0.0090								
2003	1	0.0000	0.0010	0.0120	0.6910	0.1150	0.0350	0.0490	0.0310	0.0260	0.0220	0.0070
	0.0030	0.0050	0.0020	0.0030								
2004	1	0.0000	0.0000	0.0460	0.0610	0.6900	0.0840	0.0220	0.0440	0.0250	0.0110	0.0090
	0.0030	0.0020	0.0020	0.0010								
2005	1	0.0000	0.0060	0.0040	0.0660	0.0530	0.6900	0.0830	0.0230	0.0280	0.0220	0.0110
	0.0100	0.0020	0.0010	0.0020								
2006	1	0.0030	0.0280	0.1050	0.0180	0.0890	0.0520	0.5880	0.0540	0.0150	0.0220	0.0110
	0.0080	0.0040	0.0010	0.0010								
2007	1	0.0080	0.1140	0.0370	0.1520	0.0150	0.0710	0.0390	0.4500	0.0570	0.0190	0.0180
	0.0080	0.0030	0.0060	0.0030								
2008	1	0.0080	0.0900	0.3030	0.0230	0.1500	0.0110	0.0370	0.0330	0.2860	0.0300	0.0100
	0.0080	0.0040	0.0030	0.0040								
2009	1	0.0070	0.0050	0.2870	0.2700	0.0300	0.1090	0.0100	0.0240	0.0190	0.1810	0.0340
	0.0080	0.0120	0.0020	0.0030								
2010	1	0.0000	0.2400	0.0320	0.3680	0.2160	0.0250	0.0300	0.0070	0.0070	0.0110	0.0490
	0.0120	0.0010	0.0010	0.0020								
2011	1	0.0130	0.0540	0.6540	0.0320	0.0970	0.0740	0.0170	0.0120	0.0050	0.0040	0.0060
	0.0210	0.0040	0.0030	0.0030								
#												
1995	2	0.3040	0.0480	0.0140	0.2090	0.0120	0.0420	0.1440	0.0030	0.0010	0.1650	0.0010
	0.0070	0.0000	0.0510									
1998	2	0.1250	0.1440	0.1680	0.1910	0.0160	0.0760	0.0930	0.0140	0.0280	0.0610	0.0050
	0.0030	0.0610	0.0150									
2001	2	0.6410	0.1040	0.0540	0.0600	0.0300	0.0370	0.0220	0.0110	0.0100	0.0080	0.0080
	0.0100	0.0020	0.0040									

2003 2 0.0240 0.0230 0.6350 0.0920 0.0310 0.0700 0.0420 0.0280 0.0260 0.0110 0.0070
0.0050 0.0040 0.0040
2005 2 0.2290 0.0210 0.0690 0.0480 0.4920 0.0530 0.0200 0.0270 0.0160 0.0130 0.0070
0.0020 0.0010 0.0020
2007 2 0.3660 0.0220 0.1080 0.0130 0.0440 0.0300 0.3340 0.0340 0.0170 0.0140 0.0070
0.0070 0.0030 0.0010
2009 2 0.0060 0.2990 0.4210 0.0230 0.0820 0.0120 0.0160 0.0150 0.0730 0.0320 0.0130
0.0030 0.0040 0.0020
2011 2 0.2440 0.6310 0.0390 0.0290 0.0300 0.0040 0.0040 0.0030 0.0020 0.0010 0.0070
0.0030 0.0010 0.0000
#n_wt_obs
46
#Year wa (kg)
1966 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1967 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1968 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1969 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1970 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1971 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1972 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1973 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1974 0.0885 0.2562 0.3799 0.4913 0.5434 0.5906 0.662 0.7215 0.791 0.8629 0.9315 0.9681
1.0751 1.0016 1.0202
1975 0.1575 0.2987 0.3658 0.6143 0.6306 0.7873 0.8738 0.9678 0.9075 0.9700 1.6933 1.5000
1.9000 1.9555 2.7445
1976 0.0986 0.2359 0.4973 0.5188 0.6936 0.8041 0.9166 1.2097 1.3375 1.4498 1.6532 1.8066
1.8588 1.9555 2.7445
1977 0.2286 0.4021 0.4870 0.5902 0.6650 0.7493 0.8267 0.9781 1.1052 1.2349 1.3148 1.4058
1.7511 2.0367 2.2094
1978 0.1026 0.1360 0.4699 0.5300 0.6027 0.6392 0.7395 0.8391 0.9775 1.0971 1.2349 1.3028
1.4814 1.7419 2.3379
1979 0.0913 0.2410 0.2587 0.5821 0.6868 0.7677 0.8909 0.9128 1.0369 1.1987 1.2482 1.5326
1.5520 1.7950 1.9817
1980 0.0800 0.2236 0.4529 0.3922 0.4904 0.5166 0.6554 0.7125 0.8740 1.0616 1.1623 1.2898
1.3001 1.2699 1.3961
1981 0.1079 0.2137 0.3422 0.5264 0.3933 0.5254 0.5462 0.7464 0.7204 0.8231 1.0413 1.0989
1.3449 1.4926 1.2128
1982 0.1183 0.2465 0.3336 0.3097 0.5496 0.3956 0.5275 0.5629 0.7606 0.6837 0.8539 1.0670
0.8793 1.0186 1.1693
1983 0.1287 0.1357 0.3410 0.3694 0.3277 0.5200 0.5028 0.6179 0.7060 0.8800 0.9299 1.0356
1.0310 1.3217 1.4823
1984 0.1315 0.1642 0.2493 0.4385 0.4113 0.4352 0.5872 0.5802 0.6758 0.7010 0.9513 1.1364
1.0258 1.2807 1.8800
1985 0.1740 0.2297 0.2679 0.4414 0.5497 0.5474 0.6014 0.7452 0.6933 0.7231 0.8584 0.8698
0.9458 0.6759 1.1217
1986 0.1555 0.2771 0.2909 0.3024 0.3735 0.5425 0.5717 0.6421 0.8209 0.9403 1.1860 1.1900
1.3864 1.6800 1.6142
1987 0.1478 0.1388 0.3790 0.2786 0.2870 0.3621 0.5775 0.5975 0.6369 0.7638 0.9820 0.9250
1.2407 1.2031 1.4157
1988 0.1400 0.1870 0.3189 0.4711 0.3689 0.3731 0.5163 0.6474 0.6851 0.7183 0.9167 1.0924
1.0225 1.4500 1.4537
1989 0.1389 0.2737 0.3047 0.2931 0.5134 0.4386 0.4064 0.5167 0.6263 0.6611 0.6027 0.8758
0.6686 0.8282 1.1264
1990 0.1378 0.2435 0.3506 0.3906 0.5111 0.5462 0.6076 0.6678 0.5300 0.7691 0.8313 2.2000
1.1847 1.0166 1.4668
1991 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437 0.5907 0.7210 0.8497 1.0997 0.7185 0.6403
1.0174 1.2051 2.3828
1992 0.1356 0.2316 0.3473 0.4743 0.5334 0.5817 0.6210 0.6406 0.6530 0.6330 0.7217 0.7354
0.8501 0.9750 1.0272

1993	0.1274	0.2486	0.3384	0.3960	0.4539	0.4935	0.5017	0.4880	0.5491	0.5100	1.2630	1.0250
	0.6135	0.5995	0.6850									
1994	0.1191	0.3000	0.3626	0.4469	0.4473	0.5262	0.5700	0.6218	0.5598	0.6341	0.4850	0.6491
	0.7300	0.7013	0.7455									
1995	0.1108	0.2682	0.3418	0.4876	0.5367	0.6506	0.6249	0.6597	0.7560	0.6670	0.7442	0.7998
	0.9101	0.6804	0.8008									
1996	0.1007	0.2876	0.3982	0.4674	0.5317	0.5651	0.6509	0.5957	0.6362	0.6049	0.7500	0.6756
	0.8109	1.4853	0.7509									
1997	0.0906	0.3555	0.4322	0.4931	0.5476	0.5453	0.5833	0.5855	0.6071	0.6315	0.8633	0.5946
	0.7118	0.6618	0.8693									
1998	0.0805	0.2091	0.3539	0.5041	0.5172	0.5420	0.6412	0.6099	0.6769	0.8078	0.7174	0.8100
	0.7733	0.7510	0.7714									
1999	0.1352	0.2502	0.3455	0.4251	0.5265	0.5569	0.5727	0.6117	0.7030	0.6650	0.7989	0.7554
	0.8787	0.7348	0.8187									
2000	0.1899	0.3216	0.4729	0.5766	0.6598	0.7176	0.7279	0.7539	0.8378	0.8159	0.8814	0.8554
	0.9391	0.8744	0.9336									
2001	0.0512	0.2867	0.4843	0.6527	0.6645	0.7469	0.8629	0.8555	0.8802	0.9630	0.9790	1.0054
	1.0494	0.9927	0.9768									
2002	0.0756	0.3583	0.4575	0.6058	0.8160	0.7581	0.8488	0.9771	0.9322	0.9176	0.9974	0.9890
	0.9236	1.1250	1.0573									
2003	0.1000	0.2551	0.4355	0.5225	0.5879	0.7569	0.6915	0.7469	0.8246	0.7692	0.8887	0.9266
	0.7894	0.8414	0.9965									
2004	0.1081	0.2577	0.4360	0.4807	0.5319	0.6478	0.7068	0.6579	0.7094	0.8050	0.8581	0.7715
	0.9704	0.8631	0.8959									
2005	0.1162	0.2603	0.4311	0.5086	0.5393	0.5682	0.6336	0.6550	0.7027	0.7962	0.8104	0.8109
	0.7602	1.1449	0.9678									
2006	0.1324	0.3831	0.4575	0.5341	0.5740	0.5910	0.5979	0.6560	0.6997	0.7259	0.7220	0.7753
	0.6580	0.6399	0.9550									
2007	0.0461	0.2272	0.3776	0.5352	0.5530	0.6073	0.6328	0.6475	0.7055	0.7723	0.7627	0.8137
	0.8702	0.8008	0.8698									
2008	0.1403	0.2445	0.4081	0.5630	0.6371	0.6865	0.6818	0.7084	0.7210	0.7488	0.8073	0.8483
	0.7755	0.8834	0.8332									
2009	0.0667	0.2448	0.3431	0.4712	0.6371	0.6702	0.6942	0.7463	0.8226	0.7672	0.8115	1.0147
	0.8503	0.9582	1.0334									
2010	0.1089	0.2325	0.2535	0.4335	0.5293	0.6577	0.8349	1.0828	1.0276	0.9409	0.8763	0.8373
	1.1253	0.7200	0.9021									
2011	0.0796	0.2399	0.3185	0.3822	0.5134	0.5863	0.6674	0.8199	0.8760	0.9199	1.0508	0.9844
	0.9878	0.9877	0.8909									

```
#
 #eof
999
```

Control File for CCAM Base

```
## _______________________________________________________________________ ##
##                    PACIFIC HAKE CONTROLS
## __________________CONTROLS FOR ESTIMATED PARAMETERS______________________ ##
##  Prior descriptions:
##              -0 uniform (0,0)
##              -1 normal (p1=mu,p2=sig)
##              -2 lognormal (p1=log(mu),p2=sig)
##              -3 beta (p1=alpha,p2=beta)
##              -4 gamma(p1=alpha,p2=beta)
## _______________________________________________________________________ ##
7   ## npar

#2012 Management oriented priors
##  ival     lb     ub     phz    prior    p1     p2     parameter name
## _______________________________________________________________________ ##
#0.2        0.01       3.00       1          2          -1.609438  0.5        #msy -1.609438  0.133939
#0.35       0.01       3.00       1          2          -1.049822  0.4        #fmsy
#-1.481141     -5.0    0.0     2     1      -1.609438  0.1    #log.m   #-1.481141
#1.163151       -5.0    15           1      0      -5.0    15     #log_avgrec
#1.163151       -5.0    15           1    0       -5.0    15     #log_recinit
##0.2      0.001   0.999    3      3      12.0    52.8    #rho
##1.25      0.01    10.     3      4      39.0625 62.5  #varphi (precision)
#0.15       0.01         0.999       4     3      3.0    12.0    #rho
#1.25      0.01          150.         3     4      7.49836 5.78354    #varphi (precision)  (RF Change - SJDM had called this kappa)
```

```
##0.223412                    0.05       0.9                   -1          2           -1.609438  0.1 #m


#Original iscam biological oriented priors
## ______________________________________________________________________________ ##

##  ival      lb     ub     phz    prior   p1     p2     parameter name
## ______________________________________________________________________________ ##
1.9       -1.0    4      1      0      -1.    4.    #log_ro  priors - see SS_ro_prior.xls
0.77      0.2    1.0     1      3      9.766627      2.803034      #steepness  a and b parameters approximate prior from SS - see Betapars.r
-1.609438    -5.0   0.0     2      1      -1.609438  0.2  #log.m
1.9       -5.0    15      1      0      -5.0    15     #log_avgrec
1.9       -5.0    15      1     0       -5.0    15    #log_recinit
0.15       0.01          0.999       4      3      3.0    12.0   #rho
1.25      0.01          150.        3      4      7.49836 5.78354    #varphi (precision)  (RF Change - SJDM had called this kappa)
## ______________________________________________________________________________ ##



## _________________________SELECTIVITY PARAMETERS_____________________________ ##
## OPTIONS FOR SELECTIVITY:
##      1) logistic selectivity parameters
##      2) selectivity coefficients
##      3) a constant cubic spline with age-nodes
##      4) a time varying cubic spline with age-nodes
##      5) a time varying bicubic spline with age & year nodes.
##      6) fixed logistic (set isel_type=1, and estimation phase is set to -1 in tpl (ie estimation phase below is ignored))
## Gear 1 fishery:  Gear 2 survey
## isel_type
1           1
## Age at 50% selectivity (logistic) ahat
#4.          4.5
#4.82102   4.5
3.5          3.5
## STD at 50% selectivity (logistic) ghat
#1.1         0.5
#1.31762   2.1
0.45         0.45
## No. of age nodes for each gear (0 to ignore).
3            0
## No. of year nodes for each gear (0 to ignore).
5            0
## Estimation phase - any negative number means it is fixed!
1            1
## Penalty weight for 2nd differences w=1/(2*sig^2)
150.0        200.0
## Penalty weight for dome-shaped selectivity 1=1/(2*sig^2)
50.0         200.0
#GAMMA prior for  STD at 50% selectivity (logistic) ghat for SURVEY
#prior type (4=gamma)   par1     par2         switch
#ghat_p1 ghat_p2 ghat_pswitch
2.           4.           0

## ______________________________________________________________________________ ##
## ______________________________________________________________________________ ##
##                       Priors for Survey q                         ##
## ______________________________________________________________________________ ##
## nits  #number of surveys
1
## priors 0=uniform density     1=normal density
1
## prior log(mean);
0
## prior sd
0.1
## ______________________________________________________________________________ ##
```

```
## _______________________OTHER MISCELLANEOUS CONTROLS cntrl_________________________ ##
0         ## 1 verbose ADMB output (0=off, 1=on)
1          ## 2 recruitment model (1=beverton-holt, 2=ricker)
0.05       ## 3 std in observed catches in first phase.
0.01       ## 4 std in observed catches in last phase.
0          ## 5 Assume unfished in first year (0=FALSE, 1=TRUE)
0.00       ## 6 Minimum proportion to consider in age-proportions for dmvlogistic
0.2        ## 7 Mean fishing mortality for regularizing the estimates of Ft
0.05       ## 8 std in mean fishing mortality in first phase
2.00       ## 9 std in mean fishing mortality in last phase
-1         ## 10 phase for estimating m_deviations (use -1 to turn off mdevs)
0.1        ## 11 std in deviations for natural mortality
12                   ## 12 number of estimated nodes for deviations in natural mortality
0.00       ## 13 fraction of total mortality that takes place prior to spawning
1          ## 14 switch for age-composition likelihood (1=dmvlogistic,2=dmultinom)
0          ## 15 1=estimate Management parameters, 0=estimate population parameters
## ____________________________________________________________________________ ##

## RF ADDED NUMBER OF PROJECTION YEARS
##pyrs
3

## RF ADDED harvest control rule switch
##hcr
1 ## 1 = 40-10 Rule ... nothing else implemented yet

##Catch stream from SS (OY)
#SSstream
0.274024
0.282668
0.283845

## eofc
999

Control File for CCAM base with steep selectivity
## ____________________________________________________________________________ ##
##                    PACIFIC HAKE CONTROLS
## ___________________CONTROLS FOR ESTIMATED PARAMETERS________________________ ##
##  Prior descriptions:
##                 -0 uniform (0,0)
##                 -1 normal (p1=mu,p2=sig)
##                 -2 lognormal (p1=log(mu),p2=sig)
##                 -3 beta (p1=alpha,p2=beta)
##                 -4 gamma(p1=alpha,p2=beta)
## ____________________________________________________________________________ ##
7   ## npar

#Original iscam biological oriented priors
## ____________________________________________________________________________ ##

##  ival      lb     ub     phz    prior   p1     p2     parameter name
## ____________________________________________________________________________ ##
1.9       -1.0    4      1      0      -1.   4.    #log_ro  priors - see SS_ro_prior.xls
0.77      0.2    1.0     1      3      9.766627      2.803034      #steepness  a and b parameters approximate prior from SS - see Betapars.r
-1.609438    -5.0   0.0     2      1      -1.609438  0.2   #log.m
1.9       -5.0    15      1      0      -5.0    15     #log_avgrec
1.9       -5.0    15      1     0       -5.0    15    #log_recinit
0.15      0.01          0.999        4      3      3.0    12.0    #rho
1.25      0.01           150.         3      4      7.49836 5.78354    #varphi (precision)  (RF Change - SJDM had called this kappa)
## ____________________________________________________________________________ ##


## _________________________SELECTIVITY PARAMETERS____________________________ ##
## OPTIONS FOR SELECTIVITY:
```

```
##      1) logistic selectivity parameters
##      2) selectivity coefficients
##      3) a constant cubic spline with age-nodes
##      4) a time varying cubic spline with age-nodes
##      5) a time varying bicubic spline with age & year nodes.
##      6) fixed logistic (set isel_type=1, and estimation phase is set to -1 in tpl (ie estimation phase below is ignored))
## Gear 1 fishery:  Gear 2 survey
## isel_type
1            6
## Age at 50% selectivity (logistic) ahat
#4.          4.5
#4.82102   4.5
3.5          2
## STD at 50% selectivity (logistic) ghat
#1.1         0.2
#1.31762   2.1
0.45         0.1
## No. of age nodes for each gear (0 to ignore).
3            0
## No. of year nodes for each gear (0 to ignore).
5            0
## Estimation phase - any negative number means it is fixed!
1            1
## Penalty weight for 2nd differences w=1/(2*sig^2)
150.0        200.0
## Penalty weight for dome-shaped selectivity 1=1/(2*sig^2)
50.0         200.0
#GAMMA prior for  STD at 50% selectivity (logistic) ghat for SURVEY
#prior type (4=gamma)   par1      par2          switch
#ghat_p1 ghat_p2 ghat_pswitch
2.           4.            0

## ___________________________________________________________________________ ##
## ___________________________________________________________________________ ##
##                       Priors for Survey q                         ##
## ___________________________________________________________________________ ##
## nits  #number of surveys
1
## priors 0=uniform density     1=normal density
1
## prior log(mean);
0
## prior sd
0.1
## ___________________________________________________________________________ ##

## _______________________OTHER MISCELLANEOUS CONTROLS cntrl_________________________ ##
0         ## 1 verbose ADMB output (0=off, 1=on)
1          ## 2 recruitment model (1=beverton-holt, 2=ricker)
0.05       ## 3 std in observed catches in first phase.
0.01       ## 4 std in observed catches in last phase.
0          ## 5 Assume unfished in first year (0=FALSE, 1=TRUE)
0.00       ## 6 Minimum proportion to consider in age-proportions for dmvlogistic
0.2        ## 7 Mean fishing mortality for regularizing the estimates of Ft
0.05       ## 8 std in mean fishing mortality in first phase
2.00       ## 9 std in mean fishing mortality in last phase
-1         ## 10 phase for estimating m_deviations (use -1 to turn off mdevs)
0.1        ## 11 std in deviations for natural mortality
12                       ## 12 number of estimated nodes for deviations in natural mortality
0.00       ## 13 fraction of total mortality that takes place prior to spawning
1          ## 14 switch for age-composition likelihood (1=dmvlogistic,2=dmultinom)
0          ## 15 1=estimate Management parameters, 0=estimate population parameters
## ___________________________________________________________________________ ##

## RF ADDED NUMBER OF PROJECTION YEARS
##pyrs
3
```

```
## RF ADDED harvest control rule switch
##hcr
1 ## 1 = 40-10 Rule ... nothing else implemented yet

##Catch stream from SS (OY)
#SSstream
0.274024
0.282668
0.283845

## eofc
999
```

12. Appendix E. Documentation of the transition from TINSS to CCAM

Background

From 2008 to 2010, U.S. and Canadian scientists prepared separate stock assessments for Pacific hake. To an extent, this continued in 2011, although the U.S. and Canadian stock assessment teams collaborated to a much greater degree than previously and presented parallel results from the two models in the same document (Stewart et al. 2011). In all these assessments, the Canadian stock assessment team used a management-oriented model named TINSS (Martell 2008; 2009; 2010; Stewart et al. 2011).

TINSS is an age-structured model that is conditioned on historical catch and parameterized from a management-oriented perspective, where leading estimated parameters are long term Maximum Sustainable Yield (*MSY*) and the equilibrium fishing mortality that results in MSY (F_{MSY}). In management-oriented models (see also Schnute and Kronlund (1996); Richards and Schnute (1998); and Forrest et al. (2008)), *MSY* and F_{MSY} are directly estimated as parameters and analytically transformed to their biological equivalents: unfished recruitment R_0 and the productivity parameter steepness, through the survivorship, growth, maturity and selectivity schedules of the stock (see Stewart et al. (2011): their Appendix F; and Martell et al. (2008) for a detailed description of the transformation from estimated management parameters to biological parameters). Potential advantages of using a management-oriented approach include some improved statistical properties (less confounding between scale and productivity parameters) and the ability to set priors on quantities that are directly observable, such as long term catch and fishing mortality rates (Schnute and Kronlund 1996). However, difficulties in interpreting these reference points and initializing the model may arise when biological or other properties of the stock are not stationary through time. The Pacific hake stock has undergone large fluctuations in mean weight at age since observations began in the 1970s, and it is unlikely that fishery selectivity has remained constant throughout the time series, although time-invariant selectivity has been assumed in recent assessments (and the present assessment) for reasons of parsimony.

In the 2011 stock assessment, results from Stock Synthesis (SS) and TINSS were closer than they had been in previous years (Stewart et al. 2011). This was in large part due to efforts by the two assessment teams to use the same data and underlying assumptions. There were, however, some outstanding differences that were attributed mostly to differences in model parameterisation, priors and selectivity, although the relative contributions of these differences were not able to be quantified in the time available. In part, differences due to the different parameterisations could not be quantified because TINSS could not be parameterised with leading estimated biological parameters. Furthermore, during its four years of use in the Pacific hake assessment, TINSS underwent a number of additions and modifications, largely in response to requests from scientific reviewers. This gradual accumulation of customizations resulted in a model less flexible than was desired for the 2012 assessment.

The Canadian members of the 2012 stock assessment team opted to switch to a new modelling platform in 2012. This was largely in response to a need for greater flexibility than could be provided by TINSS and also because of a desire to develop a more general modelling tool for Canadian Pacific groundfish assessments and management strategy evaluations into the future. Furthermore, it was decided to switch to a model parameterized with leading biological parameters to avoid difficulties associated with initialising a model with *MSY* and F_{MSY} in the presence of non-stationarity in hake weight at age. A new model has been developed at the University of British Columbia by Dr Steven Martell, who has posted it as an open source project with the title ISCAM (Integrated Statistical Catch Age Model). The model contains options for a wide range of structural configurations, including alternative forms for fixed or time-varying selectivity; fixed or time-varying natural mortality; alternative stock-recruit relationships and options for multiple fishing fleets (Martell 2011). During 2011 and 2012, this model has been customized by the Canadian assessment team to calculate the outputs needed for the 2012 Pacific hake assessment. It is referred to here as the "Canadian" Catch Age Model (CCAM) to distinguish the customized version from the original software. Technical details of the model are described in Appendix G of this document. The original ISCAM source code and additional documentation are available at http://code.google.com/p/iscam-project/source/checkout.

A key modification made by the Canadian assessment team has been the addition of a module that allows the model to be parameterized with leading estimated management parameters *MSY* and F_{MSY} (as in TINSS). The ability to switch between alternative biological and management parameterizations provides the option to switch to a biologically-parameterized model for the 2012 assessment, while keeping track of changes in assessment outputs arising from the switch to a new model. The following pages briefly document the steps taken in transitioning from the 2011 TINSS model to the current CCAM model with estimated survey selectivity, through changes in underlying data and model assumptions. This will in part address the 2011 STAR panel request to better understand the differences between TINSS and SS. It will also contribute to greater understanding of the differences between SS and CCAM in the present assessment.

Note that more combinations of settings were tested than are shown in the figures. Some steps that resulted in negligible change in model results are omitted for clarity of presentation, resulting in some skipped letters in step names. All graphs are the result of 500,000 MCMC iterations, thinned to produce 2,000 retained samples, with the first 1,000 discarded. It should be noted that results from these short chains were likely not fully converged and are presented to illustrate broad trends rather than precise results. For the same reason, the final steps presented here may not be identical to those presented in the main body of the assessment.

1. Compare CCAM and TINSS under 2011 conditions

The first step was to compare CCAM and TINSS under the same set of assumptions, priors and data as used in the 2011 assessment. For this set of comparisons, CCAM was run in management-oriented mode, i.e., *MSY* and F_{MSY} were directly estimated, with biological parameters R_0 and steepness analytically derived from them. Figure E1 shows the comparison of posterior estimated female spawning biomass and depletion for TINSS and CCAM in management-oriented mode (CCAM-m), with *MSY* fixed in CCAM-m at the maximum posterior density estimate from TINSS (all other parameters estimated). Figure E2 shows the same comparison, for two alternative steps: C) all parameters in CCAM-m are estimated; and D) CCAM is configured with biologically-oriented leading estimated parameters, R_0 and steepness (CCAM-b), all parameters estimated.

Figure E1 shows very close agreement between the two models when MSY is fixed in CCAM-m, indicating close agreement in the dynamic equations in both models. However, when MSY is allowed to be estimated in CCAM-m (Figure E2), the spawning biomass series still show very close agreement, but the estimated unfished equilibrium spawning biomass from CCAM-m (2.55 million mt) is about twice that estimated in TINSS (1.24 million mt). This is because the estimate of MSY in CCAM-m is about twice of that estimated in TINSS. The CCAM-m median posterior estimate of unfished spawning biomass from step C is closer to that estimated by the 2011 Stock Synthesis model (2.03 million mt) and results in estimates of spawning depletion that are lower than those from the 2011 TINSS assessment (and closer to the 2011 SS assessment).

Investigations to date have not revealed the source of the difference in estimates of MSY (and therefore unfished spawning biomass) between CCAM-m and TINSS. Extensive tests with CCAM in biological and management-oriented mode and process errors turned off have shown that the analytical transformations from MSY and F_{MSY} to R_0 and steepness and the numerical back-transformations from R_0 and steepness to MSY and F_{MSY} are internally correct within CCAM (identical results are obtained in either direction). Similarly, Figure E1 indicates that these calculations are also consistent between CCAM-m and TINSS (i.e., when MSY is fixed in CCAM-m at the same value as in TINSS, the estimated unfished spawning biomass is very close; Figure E1). Work is continuing to identify the reason for the differences in estimates of MSY between the two models, although a number of possible causes have been eliminated (e.g., differences in weights at age used in equilibrium calculations). Differences between treatment of fishing mortality (directly estimated *vs* direct solving of the Baranov equation) and treatment of average recruitment and residuals between CCAM and TINSS mean that there are some fundamental differences in the objective functions and penalties applied in the two models. Given the strong agreement between CCAM and SS in the current (2012) assessment, it appears that the estimate of MSY in TINSS was one of the causes of the difference in estimates of spawning depletion and reference point calculations between SS and TINSS in 2011.

Switching to biological-oriented mode in CCAM (CCAM-b) did not result in major differences in estimates of spawning biomass (Figure E2), although the estimate of unfished spawning biomass was higher, leading to lower estimated depletion (but see note above about convergence). This is likely because the estimate of unfished spawning biomass in this case was analytically derived from estimates of log(R_0), which had a broad uniform prior rather than the informative log normal prior for MSY that was used in CCAM-m. The finding that estimates of spawning biomass were similar for all four steps (TINSS, A, C and D), indicates that switching from TINSS to CCAM, configured in either biological or management mode, has not had a major effect on predicted population dynamics. Differences in reference point calculations and, therefore, estimates of depletion appear to be due to differences in priors and properties of the objective function rather than structural differences in the platform itself.

2. Correct and update data from 2011 assessment

Despite the best efforts of the 2011 stock assessment teams to line up the data streams in the two models, a number of inconsistencies were discovered after the assessment period. Therefore, the next step was to bring the 2011 data in line with those used by SS, using CCAM-b. Most of the data updates had negligible effects on model results. One large inconsistency was in the age composition data from the acoustic survey. In the short time frame given for the assessment in

2011, the Canadian team had omitted to update the acoustic age composition data from the 2010 assessment. This was the only correction to the 2011 assessment data that had a significant effect on estimated spawning biomass, with a smaller effect on estimated spawning depletion (Figure E3). See Figure E caption for description of other updates to the data.

3. Add 2012 data

The next steps were to bridge from the 2011 assessment to the 2012 assessment by updating the data file with data from the 2011 fishery and acoustic survey. Figures E4 and E5 show the effects of step-wise additions of new data. Steps taken were: F) update 2010 commercial catch with last of 2010 data; G) update with 2011 commercial catch, catch age and weight at age; H) update with 2011 acoustic survey catch age; I) update with 2011 acoustic survey index; J) update all weight at age data with small changes since 2011; K) update all catch age data with new weighting scheme (see Section 2.1.2 of main document); L) include age-1 in commercial catch age data (TINSS had not previously included commercial age 1 age composition data, largely due to legacies from previous separate Canadian and U.S. modeling efforts, where age-1 data had not always been available to the Canadian scientists). Finally, Figure E6 shows steps: M) match priors for R_0 and steepness to those in SS; and N) set standard deviation for the normal prior on log(M) to 0.2, as in the CCAM model with estimated survey selectivity.

Updating the 2010 catch data with the final numbers (which had not been available in time for the 2011 assessment) had a negligible effect on estimates of spawning biomass. Figure E4 shows that adding the 2011 commercial and survey data, however, had noticeable effects on model outcomes. Notably, when compared to step F (updated 2010 catch), adding the 2011 fishery catch and age composition data resulted in an increase in predicted spawning biomass (Figure E4, red line). The same effect was reported for Stock Synthesis and is discussed in the main body of this assessment document (Figure 12 and Section 3.4.1). Adding the 2011 survey age composition data (step H) resulted in a slight decrease in estimated spawning biomass, and adding the 2011 acoustic survey index (step I) further downgraded the estimate (Figure E4). The effect of adding the 2011 acoustic index appeared to have a much lesser effect than that observed in the SS bridge model (Figure 12, main body of this assessment document). This is because the model showed very poor fit to the survey index data at this step, particularly the 2011 index point (Figure E7).

Figure E5 shows the effect of updates to the weight at age data and weighting of the U.S. and Canadian age composition data (steps J and K). Both of these steps had very minor effects on estimated spawning biomass. The greatest change to the estimates spawning biomass and depletion resulted from the addition of the age-1 commercial age composition data (step L; Figure E5). This is because the age-1 commercial age composition data provided more information for estimation of commercial selectivity for 1-2 year old fish and resulted in a steeper parametric curve that was shifted further left than in steps where those data were excluded (Figure E7). The steeper selectivity curve resulted in a closer fit to the low 2011 acoustic index point (Figure E7) than had been achieved by addition of the survey index alone. Exclusion of age 1 commercial age composition data is likely a reason for the more optimistic results obtained with TINSS in 2011, which had commercial and survey selectivity curves shifted further right than the SS model. Note that the 2011 TINSS model achieved a closer fit to the high 2009 survey index point than the 2011 SS model had. This is likely in part due to the omission of age-1 fish from the commercial age composition data.

Figure E6 shows that matching the priors to those in SS had a small effect when compared to the effect of adding age-1s to the commercial age composition data (step M). Finally, broadening the prior on log (*M*) had the effect of increasing the estimated spawning biomass slightly. This is presented as one of the key sensitivities in the 2012 assessment and is discussed in more detail in the main body of this assessment document.

In summary, this appendix has summarised the steps taken from the TINSS model used in the 2011 stock assessment, through data updates, to the current key sensitivity case presented for the CCAM model. Differences in estimated spawning biomass between the 2011 TINSS assessment and the current CCAM configuration can be explained wholly by addition of new data to the assessment rather than a switch in modelling platforms. Differences in estimates of depletion and MSY-based reference points must also be largely due to updated data, but are also in part due to the switch from TINSS. Further investigation will reveal the source of the differences, although it is noted that results from the CCAM with the 2011 data (steps C and D above) appear to have been more consistent with SS than those from TINSS.

References

Forrest, R.E., S.J.D. Martell, M.C. Melnychuk and C.J. Walters. 2008. An age-structured model with leading management parameters, incorporating age-specific selectivity and maturity. Canadian Journal of Fisheries and Aquatic Sciences 65: 286-296.

Martell, S.J.D. 2008. Assessment and Management Advice for Pacific Hake in U.S. and Canadian Waters in 2008. Technical Report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest and Alaska Fisheries Science Center.

Martell, S.J.D. 2009. Assessment and Management Advice for Pacific Hake in U.S. and Canadian Waters in 2009. DFO Canadian Science Advis. Sec. Res. Doc., 2009/021:iv+54p.

Martell, S. J. D. 2010. Assessment and management advice for Pacific hake in U.S. and Canadian waters in 2010. Pacific Fishery Management Council. Portland, Oregon. 80 p.

Martell, S. J. D. 2011. iSCAM User's Guide. Version 1.0. University of British Columbia, Vancouver. 34 pp. Available online at http://code.google.com/p/iscam-project/source/checkout.

Martell, S.J.D., Pine, W.E., Walters, C.J. 2008. Parameterizing Age-Structured Models from a Fisheries Management Perspective. Canadian Journal of Fisheries and Aquatic Sciences, 65:1586-1600.

Richards, L.J., Schnute, J.T. 1998. Model Complexity and Catch-Age Analysis. Canadian Journal of Fisheries and Aquatic Sciences, 55: 949-957.

Richards, L. J., J. T. Schnute, and N. Olsen. 1997. Visualizing catch-age analysis: a case study. Canadian Journal of Fisheries and Aquatic Sciences 54: 1646-1658.

Schnute, J.T., Richards, L.J. 1998. Analytical Models for Fishery Reference Points. Canadian Journal of Fisheries and Aquatic Sciences, 55: 515-528.

Schnute, J.T. and Kronlund, A.R. 1996. A management oriented approach to stock recruitment analysis. Can. J. Fish. Aquat. Sci. 53: 1281-1293.

Stewart, I. J., R. E. Forrest, C.J. Grandin, O.S. Hamel, A.C. Hicks, S.J.D. Martell and I.G. Taylor. 2011. Status of the Pacific hake (whiting) stock in U.S. and Canadian waters in 2011, In Status of the Pacific Coast Groundfish Fishery through 2011, Stock Assessment and Fishery Evaluation: Stock Assessments, STAR Panel Reports, and rebuilding analyses. Pacific Fishery Management Council, Portland, Oregon. 217 p.

Appendix E Figures

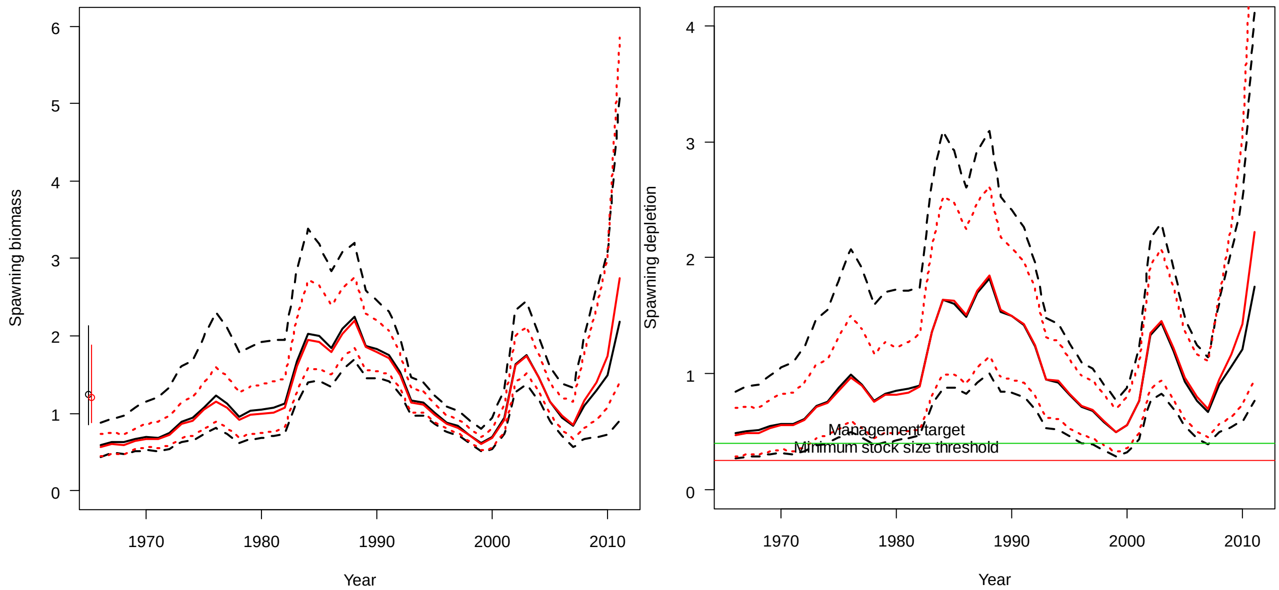
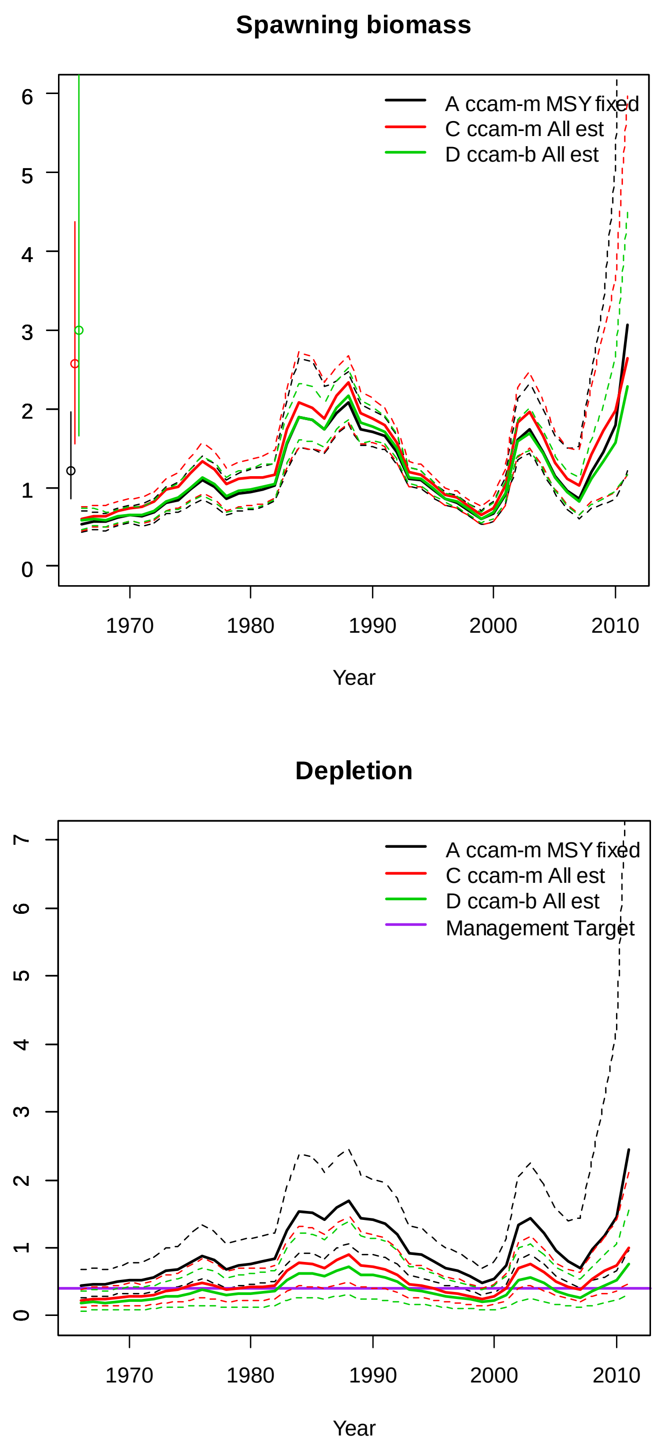
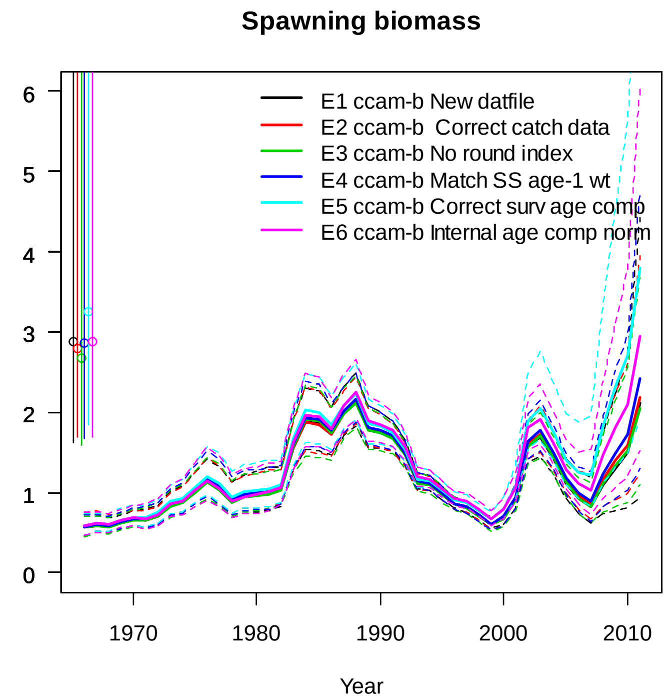


Figure E1. Comparison of female spawning biomass between TINSS and CCAM-m, with MSY fixed in CCAM-m at the maximum likelihood estimate from TINSS (all other parameters estimated).



FigureE2. Comparison of female spawning biomass and depletion in CCAM-m, for B) all parameters in CCAM-m are estimated except M, which is fixed at the 2011 TINSS MLE value; C) all parameters in CCAM-m are estimated; and D) CCAM is configured with biologically-oriented leading estimated parameters (CCAM-b), all parameters estimated.



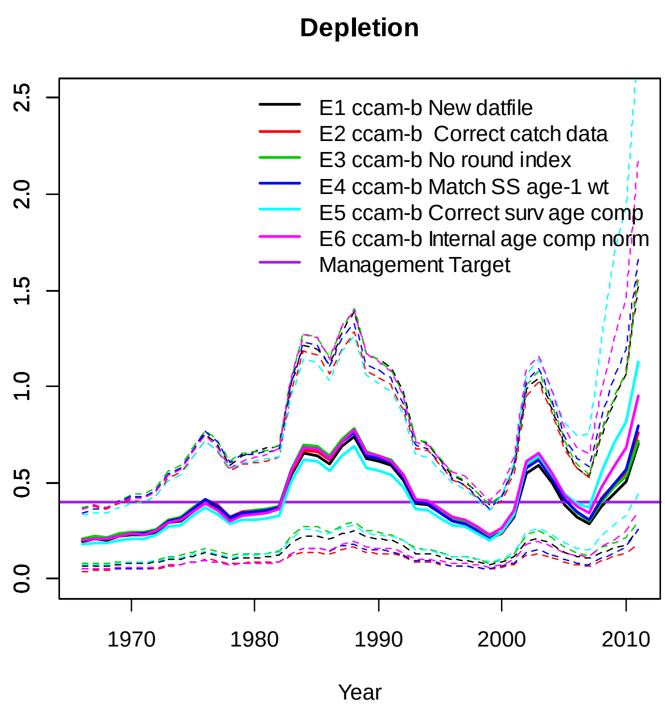


Figure E3. Comparison of estimated female spawning biomass and depletion in CCAM-b, for : E1) New 2011 datafile (but no changes to the data; same as D above); E2) Correct small errors in catch; E3) Don't round survey index; E4) Line up age-1 estimated weights with SS; E5) Correct the survey age composition data; and E6) use un-normalised fishery age composition data and normalise within the model.

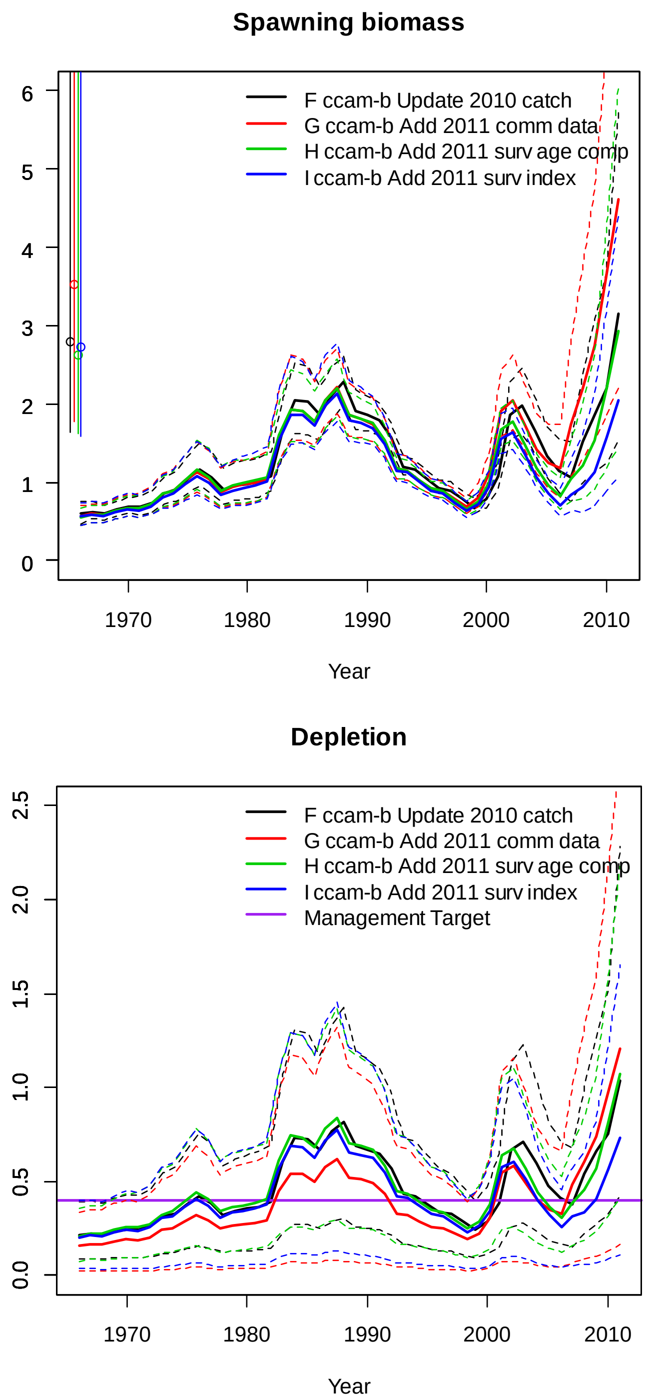


Figure E4. Comparison of female spawning biomass and depletion in CCAM-b for: F) Update 2010 commercial catch with last of 2010 data; G) Update with 2011 commercial catch, catch age and weight at age; H) Update with 2011 acoustic survey catch age; and I) Update with 2011 acoustic survey index.

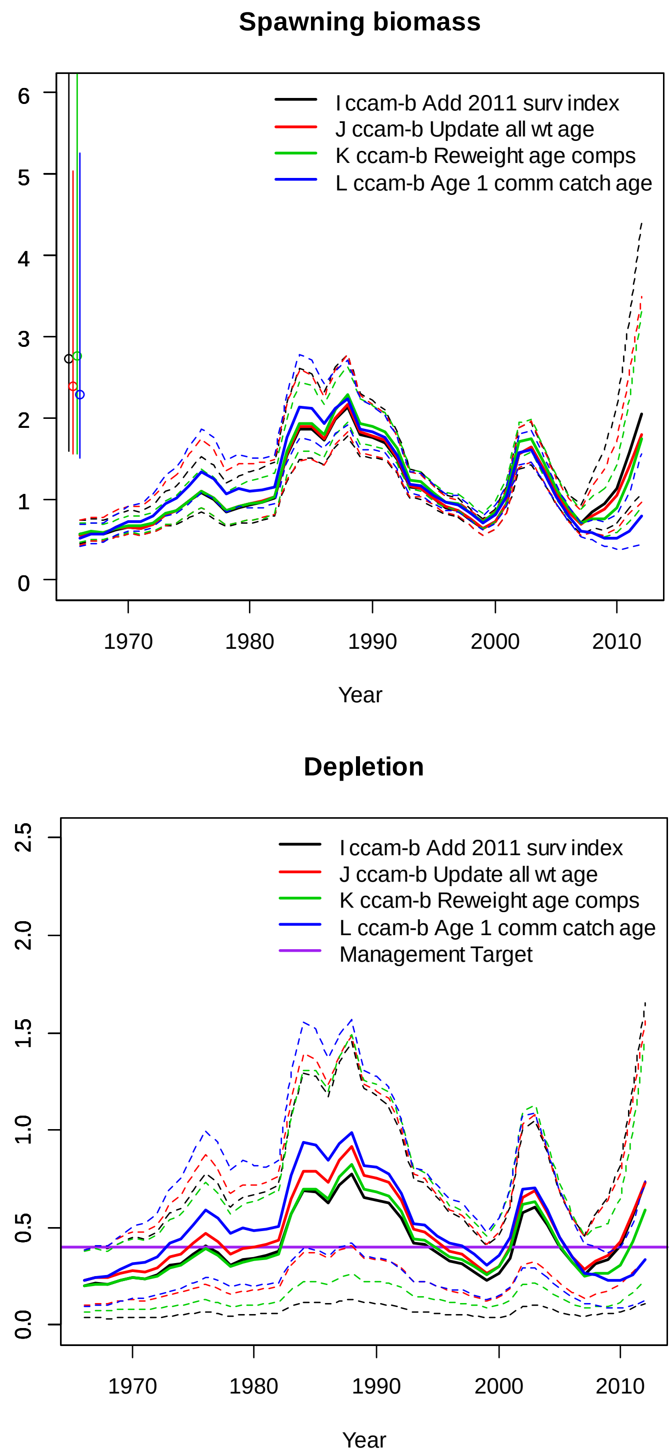


Figure E5. Comparison of female spawning biomass and depletion in CCAM-b for: I) Update with 2011 acoustic survey index; J) Update all weight at age data; K) Update all catch age data with new weighting scheme; and L) Include age-1 in commercial catch age data.

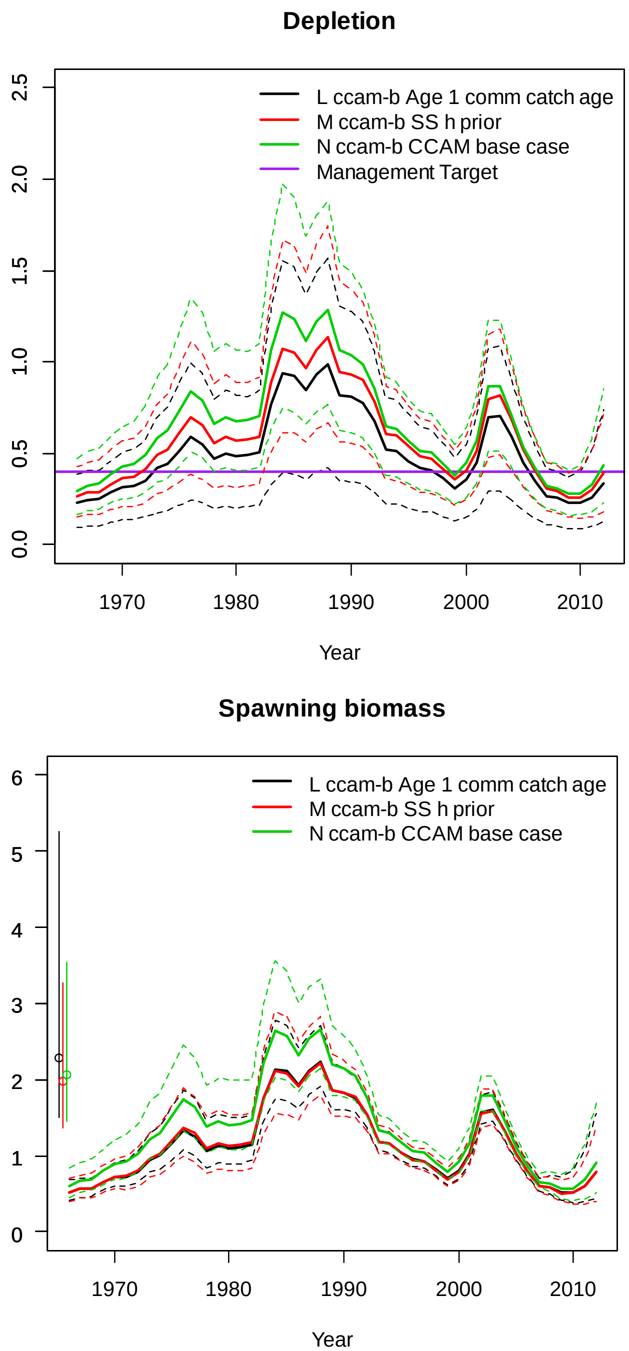


Figure E6. Comparison of female spawning biomass and depletion in CCAM-b for L) Include age-1 in commercial catch age data; M) Match priors for R_0 and steepness to those in SS; and N) Set standard deviation for the normal prior on log(M) to 0.2, as in the CCAM model with estimated survey selectivity.

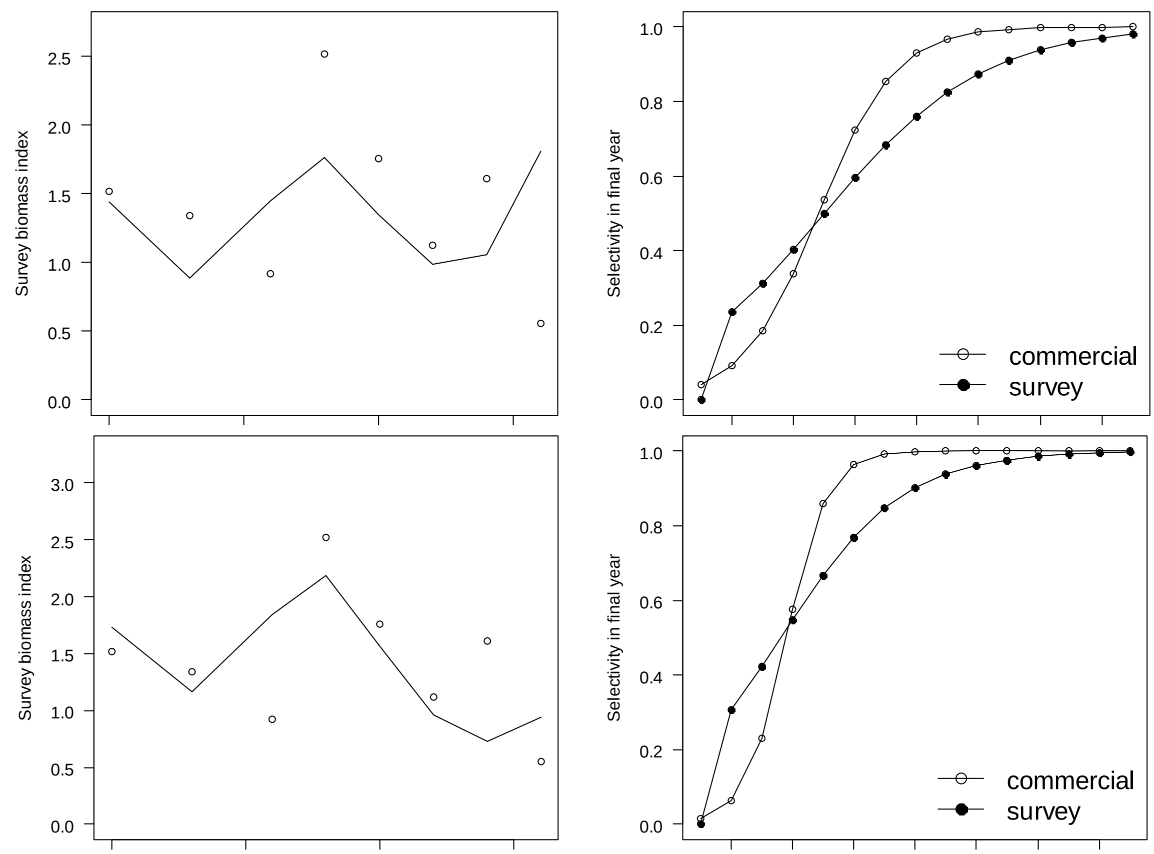


Figure E7. Fits to the acoustic survey index (left) and estimated commercial and survey selectivity (right) for Steps: I) Update with 2011 acoustic survey index; and L) Include age-1 in commercial catch age data.

13. Appendix F. CCAM model description and documentation

Technical description of the Canadian Catch Age Model (CCAM)

Analytic methods

The section contains technical documentation of the underlying age-structured model, its steady state version used to calculate reference points, the observation models used in predicting observations, and the components of the objective function that formulate the statistical criterion used to estimate model parameters. Model equations are presented in tables intended to represent the order of operations, or pseudocode, in which to implement the model. CCAM was implemented in AD Model Builder version 10.1. The model was originally developed at the University of British Columbia and has been posted as an open source project by its author, Dr Steven Martell, under the title ISCAM (Integrated Statistical Catch Age Model). The model has been customized by the Canadian assessment team to calculate the outputs needed for the assessment of Pacific hake and for production of this document. It is therefore referred to here as CCAM to distinguish this customized version from the original software. The original source code and additional documentation is available at `http://code.google.com/p/iscam-project/source/checkout`.

Equilibrium considerations

Steady-state conditions are presented in Table 1; here we assume the parameter vector Θ is an input (with the exception of F_e) that is estimated by fitting the dynamics model to time series data (Tables 2 and 3 below). Note however, that the equilibrium model is parameterized in terms of recruitment compensation κ (Table 1), whereas the estimation model is parameterized in terms steepness h; the conversion $\kappa = 4h/(1-h)$ (?) is applied to steepness before being passed from the estimation model to the equilibrium model. The definition of F_e is the steady-state fishing mortality rate, and the value of F_e that maximizes equilibrium yield corresponds to F_{MSY} (see section). The value of F_e where $\phi_e/\phi_E = 0.4$ is $F_{40\%}$.

For Pacific hake, weight at age w_a is given by the empirical weight-at-age data and the age-specific vulnerability is given by a logistic function (5). If alternative selectivity functions are implemented in CCAM, then (5) does not apply; other forms are described section . Mean fecundity-at-age is assumed to be proportional to the mean weight-at-age of mature fish, where maturity at age is specified by the parameters $\dot{a}$ and $\dot{\gamma}$ for the logistic function.

Survivorship for unfished and fished populations is defined by (7) and (8), respectively. It is assumed that all individuals ages A and older (i.e., the plus group) have the same total mortality rate. The incidence functions refer to the life-time or per-recruit quantities such as spawning biomass per recruit (ϕ_E) or vulnerable biomass per recruit (ϕ_b). Note that upper and lower case subscripts denote unfished and fished conditions, respectively. Spawning biomass per recruit is given by (9), the vulnerable biomass per recruit is given by (10) and the

Table 1: Steady-state age-structured model assuming unequal vulnerability-at-age, age-specific natural mortality, age-specific fecundity and Beverton-Holt type recruitment. Note that M is the average natural mortality rate between 1966-2011.

Parameters

$$\Theta = (B_o, \kappa, M, \hat{a}, \hat{\gamma}, F_e) \tag{1}$$

$$B_o > 0; \kappa > 1; M > 0; F_e \geq 0$$

$$\Phi = (l_\infty, k, t_o, a, b, \dot{a}, \dot{\gamma}) \tag{2}$$

Age-schedule information

$$l_a = l_\infty(1 - \exp(-k(a - t_o))) \tag{3}$$

$$w_a = a(l_a)^b \tag{4}$$

$$v_a = (1 + \exp(-(\hat{a} - a)/\hat{\gamma}))^{-1} \tag{5}$$

$$f_a = w_a(1 + \exp(-(\dot{a} - a)/\dot{\gamma}))^{-1} \tag{6}$$

Survivorship

$$\iota_a = \begin{cases} 1, \quad a = 1 \\ \iota_{a-1}e^{-M}, \quad a > 1 \\ \iota_{a-1}/(1 - e^{-M}), \quad a = A \end{cases} \tag{7}$$

$$\hat{\iota}_a = \begin{cases} 1, \quad a = 1 \\ \hat{\iota}_{a-1}e^{-M-F_e v_{a-1}}, \quad a > 1 \\ \hat{\iota}_{a-1}e^{-M-F_e v_{a-1}}/(1 - e^{-M-F_e v_a}), \quad a = A \end{cases} \tag{8}$$

Incidence functions

$$\phi_E = \sum_{a=1}^{\infty} \iota_a f_a, \quad \phi_e = \sum_{a=1}^{\infty} \hat{\iota}_a f_a \tag{9}$$

$$\phi_B = \sum_{a=1}^{\infty} \iota_a w_a v_a, \quad \phi_b = \sum_{a=1}^{\infty} \hat{\iota}_a w_a v_a \tag{10}$$

$$\phi_q = \sum_{a=1}^{\infty} \frac{\hat{\iota}_a w_a v_a}{M + F_e v_a}\left(1 - e^{(-M-F_e v_a)}\right) \tag{11}$$

Steady-state conditions

$$R_o = B_o/\phi_B \tag{12}$$

$$R_e = R_o\frac{\kappa - \phi_E/\phi_e}{\kappa - 1} \tag{13}$$

$$C_e = F_e R_e \phi_q \tag{14}$$

per recruit yield to the fishery is given by (11). Unfished recruitment is given by (12) and the steady-state equilibrium recruitment for a given fishing mortality rate F_e is given by (13). Note that in (13) we assume that recruitment follows a Beverton-Holt model of the form:

$$R_e = \frac{s_o R_e \phi_e}{1 + \beta R_e \phi_e}$$

where

$$s_o = \kappa/\phi_E,$$
$$\beta = \frac{(\kappa - 1)}{R_o \phi_E},$$
$$\kappa = 4h/(1 - h),$$

which simplifies to (13), for the Beverton-Holt model.

The equilibrium yield for a given fishing mortality rate is (14). These steady-state conditions are critical for determining various reference points such as F_{MSY}, $F_{40\%}$ and B_{MSY}. The description of calculating steady-state yield for a given value of F_e in Table 1 is written assuming that only one fishing fleet exists, as assumed for the current Pacific hake assessment.

It should be noted here that MSY and $F_{40\%}$-based reference points assume steady-state conditions, and the model structure that is implemented for the Pacific Hake stocks is non-stationary due to time-varying changes in weight at age and optionally, selectivity. For the purpose of this assessment, reference point estimates assume that the equilibrium weights at age are given by the average mean weight-at-age over the entire time series.

Reference points

CCAM calculates MSY-based reference points by finding the value of F_e that results in the zero derivative of the steady-state catch equation (14). This is accomplished numerically using a Newton-Raphson method where an initial guess for F_{MSY} is set equal to $1.5\bar{M}$, then use (15) to iteratively find F_{MSY}. Note that the partial derivatives in (15) can be found in Table 2.

$$F_{e+1} = F_e - \frac{\frac{\partial C_e}{\partial F_e}}{\frac{\partial^2 C_e}{\partial F_e}} \tag{15}$$

where

$$\frac{\partial C_e}{\partial F_e} = R_e \phi_q + F_e \phi_q \frac{\partial R_e}{\partial F_e} + F_e R_e \frac{\partial \phi_q}{\partial F_e}$$
$$\frac{\partial^2 C_e}{\partial F_e} = \phi_q \frac{\partial R_e}{\partial F_e} + R_e \frac{\partial \phi_q}{\partial F_e}$$

The algorithm usually converges in less than 10 iterations depending on how close the initial guess of F_{MSY} is to the true value. A maximum of 20 iterations are allowed in CCAM, however, if $\frac{\partial C_e}{\partial F_e} < 10^{-6}$ the algorithm stops. Note also, that this is only performed on data type variables and not differentiable variables within AD Model Builder.

The equilibrium fishing mortality rate ($F_{40\%}$) that results in the spawning potential ratio (SPR) being reduced to 40% of the unfished level is calculated using the Newton-Raphson approach and partial derivatives described for F_{MSY}, where the criterion is to search for the value of F_e that results in $\phi_e/\phi_E = 0.4$. Similarly, $FB_{40\%}$ is defined as the value of F_e that results in $SB_e/SB_0 = 0.4$, where SB_e is equilibrium fished spawning biomass ($R_e\phi_e$) and SB_0 is unfished spawning biomass ($R_0\phi_E$).

Given an estimate of F_{MSY}, $F_{40\%}$ or $FB_{40\%}$, other reference points such as MSY are calculated use the equations in Table 1 where each of the expressions is evaluated at F_{MSY}, $F_{40\%}$ or $FB_{40\%}$.

Dynamic age-structured model

The estimated parameter vector in CCAM is defined in (22), where R_0, h and M are the leading unknown population parameters that define the overall population scale in the form of unfished recruitment and productivity in the form of steepness h and natural mortality, M. CCAM does not assume that the population is at unfished equilibrium in the first model year; instead, it assumes that initial recruitment is given by $\ddot{R}$. The total standard deviation ϑ^2 and the proportion of the total total standard deviation that is associated with observation errors ρ are also estimated, then the total is partitioned into observation errors (σ^2) and process errors (τ^2) using (23).

The unobserved state variables (24) include the numbers-at-age year year t ($N_{t,a}$), the spawning stock biomass (B_t) and the total age-specific total mortality rate ($Z_{t,a}$).

The initial numbers-at-age in the first year (25) and the annual recruits (26) are treated as estimated parameters and used to initialize the numbers-at-age matrix. Age-specific selectivity for gear type k is a function of the selectivity parameters γ_k (27), and the annual fishing mortality for each gear k in year t ($\digamma_{k,t}$). The vector of log fishing mortality rate parameters $\digamma_{k,t}$ is a bounded vector with a minimum value of -30 and an upper bound of 3.0. In arithmetic space this corresponds to a minimum value of 9.36e-14 and a maximum value of 20.01 for annual fishing mortality rates. In years where there are 0 reported catches for a given fleet, no corresponding fishing mortality rate parameter is estimated and the implicit assumption is there was no fishery in that year.

There is an option to treat natural mortality as a random walk process (28), where the natural mortality rate in the first year is the estimated leading parameter (22) and in subsequent years the mortality rate deviates from the previous year based on the estimated deviation parameter φ_t. If the mortality deviation parameters are not estimated, then M is assumed to be time invariant.

Table 2: Partial derivatives, based on components in Table 1, required for the numerical calculation of F_{MSY} using (15).

Mortality & Survival

$$Z_a = M + F_e v_a \tag{16}$$

$$S_a = 1 - e^{-Z_a} \tag{17}$$

Partial for survivorship

$$\frac{\partial \hat{\iota}_a}{\partial F_e} = \begin{cases} 0, & a = 1 \\ e^{-Z_{a-1}} \left(\frac{\partial \hat{\iota}_{a-1}}{\partial F_e} - \hat{\iota}_{a-1} v_{a-1} \right), & 1 < a < A \\ \frac{\frac{\partial \hat{\iota}_{a-1}}{\partial F_e}}{(1 - e^{-Z_a})} - \frac{\hat{\iota}_{a-1} e^{-Z_{a-1}} v_a e^{-Z_a}}{(1 - e^{-Z_a})^2}, & a = A \end{cases} \tag{18}$$

Partials for incidence functions

$$\frac{\partial \phi_e}{\partial F_e} = \sum_{a=1}^{\infty} f_a \frac{\partial \hat{\iota}_a}{\partial F_e} \tag{19}$$

$$\frac{\partial \phi_q}{\partial F_e} = \sum_{a=1}^{\infty} \frac{w_a v_a S_a}{Z_a} \frac{\partial \hat{\iota}_a}{\partial F_e} + \frac{\hat{\iota}_a w_a v_a^2}{Z_a} \left(e^{-Z_a} - \frac{S_a}{Z_a} \right) \tag{20}$$

Partial for recruitment

$$\frac{\partial R_e}{\partial F_e} = \frac{R_o}{\kappa - 1} \frac{\phi_E}{\phi_e^2} \frac{\partial \phi_e}{\partial F_e} \tag{21}$$

Table 3: Statistical catch-age model using the Baranov catch equation, where R_0 and h are the leading parameters that define population scale and productivity, respectively.

Estimated parameters

$$\Theta = \left(R_0, h, M, \bar{R}, \ddot{R}, \rho, \vartheta, \vec{\gamma}_k, F_{k,t}, \{\ddot{\omega}_a\}_{a=\acute{a}+1}^{a=A}, \{\omega_t\}_{t=1}^{t=T}, \{\varphi_t\}_{t=2}^{T}\right) \tag{22}$$

$$\sigma = \rho/\vartheta, \quad \tau = (1-\rho)/\vartheta \tag{23}$$

Unobserved states

$$N_{t,a}, B_t, Z_{t,a} \tag{24}$$

Initial states ($t = \acute{t}$)

$$N_{t,a} = \ddot{R}e^{\ddot{\omega}_a} \exp(-M_t)^{(a-\acute{a})}; \quad t = \acute{t}; \acute{a} \leq a \leq A \tag{25}$$

$$N_{t,a} = \bar{R}e^{\omega_t}; \quad \acute{t} \leq t \leq T; a = \acute{a} \tag{26}$$

$$v_{k,a} = f(\vec{\gamma}_k) \tag{27}$$

$$M_t = M_{t-1} \exp(\varphi_t), \quad t > 1, \varphi_t \sim N(0, \sigma_M) \tag{28}$$

$$F_{k,t} = \exp(F_{k,t}) \tag{29}$$

State dynamics ($t > \acute{t}$)

$$B_t = \sum_a N_{t,a} f_a \tag{30}$$

$$Z_{t,a} = M_t + \sum_k F_{k,t} v_{k,t,a} \tag{31}$$

$$\hat{C}_{k,t} = \sum_a \frac{N_{t,a} w_a F_{k,t} v_{k,t,a} \left(1 - e^{-Z_{t,a}}\right)}{Z_{t,a}} e^{\eta_t} \tag{32}$$

$$N_{t,a} = \begin{cases} N_{t-1,a-1} \exp(-Z_{t-1,a-1}) & a > \acute{a} \\ N_{t-1,a} \exp(-Z_{t-1,a}) & a = A \end{cases} \tag{33}$$

Recruitment models

$$R_t = \frac{s_o B_{t-k}}{1 + \beta B_{t-k}} e^{\delta_t - 0.5\tau^2} \quad \text{Beverton-Holt} \tag{34}$$

$$R_t = s_o B_{t-k} e^{-\beta B_{t-k} + \delta_t - 0.5\tau^2} \quad \text{Ricker} \tag{35}$$

Table 4: An incomplete list of symbols, constants and description for variables used in CCAM.

Symbol	Constant value	Description
Indexes		
a		index for age
t		index for year
k		index for gear
Model dimensions		
$\acute{a}, A$	2, 10	youngest and oldest age class (A is a plus group)
$\acute{t}, T$	1951, 2010	first and last year of catch data
K	5	Number of gears including survey gears
Observations (data)		
$C_{k,t}$		catch in weight by gear k in year t
$I_{k,t}$		relative abundance index for gear k in year t
$p_{k,t,a}$		observed proportion-at-age a in year t for gear k
Estimated parameters		
R_o		Age-$\acute{a}$ recruits in unfished conditions
h		recruitment steepness
M		instantaneous natural mortality rate
$\bar{R}$		average age-$\acute{a}$ recruitment from year $\acute{t}$ to T
$\ddot{R}$		average age-$\acute{a}$ recruitment in year $\acute{t}-1$
ρ		fraction of the total variance associated with observation error
ϑ		total precision (inverse of variance) of the total error
$\vec{\gamma}_k$		vector of selectivity parameters for gear k
$F_{k,t}$		logarithm of the instantaneous fishing mortality for gear k in year t
$\ddot{\omega}_a$		age-$\acute{a}$ deviates from $\ddot{R}$ for year $\acute{t}$
ω_t		age-$\acute{a}$ deviates from $\bar{R}$ for years $\acute{t}$ to T
φ_t		logarithm of annual change in natural mortality rate
Standard deviations		
σ_M	0.1	standard deviation in random walk for natural mortality
σ		standard deviation for observation errors in survey index
τ		standard deviation in process errors (recruitment deviations)
σ_C	0.0707	standard deviation in observed catch by gear
Residuals		
δ_t		annual recruitment residual
η_t		residual error in predicted catch

State variables in each year are updated using equations 30–33, where the spawning biomass is the product of the numbers-at-age and the mature biomass-at-age (30). The total mortality rate is given by (31), and the total catch (in weight) for each gear is given by (32) assuming that both natural and fishing mortality occur simultaneously throughout the year. The numbers-at-age are propagated over time using (33), where members of the plus group (age A) are all assumed to have the same total mortality rate.

Recruitment to age k can follow either a Beverton-Holt model (34) or a Ricker model (35) where the maximum juvenile survival rate (s_o) in either case is defined by $s_o = \kappa/\phi_E$. For the Beverton-Holt model, β is derived by solving (34) for β conditional on estimates of κ and R_o:

$$\beta = \frac{\kappa - 1}{R_o \phi_E},$$

and for the Ricker model this is given by:

$$\beta = \frac{\ln(\kappa)}{R_o \phi_E}$$

where $\kappa = 4h/(1-h)$ and $\kappa = 5h^{5/4}$ for the Beverton-Holt and Ricker models, respectively. Note that only the Beverton-Holt formulation is used in the current Pacific hake assessment.

Options for selectivity

At present, there are eight alternative age-specific selectivity options in CCAM. We describe a subset of these below. For further information, see additional documentation available at `http://code.google.com/p/iscam-project/source/checkout`. The simplest of the selectivity options is a simple logistic function with two parameters where it is assumed that selectivity is time-invariant. For the purposes of the current Pacific hake assessment, we confine our explorations of selectivity to the logistic form.

The more complex selectivity options assume that selectivity may vary over time a may have as many as (A-1)·T parameters. For time-varying selectivity, cubic and bicubic splines are used to reduce the number of estimated parameters. The last two options consider how selectivity may vary over time based on changes in mean weight-at-age. Prior to parameter estimation, CCAM will determine the exact number of selectivity parameters that need to be estimated based on which selectivity option was chosen for each gear type. It is not necessary for all gear types to have the same selectivity option. For example it is possible to have a simple two parameter selectivity curve for say a survey gear, and a much more complicated selectivity option for a commercial fishery.

Logistic selectivity The logistic selectivity option is a two parameter model of the form

$$v_a = \frac{1}{1 + \exp\left(-(a - \mu_a)/\sigma_a\right)}$$

where μ_a and σ_a are the two estimated parameters representing the age-at-50% vulnerability and the standard deviation, respectively. Throughout the main body of the assessment we occasionally refer to parameters μ_a and σ_a as *ahat* and *ghat* respectively.

Age-specific selectivity coefficients The second option also assumes that selectivity is time-invariant and estimates at total of A-1 selectivity coefficients, where the plus group age-class is assumed to have the same selectivity as the previous age-class. For example, if the ages in the model range from 1 to 15 years, then a total of 14 selectivity parameters are estimated, and age-15+ animals will have the same selectivity as age-14 animals.

When estimating age-specific selectivity coefficients, there are two additional penalties that are added to the objective function that control how much curvature there is and limit how much dome-shaped can occur. To penalize the curvature, the square of the second differences of the vulnerabilities-at-age are added to the objective function:

$$\lambda_k^{(1)} \sum_{a=2}^{A-1} (v_{k,a} - 2v_{k,a-1} + v_{k,a-2})^2 \tag{36}$$

The dome-shaped term penalty as:

$$\begin{cases} \lambda_k^{(2)} \sum_{a=1}^{A-1} (v_{k,a} - v_{k,a+1})^2 & (if) v_{k,a+1} < v_{k,a} \\ 0 & (if) v_{k,a+1} \geq v_{k,a} \end{cases} \tag{37}$$

For this selectivity option the user must specify the relative weights $(\lambda_k^{(1)}, \lambda_k^{(2)})$ to add to these two penalties.

Cubic spline interpolation The third option also assumes time-invariant selectivity and estimates a selectivity coefficients for a series age-nodes (or spline points) and uses a natural cubic spline to interpolate between these nodes. Given $n+1$ distinct knots x_i, selectivity can be interpolated in the intervals defined by

$$S(x) = \begin{cases} S_0(x) & x \in [x_0, x_1] \\ S_1(x) & x \in [x_1, x_2] \\ \dots \\ S_{n-1}(x) & x \in [x_{n-1}, x_n] \end{cases}$$

where $S''(x_0) = S''(x_n) = 0$ is the condition that defines a natural cubic spline.

The same penalty functions for curvature and dome-shaped selectivity are also invoked for the cubic spline interpolation of selectivity.

Time-varying selectivity with cubic spline interpolation A fourth option allows for cubic spline interpolation for age-specific selectivity in each year. This option adds a considerable number of estimated parameters but the most extreme flexibility. For example, given 40 years of data and estimated 5 age nodes, this amounts 200 (40 years times 5 ages) estimated selectivity parameters. Note that the only constraints at this time are the dome-shaped penalty and the curvature penalty; there is no constraint implemented for say a random walk (first difference) in age-specific selectivity). As such this option should only be used in cases where age-composition data is available for every year of the assessment.

Bicubic spline to interpolate over time and ages The fifth option allows for a two-dimensional interpolation using a bicubic spline. In this case the user must specify the number of age and year nodes. Again the same curvature and dome shaped constraints are implemented. It is not necessary to have age-composition data each and every year as in the previous case, as the bicubic spline will interpolate between years. However, it is not advisable to extrapolate selectivity back in time or forward in time where there are no age-composition data unless some additional constraint, such as a random-walk in age-specific selectivity coefficients is implemented (as of February 6, 2012, this has not been implemented).

Residuals, likelihoods & objective function value components

There are three effective components to the overall objective function that is minimized. These components consist of the likelihood of the data, prior distributions and penalty functions that are invoked to regularize the solution during intermediate phases of the non-linear parameter estimation. This section discusses each of these in turn, starting first with the residuals between observed and predicted states followed by the negative loglikelihood that is minimized for the catch data, relative abundance data, age-composition, and stock-recruitment relationships.

Catch data It is assumed that the measurement errors in the non-zero catch observations are log-normally distributed, and the residuals is given by:

$$\eta_{k,t} = \ln(C_{k,t}) - \ln(\hat{C}_{k,t}), \tag{38}$$

The residuals are assumed to be normally distributed with a user specified standard deviation σ_C. At present, it is assumed that observed catches for each gear k is assumed to have the same standard deviation. To aid in parameter estimation, two separate standard deviations are specified in the control file: the first is the assumed standard deviation used in the first, second, to N-1 phases, and the second is the assumed standard deviation in the last phase. The negative loglikelihood (ignoring the scaling constant) for the catch data is given by:

$$\ell_C = \sum_k \left[T_k \ln(\sigma_C) + \frac{\sum_{t \in \hat{C}_{k,t} \neq 0} (\eta_{k,t})^2}{2\sigma_C^2} \right], \tag{39}$$

where T_k is the total number of non-zero catch observations for gear type k.

Relative abundance data The relative abundance data are assumed to be proportional to biomass that is vulnerable to the sampling gear:

$$V_{k,t} = \sum_a N_{t,a} e^{-\lambda_{k,t} Z_{t,a}} v_{k,a} w_{a,t}, \tag{40}$$

where $v_{k,a}$ is the age-specific selectivity of gear k, and w_a is the mean-weight-at-age. A user specified fraction of the total mortality $\lambda_{k,t}$ adjusts the numbers-at-age to correct for survey timing. The residuals between the observed and predicted relative abundance index is given by:

$$\epsilon_{k,t} = \ln(I_{k,t}) - \ln(q_k) - \ln(V_{k,t}), \tag{41}$$

where $I_{k,t}$ is the observed relative abundance index, q_k is the catchability coefficient for index k, and $V_{k,t}$ is the predicted vulnerable biomass at the time of sampling. The catchability coefficient q_k is evaluated at its conditional maximum likelihood estimate:

$$q_k = \frac{1}{N_k} \sum_{t \in I_{k,t}} \ln(I_{k,t}) - \ln(V_{k,t}),$$

where N_k is the number of relative abundance observations for index k (see **?**, for more information). The negative loglikelihood for relative abundance data is given by:

$$\ell_I = \sum_k \sum_{t \in I_{k,t}} \ln(\sigma_{k,t}) + \frac{\epsilon_{k,t}^2}{2\sigma_{k,t}^2} \tag{42}$$

where

$$\sigma_{k,t} = \frac{\rho\vartheta}{\omega_{k,t}},$$

where $\rho\vartheta$ is the proportion of the total error that is associated with observation errors, and $\omega_{k,t}$ is a user specified relative weight for observation t from gear k. The $\omega_{k,t}$ terms allow each observation to be weighted relative to the total error $\rho\vartheta$; for example, to omit a particular observation, set $\omega_{k,t} = 0$, or to give 2 times the weight, then set $\omega_{k,t} = 2.0$. To assume all observations have the same variance then simply set $\omega_{k,t} = 1$. Note that if $\omega_{k,t} = 0$ then equation (42) is undefined; therefore, CCAM adds a small constant to $\omega_{k,t}$ (1.e-10, which is equivalent to assuming an extremely large variance) to ensure the likelihood can be evaluated.

For Pacific hake, survey observations I_t are multiplicatively weighted in the objective function, relative to the year with the most precise survey index (in this case, 1998) See table 5. CCAM assumes that the survey occurs in the middle of year.

Table 5: Survey weighting and timing for Pacific hake

year	I_t	gear	wt	survey timing
1995	1.517948	2	0.7376	0.5
1998	1.34274	2	1	0.5
2001	0.918622	2	0.5971	0.5
2003	2.520641	2	0.693	0.5
2005	1.754722	2	0.5795	0.5
2007	1.122809	2	0.6534	0.5
2009	1.612027	2	0.3562	0.5
2011	0.553991	2	0.5125	0.5

Age composition data Sampling theory suggest that age composition data are derived from a multinomial distribution (?). However, CCAM assumes that age-proportions are obtained from a multivariate logistic distribution (??). The multinomial distribution, used in many stock assessments, requires the specification of an effective sample size. This may be done arbitrarily or through iterative re-weighting (?). In cases where there are very large numbers of observations, the age composition data may be too heavily weighted in the objective function, i.e., the assumed effective sample size can have a large impact on the overall model results.

In the multivariate logistic distribution, the age-proportion data can be weighted based on the conditional maximum likelihood estimate of the variance in the age-proportions. Therefore, the contribution of the age-composition data to the overall objective function is "self-weighting" and is conditional on other components in the model.

Ignoring the subscript for gear type for clarity, the observed and predicted proportions-at-age must satisfy the constraint

$$\sum_{a=1}^{A} p_{t,a} = 1$$

for each year. The multivariate logistic residuals between the observed ($p_{t,a}$) and predicted proportions ($\widehat{p_{t,a}}$) is given by:

$$\eta_{t,a} = \ln(p_{t,a}) - \ln(\widehat{p_{t,a}}) - \frac{1}{A}\sum_{a=1}^{A}\left[\ln(p_{t,a}) - \ln(\widehat{p_{t,a}})\right]. \tag{43}$$

The conditional maximum likelihood estimate of the variance is given by

$$\widehat{\tau}^2 = \frac{1}{(A-1)T}\sum_{t=1}^{T}\sum_{a=1}^{A}\eta_{t,a}^2,$$

and the negative loglikelihood evaluated at the conditional maximum likelihood estimate of the variance is given by:

$$\ell_A = (A-1)T\ln(\widehat{\tau}^2). \tag{44}$$

In short, the multivariate logistic likelihood for age-composition data is just the log of the residual variance weighted by the number observations over years and ages.

Examination of (43) reveals that observed and predicted proportions-at-age must be greater than zero. It is not uncommon in catch-age data sets to observe zero proportions for older, or young, age classes or weak year classes. In CCAM the same approach described by **?** is adopted where the definition of age-classes is altered to require that $p_{t,a} \geq \acute{p}$ for every age in each year, where $\acute{p}$ is the minimum percentage specified by the user (e.g., $\acute{p} = 0.02$ corresponds to 2%). This is accomplished by grouping consecutive ages, where $p_{t,a} < \acute{p}$, into a single age-class and reducing the effective number of age-classes in the variance calculation ($\widehat{\tau}^2$) by the number of groups created. The minimum proportion (which can be zero) is set by the user and can influence the results, especially in cases where there is sparse aging information. In the case of $\acute{p} = 0$, the pooling of the adjacent age-class still occurs, this ensures that (43) is defined. In the current Pacific hake assessment, the minimum proportion is set to zero.

Stock-recruitment

There are two alternative stock-recruitment models available in CCAM: the Beverton-Holt model and the Ricker model. Annual recruitment and the initial age-composition are treated as latent variables in CCAM, and residuals between estimated recruits and the deterministic stock-recruitment models are used to estimate unfished spawning stock biomass and recruitment compensation. The residuals between the estimated and predicted recruits is given by

$$\delta_t = \ln(\bar{R}e^{w_t}) - \ln(f(B_{t-\acute{a}})) \tag{45}$$

where $f(B_{t-k})$ is given by either (34) or (35), and $\acute{a}$ is the age at recruitment. Note that a bias correction term for the lognormal process errors is included in (34) and (35).

The negative log likelihood for the recruitment deviations is given by the normal density (ignoring the scaling constant):

$$\ell_\delta = n\ln(\tau) + \frac{\sum_{t=1+k}^{T} \delta_t^2}{2\tau^2} \tag{46}$$

Equations (45) and (46) are key for estimating unfished spawning stock biomass and recruitment compensation via the recruitment models. The relationship between (s_0, β) and (B_0, κ) is defined as:

$$s_o = \kappa/\phi_E \tag{47}$$

$$\beta = \begin{cases} \frac{\kappa-1}{E_0} & \text{Beverton-Holt} \\ \frac{\ln(\kappa)}{B_0} & \text{Ricker} \end{cases} \tag{48}$$

where s_0 is the maximum juvenile survival rate, β is the density effect on recruitment, and B_o is the unfished spawning stock biomass. Unfished steady-state spawning stock biomass per recruit is given by ϕ_E, which is the sum of products between age-specific survivorship and relative fecundity. In cases where the natural mortality rate is allowed to vary over time, the calculation of ϕ_E, and the corresponding unfished spawning stock biomass (B_0) is based on the average natural mortality rate over the entire time period. This subtle calculation has implications for reference point calculations in cases where there are increasing or decreasing trends in natural mortality rates over time; as estimates of natural mortality rates trend upwards, estimates of B_0 decrease.

Note that for this Pacific hake assessment, only the Beverton-Holt recruitment model was considered.

Parameter Estimation and Uncertainty

Parameter estimation and quantifying uncertainty was carried out using the tools available in AD Model Builder `http://admb-project.org/`. AD Model Builder (ADMB) is a software for creating computer programs to estimate the parameters and associated probability distributions for nonlinear statistical models. The software is freely available from `http://admb-project.org/`. This software was used to develop CCAM, and the source code and documentation for the original version of ISCAM (on which CCAM is based) is freely available from `https://sites.google.com/site/ISCAMproject/`, or from a subversion repository at `http://code.google.com/p/ISCAM-project/`.

There are actually five distinct components that make up the objective function that ADMB is minimizing:

$$f = \text{negative loglikelihoods}+\text{constraints}+\text{priors for parameters}+\text{survey priors}+\text{convergence penalties}.$$

The purpose of this section is to completely document all of the components that make up the objective function.

Negative loglikelihoods The negative loglikelihoods pertain specifically elements that deal with the data and variance partitioning and have already been described in detail in section . There are four specific elements that make up the vector of negative loglikelihoods:

$$\vec{\ell} = \ell_C, \ell_I, \ell_A, \ell_\delta. \tag{49}$$

To reiterate, these are the likelihood of the catch data ℓ_C, likelihood of the survey data ℓ_I, the likelihood of the age-composition data ℓ_A and the likelihood of the stock-recruitment residuals ℓ_δ. Each of these elements are expressed in negative log-space, and ADMB attempts to estimate model parameters by minimizing the sum of these elements.

Constraints There are two specific constraints that are described here: 1) parameter bounds, and 2) constraints to ensure that a parameter vector sums to 0. In CCAM the user must specify the lower and upper bounds for the leading parameters defined in the control file $(\ln(R_o), h, \ln(M), \ln(\bar{R}), \ddot{R}, \rho, \vartheta)$. All estimated selectivity parameters $\vec{\gamma}_k$ are estimated in log space and have a minimum and maximum values of -5.0 and 5.0, respectively. These values are hard-wired into the code, but should be sufficiently large/small enough to capture a wide range of selectivities. Estimated fishing mortality rates are also constrained (in log space) to have a minimum value of -30, and a maximum value of 3.0. Log annual recruitment deviations are also constrained to have minimum and maximum values of -15.0 and 15.0 and there is an additional constraint to ensure the vector of deviations sums to 0. This is necessary in order to be able to estimate the average recruitment $\bar{R}$. Finally, the annual log deviations in natural mortality rates are constrained to lie between -5.0 and 5.0, although we note that these are not implemented in the current assessment.

An array of selectivity parameters (i.e., `init_bounded_matrix_vector`) is estimated within CCAM, where each matrix corresponds to a specific gear type, and the number of rows and columns of each depends on the type of selectivity function assumed for the gear and if that selectivity changes over time. In cases where the nodes of a spline are estimated these nodes also have an additional constraint to sum to zero. This is effectively implemented by adding to the objective function:

$$1000\left(\frac{1}{N_{\vec{\lambda_k}}}\sum \vec{\lambda}_k\right)^2.$$

This additional constraint is necessary to ensure the model remains separable and the annual fishing mortality rates are less confounded with selectivity parameters.

Priors for parameters Each of the seven leading parameters specified in the control file $(\ln(R_o), h, \ln(M), \ln(\bar{R}), \ln(\ddot{R}), \rho, \vartheta)$ are declared as bounded parameters and in addition the user can also specify an informative prior distribution for each of these parameters. Five distinct prior distributions can be implemented: uniform, normal, lognormal, beta and a gamma distribution. For the Pacific Hake, a bounded uniform prior was specified for the log of unfished recruitment U(-1.0,4), a beta prior was assumed for steepness Beta(9.8,2.8), a normal prior was specified for the log of natural mortality rate N(-1.609,0.1), a bounded uniform prior for both the log of initial recruitment and average recruitment U(-5.0,15.0), a beta prior for the variance partitioning parameter $\rho\tilde{\beta}(3,12)$, and a gamma prior for the inverse total standard deviation parameter $\vartheta\tilde{\Gamma}(156.25,125.0)$. Priors for M, h, and $\hat{\gamma}$ are allowed to vary depending the sensitivity cases examined. Finally there is an optional prior on the slope of the selectivity ogive σ_a.

In addition to the priors specified for the seven leading parameters, there are several other informative distributions that are invoked for the non-parametric selectivity parameters. In cases were age-specific selectivity coefficients are estimated, or nodes of a spline function are estimated, two additional penalties are added to the objective function to control how smooth the selectivity changes

(36) and (if implemented) how much dome-shape is allowed in the nonparametric selectivities (37).

Survey priors The scaling parameter q for each of the surveys is not treated as an unknown parameter within the code; rather, the maximum likelihood estimate for $ln(q)$ conditional on all other parameters is used to scale the predicted spawning biomass to the observed acoustic biomass index. For Pacific Hake, we use a prior of convenience for $ln(q)$ $N(0,0.1)$. Sensitivity to the standard deviation of this prior were examined.

Convergence penalties AD Model Builder is unique in that the estimation process can be conducted in a series of phases where more and more parameters are 'freed up' as the model progress through each phase. Furthermore, the actual objective function can change between phases such that during the initial phases large penalties can be used to, "regularize the solution". For example, in the initial phases of parameter estimation CCAM uses fairly steep quadratic penalties for the annual recruitment deviations and average fishing mortality rates to initially aid in finding reasonable values of the average recruitment, natural mortality and selectivity parameters. In the final phase, these quadratic penalties are relaxed. In the case of the annual recruitment deviations, the quadratic penalty term is:

$$100 \sum_{t=1-A}^{T} \omega_t^2,$$

which is approximately a normal density with a standard deviation equal to 0.07. In the last phase this constraint is relaxed with a large standard deviation of 5.0. A similar penalty (a normal distribution for the log mean fishing rate) is also invoked for the mean fishing mortality rate, but in this case the user specifies the mean fishing mortality rate and the standard deviations in the initial phases and the last phase. Normally, a rather small standard deviation is used in the initial phases (e.g., 0.01) and this is then relaxed to a much larger value (e.g., 5.0) in the last phase. These standard deviations are specified by the user in the control file.

Agenda Item F.1.c
Supplemental GMT Report
March 2012

GROUNDFISH MANAGEMENT TEAM REPORT ON PLANNING AND NECESSARY ACTIONS FOR THE 2012 PACIFIC WHITING SEASON

The Groundfish Management Team (GMT) discussed the updated Pacific whiting assessment (Agenda Item F.1.a, Supplemental (REVISED) Attachment 1) as well as the Pacific Whiting Act of 2006 that establishes the process for implementing the Agreement between the U.S. and Canada.

At this meeting the Council is scheduled to provide guidance on the setting of the harvest level for Pacific whiting. This guidance will inform the Council representative (Mr. Phil Anderson) to the Joint Management Committee (JMC) in their deliberations. Further, there is language in the Act that describes the factors that National Marine Fisheries Service (NMFS) will take into account in the event that the JMC cannot reach consensus. One of the factors that NMFS must consider is the recommendations of the Council. With the newness of this process, we are unsure what the Council may wish to provide in terms of recommendations to the JMC and to the Secretary of Commerce.

If the Council wishes to consider any harvest specifications other than the default harvest policy of $F_{40\%}$ with a 40:10 adjustment, the GMT suggests consideration of Table e.5 in the executive summary of the updated assessment in conjunction with the decision table. This table provides a new view of the risk posed by the uncertainty in the model. That table lists the probability (i.e. relative risk) of being at or below different biomass reference points and the default harvest rate (F40%) in 2013 under various catch levels for 2012.

The Council may also wish to articulate any other factors they want to consider in setting the U.S. portion of the Total Allowable Catch (TAC) in the event they want to recommend reducing harvest below 73.88 percent of the TAC (e.g. “to the extent necessary to address the rebuilding needs of other species.”- Sec 608 (a) of the Act).

PFMC
03/02/12

Agenda Item F.1.c
Supplemental GMT Report 2
March 2012

GROUNDFISH MANAGEMENT TEAM REPORT ON PLANNING AND NECESSARY ACTIONS FOR THE 2012 PACIFIC WHITING SEASON

The Groundfish Management Team (GMT) reminds the Council that in 2011 there was a set-aside in regulations for research catch and bycatch in the pink shrimp trawl fishery of 3,000 mt. This amount comes off the top of the U.S. optimum yield (OY) in addition to the tribal allocation prior to allocation to the other sectors. The GMT notes that there is little additional information to inform this set-aside for 2012 compared to 2011. However, the Oregon and Washington state requirements to reduce bar spacing in shrimp trawl bycatch reduction devices from 1" to 3/4" may reduce interactions with small whiting compared to previous years when that requirement was being phased in. Below is a table showing recent years' mortality in both the research and pink shrimp fisheries as well as the maximum projection for proposed research in 2011 which is expected to be pursued in 2012 as well (Table 1). The GMT recommends a set-aside of 3,000 mt be adopted for the 2012 U.S. optimum yield (OY).

Table 1. Total mortality or estimates of potential catch of Pacific whiting to inform set-asides, i.e. deducted from the OY (mt), 2005-2011.

	2011	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**
Research [1/]	1,200	133	35	12	49	16	42
Incidental Catch in the Pink Shrimp Fishery [2/]	--	398.9	1,937	684	2,808	--	--
Total	--	531.9	1972	696	2857	--	--

1/ Research estimates for 2011 are based on correspondence with the Science Centers and on planned research projects. Research estimates from 2010-2005 are those reported in the total mortality reports from those years.
2/ Reported catch from non-whiting fisheries (i.e. pink shrimp) are from the total mortality reports (2010-2007). Prior to 2007, the total mortality reports did not report catches of groundfish specifically for the pink shrimp trawl fishery, so no values are reported in this table for 2006 and 2005. 2011 values are not yet available.

PFMC
03/03/12

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sustainable Fisheries Division F/NWR2
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115-0070

Agenda Item F.1.c
Supplemental NMFS Report
March 20120

FEB 29 2012

Mr. Dan Wolford, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384

Dear Mr. Wolford:

As you are aware, on February 21, 2012, Judge Henderson issued the remedy order in Pacific Dawn, LLC v. Bryson, No. C10-4829 THE (N.D. Cal.). The Order remands the regulations addressing the initial allocation of whiting for the shorebased individual fishing quota (IFQ) fishery and the at-sea mothership fishery "for further consideration" consistent with the court's December 22, 2011 summary judgment ruling, the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and all other governing law. Further, the Order requires that the National Marine Fisheries Service (NMFS) implement revised regulations before the 2013 Pacific whiting fishing season begins on April 1, 2013. In the interim, the existing regulations remain in effect.

Judge Henderson, in response to plaintiffs' suggestion that revised regulations could be adopted by emergency action under the MSA, noted that the agency, on remand "should consider whether use of this mechanism is appropriate." NMFS does not believe that use of the emergency authority of the MSA is appropriate in this situation. As stated in the Policy Guidelines on the Use of Emergency Rules, generally controversial actions with serious economic effects should not be taken pursuant to emergency authority. Further, we do not believe that the immediate benefits of an emergency rulemaking in this situation outweigh the value of advance notice, public comment, and deliberative consideration. *See* 62 Fed. Reg. 44,421-22 (August. 21, 1997).

By this letter, NMFS requests that the Pacific Fishery Management Council (Council) initiate the reconsideration of the initial allocations for quota share (QS) of whiting in the shorebased IFQ fishery and for whiting catch history assignments in the at-sea mothership fishery. An important step in this reconsideration is revising the Council's current agenda by scheduling the appropriate items for the April, June, and September meetings. The Council will also need to commit to submission of any revised recommendations to the agency as soon as practicable following the September Council meeting.

NMFS will also need to revise its workplan over the coming months and commit to helping the Council work through the additional workload, as follows.

Given the limited amount of time available, and in order to facilitate the Council's reconsideration of the issues, for the April meeting, NMFS will provide the Council with what we believe is an appropriate range of alternatives for reconsideration.

In addition, NMFS intends to publish an Advanced Notice of Proposed Rulemaking (ANPR) to inform the public of the Court Order and the schedule that the Council and NMFS intend to follow to comply with the Court Order. In the ANPR, we will advise the public of the appropriate process to correct data that may be used for initial allocation; this process will be similar to that undertaken in early 2010 prior to the implementation of the trawl rationalization program. In the ANPR, we will also highlight the relevant aspects of the trawl rationalization program that may need to be suspended or adjusted, including the issues identified below.

NMFS has preliminarily concluded that, pending the reconsideration of the initial whiting allocation, it is necessary to initiate a rulemaking to delay at least two elements of the existing regulations—

1) Transfer of QS or Individual Bycatch Quota (IBQ) between QS accounts[§ 660.140(d)(3)(ii)(B)(2)]; this rule would need to be completed before at least December 1, 2012, and;
2) the ability to change mothership catcher vessel (MS/CV) endorsement and associated catch history assignment from one limited entry trawl permit to another [§ 660.150(g)(2)(iv)]; this rule would need to be completed by at least August 1, 2012.

Delaying these existing regulations is necessary due to the increased complications that would be caused by allowing transfer of QS or MS/CV endorsements, since these are all based on initial whiting allocations which may be subject to change.

Because quota shares for whiting may be revised, on January 1, 2013, NMFS may need to hold back sufficient quota pounds for whiting and all associated bycatch species in order for QS holders to receive the appropriate final amounts. In addition, for the at-sea mothership fishery, NMFS may need to consider impacts on the processor obligation and coop formation, both of which occur before April 1, 2013. We will work with the Council to consider and address these potential issues, as well as any additional issues that may arise.

We appreciate the Council setting aside the time to discuss these issues at the March meeting.

Sincerely,

Frank D. Lockhart
Assistant Regional Administrator

Davis Wright Tremaine LLP

Suite 800
505 Montgomery Street
San Francisco, CA 94111-6533

James P. Walsh
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budwalsh@dwt.com

February 8, 2012

Via Electronic Mail and Overnight Delivery

Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Comments for Advance Briefing Book for March 2-7, 2012 Meeting

Dear Sir or Madam:

We are submitting the enclosed materials to be included in the Advance Briefing Book for the Pacific Fishery Management Council's ("Council's") March 2-7, 2012 meeting on behalf of our clients, Pacific Dawn LLC, Chellisa LLC, James and Sandra Schones, Da Yang Seafood Inc., and Jessie's Ilwaco Fish Company. These organizations and individuals are plaintiffs in a case titled *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, filed in the Northern District of California, challenging the 2011 allocation of individual fishing quotas ("IFQs") for the Pacific whiting fishery.

On December 22, 2011, the Court in *Pacific Dawn* found that the National Marine Fisheries Service's and National Oceanic and Atmospheric Administration's failure to consider fishing history beyond 2003 for harvesters and 2004 for processors in implementing 2011 IFQs for the Pacific whiting fishery was arbitrary and capricious and therefore a violation of the Magnuson-Stevens Act. Because of the impact of the Court's ruling on the IFQ allocations for Pacific whiting, we request that the accompanying materials be reviewed by the Council in its consideration and plan for the upcoming 2012-2013 the Pacific whiting fishing season.

Enclosed, please find the following (Exhibits 1-4 filed in the above referenced case):

- **<u>Exhibit 1</u>**: Order Granting in Part and Denying in Part Plaintiffs' and Defendants' Motions for Summary Judgment, *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, Northern District of California (Docket No. 49, December 22, 2011);
- **<u>Exhibit 2</u>**: Plaintiffs' Supplement Memorandum in Support of Request for Relief, *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, Northern District of California (Docket No. 51, January 30, 2012);

- **Exhibit 3:** Federal Defendants' Supplemental Brief on the Appropriate Remedy, *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, Northern District of California (Docket No. 52, January 30, 2012);

- **Exhibit 4**: Plaintiffs' Opposition to Motion of Midwater Trawlers Cooperative and Environmental Defense Fund for Leave to File Amici Curiae Brief on Remedy and Declaration of Burton Parker in support thereof, *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, Northern District of California (Docket Nos. 56, 56-1, February 6, 2012); and

- **Exhibit 5**: Letter from James Walsh to William Stelle, Northwest Regional Administrator, National Marine Fisheries Service, dated February 7, 2012.

Thank you for your consideration. Please let me know if you have any questions or would like additional information.

Very truly yours,

Davis Wright Tremaine LLP

James P. Walsh my G.F.

James P. Walsh

cc: Mariam McCall (via email only)
Meredith Flax (via email only)

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

PACIFIC DAWN, LLC, et al.,
Plaintiffs,
v.
JOHN BRYSON, et al.,
Defendants.

NO. C10-4829 TEH

ORDER GRANTING IN PART AND DENYING IN PART PLAINTIFFS' AND DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

This matter came before the Court on December 12, 2011, on the parties' cross-motions for summary judgment. After carefully considering the parties' written and oral arguments, the Court now GRANTS IN PART and DENIES IN PART the motions for the reasons discussed below.

I. BACKGROUND

This case concerns the manner in which Defendants John Bryson, sued in his official capacity as Secretary of Commerce ("Secretary");[1] National Marine Fisheries Service ("NMFS"); and National Oceanic and Atmospheric Administration ("NOAA") regulate the fishing of Pacific whiting off the coasts of Washington, Oregon, and California. The Secretary oversees NOAA, which includes NMFS among its member agencies. Plaintiffs Pacific Dawn LLC, Chellissa LLC, James and Sandra Schones, Da Yang Seafood Inc., and Jessie's Ilwaco Fish Company own three fishing vessels and two processing companies that participate in the Pacific whiting industry.

[1]Bryson is substituted for Defendant Gary Locke pursuant to Federal Rule of Civil Procedure 25(d).

Plaintiffs contend that Defendants violated the Magnuson-Stevens Fishery Conservation and Management Act ("MSA" or "Act"), 16 U.S.C. §§ 1801-84, when they adopted Amendments 20 and 21 to the fishery management plan for Pacific groundfish, which includes Pacific whiting. Amendment 20 created a limited access privilege program through which participants in the trawl sector of the fishery receive permits to harvest a specific portion of the fishery's total allowable catch via individual fishing quotas ("IFQs"). Amendment 21 allocated total allowable catch for certain species in the fishery between the trawl and non-trawl sectors.

Congress enacted the MSA, among other purposes, "to conserve and manage the fishery resources found off the coasts of the United States," "to promote domestic commercial and recreational fishing under sound conservation and management principles," and "to provide for the preparation and implementation, in accordance with national standards, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery." 16 U.S.C. § 1801(b)(1), (3)-(4). The Act created eight regional fishery management councils, including the Pacific Fishery Management Council ("Council") that governs the fishery at issue in this case. 16 U.S.C. § 1852. These councils must develop, and submit to the Secretary for approval, fishery management plans ("FMPs") and "amendments to each such plan that are necessary from time to time (and promptly whenever changes in conservation and management measures in another fishery substantially affect the fishery for which such plan was developed)." 16 U.S.C. § 1852(b), (h)(1). FMPs must comply with ten national standards, 16 U.S.C. § 1851(a), and the MSA also enumerates certain factors that councils must take into account when developing programs that limit access to a fishery. *E.g.*, 16 U.S.C. §§ 1853(b)(6), 1853a.

Of relevance to Plaintiffs' instant claims,[2] NMFS issued regulations implementing Amendment 6 to the FMP for Pacific Groundfish in 1992, to take effect on January 1, 1994.

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[2]The parties are familiar with the facts of this case, and the Court here offers only a brief summary of relevant portions of the extensive administrative record.

Those regulations required federal permits to participate in the limited entry segment of the fishery and established different levels of endorsements, including "A" and "B." 57 Fed. Reg. 32,499, 32,501-03 (July 22, 1992). "A" endorsements were transferable endorsements that were granted to vessels that met specific minimum landing requirements during the qualifying window period of July 11, 1984, through August 1, 1988. *Id.* at 32,501. "B" endorsements were non-transferable and granted to vessels that "landed some groundfish prior to August 1, 1988," but that did not meet the requirements to receive an "A" endorsement. *Id.* "'B' endorsements expire[d] at the end of the 1996 fishing year, by which time vessel owners must have obtained a permit with an 'A' endorsement or have left the limited entry fishery." *Id.* at 32,503.

In 2004, NMFS published an advanced notice of proposed rulemaking announcing that the Council was:

> considering implementing an individual quota (IQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon and California. The trawl IQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits for every 2-month period to a quota system where each quota share could be harvested at any time during an open season. The trawl IQ program would increase fishermen's flexibility in making decisions on when and how much quota to fish. This document announces a control date of November 6, 2003, for the trawl IQ program. The control date for the trawl IQ program is intended to discourage increased fishing effort in the limited entry trawl fishery based on economic speculation while the Pacific Council develops and considers a trawl IQ program.

69 Fed. Reg. 1563 (Jan. 9, 2004).

The Council subsequently decided to allocate IFQs for Pacific whiting to current permit holders based on fishing history associated with such permits from 1994 to 2003 for harvesters, and from 1994 to 2004 for on-shore processors. Fishing history under "B"-endorsed permits was included when determining the total catch for the fishery in each year of the qualifying periods, but it was not included "in calculating any permit's individual qualifying history." Nov. 21, 2011 Joint Supplemental Br. at 3 (ECF Docket No. 47) (parties' jointly agreed description of how "B"-permit history was used in calculating IFQs);

see also 75 Fed. Reg.60,869, 60,956 (Oct. 1, 2010) (setting forth allocation rules). The final rules implementing Amendments 20 and 21 were issued in October and December 2010, and implementation of the IFQ system began on January 1, 2011. 75 Fed. Reg. 60,869; 75 Fed. Reg. 78,344 (Dec. 15, 2010).

The MSA requires that:

> In developing a limited access privilege program to harvest fish a Council or the Secretary shall –
>
> (A) establish procedures to ensure fair and equitable initial allocations, *including consideration of* –
>
> (i) *current and historical harvests*;
>
> (ii) employment in the harvesting and processing sectors;
>
> (iii) investments in, and dependence upon, the fishery; and
>
> (iv) the current and historical participation of fishing communities.

16 U.S.C. § 1853a(c)(5) (emphasis added). Plaintiffs contend that Defendants violated subsection (i) of this provision – and also failed to base their decisions on "the best scientific information available," as required by National Standard Two, 16 U.S.C. § 1851(2) – in two ways: first, by not considering fishing history for harvesters beyond 2003 and for processors beyond 2004 and, second, by not adequately considering fishing history associated with "B" permits.[3] Plaintiffs argue that their initial IFQs would have been higher had harvests beyond 2003 and 2004 been considered.[4] Plaintiff Pacific Dawn further asserts that it obtained ownership of the fishing history of the Amber Dawn, a vessel that fished under a "B"-endorsed permit from 1994 to 1996, and that this history was not but should have been included when Defendants determined Pacific Dawn's initial IFQ. The parties agree that

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[3]In their papers, Plaintiffs discuss separately the 2003 and 2004 cutoff dates for harvesters and processors, respectively. The Court considers these issues concurrently because they are based on the same legal arguments.

[4]Plaintiff Da Yang Seafood Inc. did not receive an initial IFQ because it had no history prior to the 2004 cut-off date for processors. It contends that it should have received one based on its more recent history.

summary judgment is an appropriate mechanism for resolving Plaintiffs' claims, and their cross-motions for summary judgment are now pending before the Court.

II. LEGAL STANDARD

A court shall set aside regulations adopted under the MSA if they are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A); 16 U.S.C. § 1855(f)(1)(B) (adopting the standards for judicial review under 5 U.S.C. § 706(2)). This is a "highly deferential" standard of review, and an agency's action is presumed to be valid and should be affirmed "if a reasonable basis exists for its decision." *Indep. Acceptance Co. v. California*, 204 F.3d 1247, 1251 (9th Cir. 2000) (internal quotation marks and citation omitted). A reviewing court's "only task is to determine whether the Secretary has considered the relevant factors and articulated a rational connection between the facts found and the choices made." *Midwater Trawlers Coop. v. Dep't of Commerce*, 282 F.3d 710, 716 (9th Cir. 2002). The court "cannot substitute [its] judgment of what might be a better regulatory scheme . . . if the Secretary's reasons for adopting it were not arbitrary and capricious." *Alliance Against IFQs v. Brown*, 84 F.3d 343, 345 (9th Cir. 1996).

"[S]ummary judgment is an appropriate mechanism for deciding the legal question of whether the agency could reasonably have found the facts as it did." *Occidental Eng'g Co. v. INS*, 753 F.2d 766, 770 (9th Cir. 1985). Review is generally "limited to the administrative record on which the agency based the challenged decision." *Fence Creek Cattle Co. v. U.S. Forest Serv.*, 602 F.3d 1125, 1131 (9th Cir. 2010). The Ninth Circuit allows expansion of the record only "in four narrowly construed circumstances: (1) supplementation is necessary to determine if the agency has considered all factors and explained its decision; (2) the agency relied on documents not in the record; (3) supplementation is needed to explain technical terms or complex subjects; or (4) plaintiffs have shown bad faith on the part of the agency." *Id.* In this case, neither party has asked the Court to supplement the administrative record.

III. DISCUSSION

As an initial matter, Defendants correctly argue that the Act's use of the word "consideration" does not mandate a particular outcome. *See e.g., Pac. Coast Fed'n of Fishermen's Ass'ns v. Locke*, Case No. C10-4790 CRB, 2011 WL 3443533 (N.D. Cal. Aug. 5, 2011), at *5-7. However, unlike the plaintiffs in *Pacific Coast Federation*, Plaintiffs here challenge not simply the end result, but also whether Defendants considered the required statutory factors in reaching that result. The MSA unambiguously requires that Defendants consider certain factors, including "current and historical harvests." 16 U.S.C. § 1853a(c)(5)(A)(i). As explained above, Defendants must have "considered the relevant factors and articulated a rational connection between the facts found and the choices made." *Midwater Trawlers Coop.*, 282 F.3d at 716.

A. <u>Consideration of fishing history beyond 2003 and 2004</u>

Plaintiffs first argue that Defendants improperly failed to consider "current" harvests when, in 2010, they based initial IFQs on fishing histories through 2003 for harvesters and 2004 for processors. Defendants assert that they adequately considered current harvests by allocating quota shares to current permit owners rather than to individuals or vessels that may have participated in the fishery in the past. However, the statute requires consideration of current harvests, not current permits, and considering historical harvests of current permits is distinguishable from considering current harvests themselves. Defendants have cited no authority to the contrary.

Defendants' main argument on this issue is that they reasonably based the end of the qualifying period on the previously published 2003 control date. Plaintiffs raise several challenges to the validity of that control date, none of which have merit. First, Plaintiffs assert that the 2003 date reflected only a political statement or compromise, but they cite no evidence for this assertion.[5] Thus, this case is distinguishable from *Hadaja, Inc. v. Evans*, in which the regional council "urged the industry groups to reach a compromise," and the

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[5]As noted below, there is evidence in the record, however, that the extension of the qualifying period for processors to 2004 was the result of compromise.

"limited access scheme was adopted directly from the compromise reached." 263 F. Supp. 2d 346, 350, 354 (D.R.I. 2003). Plaintiffs also argue that a proposed control date is only valid if it is adopted as a formal regulation. However, Plaintiffs cite no authority to support that conclusion, and the Third Circuit recently rejected that argument, concluding that the government need not go through formal rule promulgation procedures before setting a control date; instead, the court held that publication of a proposed control date in the Federal Register was sufficient. *Gen. Category Scallop Fishermen v. Sec'y of Commerce*, 635 F.3d 106, 113 (3d Cir. 2011). Finally, Plaintiffs argue that an interim amendment to the FMP – Amendment 15 – superseded the control date, but they cite no authority to rebut Defendants' conclusion in the record, in response to a comment to the proposed regulation, that:

> Nowhere does Amendment 15 address the 2003 control date or purport to change the qualifying period for the Groundfish trawl program. Amendment 15 was a limited interim action for the non-Tribal whiting fishery issued in anticipation of the trawl rationalization that in no way attempted to address matters beyond its limited scope. Moreover, the Council has explicitly stated that vessels that qualified for whiting fishery participation under Amendment 15 were not guaranteed future participation or inclusion in the Pacific whiting fishery under the provisions of Amendment 20.

B22:638 (June 2010 Final Environmental Impact Statement prepared by the Council and NMFS) (citation omitted).[6] In light of all of the above, the Court finds that the proposed control date was procedurally valid and was not subsequently invalidated by Amendment 15.

Defendants explain that they chose to base the qualifying period on the announced control date because using a later date would "reward those who disregarded the control date announcement, create perceptions of inequity, and encourage fishermen to ignore such dates in the future, negatively affecting the Council's ability to credibly use control dates." B22:A-151; *see also* B22:A-146 ("The allocation period that would most likely minimize dislocation and the attendant costs would be the few years just prior to the initial allocation.

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[6]The Court adopts the parties' system of citation to the administrative record. Thus, the quoted language appears at page 638 of document B22. Pagination denoted with an asterisk refers to page numbers in the document's PDF format rather than pagination identified on the document itself.

That period is not used, in part, because of issues related to the need to establish credible control dates to effectively manage the fishery while deliberations on new LE [limited entry] programs are underway."). A similar rationale was upheld by the Ninth Circuit in *Alliance Against IFQs v. Brown*. In that case, the relevant statute required that "present participation in the fishery" be "take[n] into account."[5] 84 F.3d at 346 (quoting 16 U.S.C. § 1853(b)(6)(A)). The government allocated quota shares in 1993 to owners or lessees of vessels that made legal landings of halibut or sablefish during the years 1988 to 1990. *Id.* at 345-46. The Ninth Circuit found that the most persuasive reason for a 1990 cutoff date "was that if participation in the fishery while the rule was under consideration had been considered, then people would have fished and invested in boats in order to obtain quota shares, even though that would have exacerbated overcapacity and made no economic sense independently of the regulatory benefit." *Id.* at 346. The court ultimately concluded that the three-year period between the end of the cutoff period and promulgation of the regulations was not arbitrary or capricious:

> Congress left the Secretary some room for the exercise of discretion, by not defining "present participation," and by listing it as only one of many factors which the Council and the Secretary must "take into account." While the "participation" that the Council actually considered was admittedly in the "past" judged from the time when the final regulations were promulgated, it was roughly "present" with the time when the regulations were first proposed: The Council began its process on this plan in 1990, and considered participation in 1988, 1989, and 1990. The process required to issue a regulation necessarily caused substantial delay. The process of review, publication, public comments, review of public comments, and so forth, had to take a substantial amount of time, *see* 16 U.S.C. § 1854(a), and the environmental impact review also was lengthy, as it typically is, *see* 42 U.S.C. § 4332(2)(C). "Present" cannot therefore prudently be contemporaneous with the promulgation of the final regulations.

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[5]Plaintiffs assert that Congress intended the word "current" to refer to more recent events than "present," but they cite no authority for that position. Moreover, their moving papers rely on a dictionary definition of "current" expressed in terms of "present." Pls.' Mot. at 9 (defining "current" as "presently elapsing, occurring in or existing at the present time; most recent") (quoting Merriam-Webster Unabridged Dictionary (2010)).

> We further believe that the Secretary had a good reason for disregarding participation in the fishery during this lengthy process, because the alternative would encourage the speculative over-investment and overfishing which the regulatory scheme was meant to restrain. Under the regulations, eligibility for quota shares depends on fishing during the years 1988, 1989, and 1990. Whatever years are used necessarily recede into the distant past. Even in 2005, assuming the regulatory scheme lasts that long, the quota shares will be based on fishing prior to 1991. Future generations of fishermen will continue to be governed by these pre-1991 allocations. Had the Secretary extended the 1990 cutoff, the incentive to pour money and time into the fishery in order to get a bigger quota share, for those who could afford a long term speculation, would have been enormous.
>
> Thus, while the length of time between the end of the participation period considered and the promulgation of the rule *pushed the limits of reasonableness*, we are unable to characterize use of a 1988 through 1990 period as so far from "present participation" when the regulation was promulgated in 1993 as to be "arbitrary or capricious."

Id. at 347-48 (emphasis added) (citations omitted).

Alliance Against IFQs would clearly support upholding the regulations at issue in this case had they been promulgated in 2006 rather than 2010. The same "good reason" that supported the cutoff date in that case applies equally here: the desire to curb speculation while the regulations were under review. *Id.* at 347. Plaintiffs counter that there is no evidence of rampant speculation in the whiting industry that would undermine conservation and management efforts, and a control date was therefore unnecessary, but it could very well be that the announcement of a control date is what curbed any such speculation.

However, if three years between the end of a qualifying period and promulgation of a regulation "pushe[s] the limits of reasonableness," *Alliance Against IFQs*, 84 F.3d at 348, then the six- and seven-year periods in this case arguably fall beyond those limits. While "current" cannot "prudently be contemporaneous with the promulgation of the final regulations," it may be that a 2003 cutoff date is "so far" from "current" harvests when the regulation was promulgated in 2010 as to be arbitrary or capricious. *Id.* at 347-48. At oral argument, Defendants asserted that this case was more factually complex than *Alliance Against IFQs* – for example, because more species were at issue and Congress passed amendments to the MSA while the regulations were under consideration – and that a longer period of time to develop the regulations was therefore reasonable. The parties did not brief this issue, and it may be that the increased factual complexity would, indeed, render the delays in this case reasonable.

The Court need not and does not decide this question because an independent basis exists for rejecting the regulations in this case: Even if it was conceptually reasonable for Defendants to have relied on a 2003 control date when promulgating regulations in 2010, the manner in which they did so here was not rational. As Defendants correctly observe, the record demonstrates that harvests up to 2006 were considered for some purposes. At first glance, this would appear to support Defendants because it indicates that they considered harvests more recent than 2003. However, it actually undermines Defendants' position because Defendants fail to explain why it was rational to rely on the control date for some purposes but not others. For example, Defendants considered harvests from 2003 to 2006 when examining species considered to be overfished. *E.g.*, D45:*64-68 (Aug. 3, 2010 Decision Memorandum from NOAA Regional Administrator William W. Stelle, Jr. to NOAA Assistant Administrator for Fisheries Eric C. Schwaab). They justified going beyond the 2003 control date as follows:

> The ratios could not be calculated without using information from the West Coast Groundfish Observer Program. This program was not fully operational until 2003, so use of earlier years would not have been practicable. In addition, the Rockfish Conservation Areas (RCAs) were first created in 2003. Fishing operations were greatly affected by the creation of the RCAs, which will remain in place for the foreseeable future. The Council considered it important to recognize the changes caused by the RCAs, that choosing earlier years would not have done so, and that an estimate of likely patterns of activity should be based on a period of time when the RCAs were in place. The Council also considered using later years, but rejected this approach because the years 2003-2006 reasonably reflected recent fishing patterns, while not diverging too far from the target species allocation period of 1994-2003.

D45:*66. While the development of the RCAs provides a rational basis for departing from the 2003 control date in allocating QS for overfished species, it is questionable that Defendants considered whether the chosen qualifying period "reasonably reflected recent fishing patterns" for these species when they do not appear to have undertaken the same analysis for Pacific whiting. For instance, the distribution of whiting among Washington, Oregon, and California appears to have shifted significantly after 2003, with Washington's share moving from 29% in 2003 to 50% in 2008, but Defendants have not cited to any portion of the record where they considered whether the IFQ allocations based on history through 2003 and 2004 "reasonably reflected" these more recent fishing patterns. *See* M379:6, 8 (July 9, 2010 comments on proposed rule prepared for Plaintiff Pacific Dawn by Steve Hughes).

Defendants also looked at more recent harvests when considering whether new entrants would be prejudiced. B22:A-216. They concluded that:

> With respect to whiting, five new buyers have entered the fishery since 2004 (the end of the whiting QS [quota share] allocation period for processors), but these buyers have purchased nearly 3 percent of the shoreside whiting landings and about 9 percent of the landings in California (which are much smaller than for Oregon and Washington, Table A-76). With the possible exception of California, it does not appear that there are many post-2004 entrants with significant amounts of landings that will not receive an initial allocation of whiting QS under the IFQ program.

Id. Defendants make no argument as to why it was rational for them to exclude these new entrants, particularly the ones that had "significant amounts of landings that will not receive an initial allocation of whiting QS under the IFQ program." There does not appear to be any evidence, for example, that the new entrants engaged in speculation when they entered the market after the announced 2003 control date.

Most problematic is Defendants' explanation of why the qualifying period for processors was extended to 2004. Defendants did not rely on the 2003 control date for processors "because keeping the date at 2003 was viewed to disadvantage a processor that was present as a participant during the window period but had increased its share of the processing substantially since the close of the original allocation period (2003)." B22:A-214. Thus, the extension to 2004 was made to benefit a single processor, which begs the question of why that particular processor should benefit – notwithstanding an earlier control date – when others should not. This appears to be a quintessential case of arbitrariness. Moreover, the record unequivocally states that the extension of the period to 2004 for harvesters was the result of "a compromise arrived at during industry negotiations," B22:A-146, thus undermining any argument that Defendants' decision-making was free from political compromise.

While Defendants correctly argue that they have broad discretion to make decisions, and that no particular outcome is required by the MSA, they have failed to present a reasonable explanation for relying on the 2003 control date for some purposes but not others. Consequently, the Court finds that Defendants' failure to consider fishing history beyond 2003 for harvesters and 2004 for processors was arbitrary and capricious. Plaintiffs' motion for summary judgment is GRANTED on this issue, and Defendants' motion is DENIED.

B. <u>Consideration of "B"-permit history</u>

Plaintiffs next argue that Defendants violated the MSA by failing to give adequate consideration to fishing history conducted under "B" permits. The parties agree that "B"-permit history was not credited to any current permit holder when determining qualifying history for purposes of allocating initial IFQs. Defendants explain that such history was excluded because they followed a policy of having fishing history follow the permit – i.e., they allocated shares to owners of current permits to "ensure[] that the allocation will go to those that currently own assets in the fishery," B22:A-119, and based such allocations on the catch history associated with each given permit, not the catch history of any particular vessel.

Given the decision to base IFQs on fishing history associated with current permits – a decision that Plaintiffs do not challenge – it was not arbitrary or capricious for Defendants to exclude "B"-permit history when calculating qualifying fishing history. While Plaintiff Pacific Dawn may well have entered into an agreement to purchase the fishing history of the Amber Dawn, the "B" permit under which the Amber Dawn fished expired in 1996. Contrary to Plaintiffs' assertions, the record is clear that "B" permits were not transferable and were no longer valid after 1996. *E.g.*, 57 Fed. Reg. 32,499, 32,501 ("A 'B' endorsement allows the vessel to participate in the limited entry fishery through 1996, when all 'B' endorsements will expire."); *id.* at 32,503 ("The non-transferable 'B' endorsement provides short-term access to the fishery. . . . 'B' endorsements expire at the end of the 1996 fishing year, by which time vessel owners must have obtained a permit with an 'A' endorsement or have left the limited entry fishery."). Plaintiffs have failed to establish that the history of the Amber Dawn when it fished under a "B" permit is associated with any current permit, and it was therefore reasonable for Defendants not to have credited such history when it allocated initial IFQs. Accordingly, Defendants' motion for summary judgment is GRANTED on this issue, and Plaintiffs' motion is DENIED.

C. Remedy

Having found for Plaintiffs on one issue, the Court must now determine an appropriate remedy. Plaintiffs ask that the regulations be set aside and the matter be remanded to NOAA, but Defendants request an opportunity to file additional briefs on an appropriate remedy. In their reply, Plaintiffs failed to offer any reason why such briefing would be unnecessary and instead merely repeated their conclusory request that the regulations be set aside and that NOAA be ordered to revise the regulations in compliance with the MSA. Although the parties could – and should – have included more discussion on an appropriate remedy in their papers, they did not. The Court therefore finds it prudent to consider supplemental briefing before granting any relief.

IV. CONCLUSION

As discussed above, Plaintiffs' and Defendants' motions for summary judgment are both GRANTED IN PART and DENIED IN PART. Plaintiffs prevail on the issue of whether Defendants violated the MSA by basing initial IFQ allocations on fishing history only through 2003 for harvesters and 2004 for processors. Defendants prevail on the issue of whether they adequately considered fishing history conducted under "B" permits.

The parties shall submit supplemental briefing on an appropriate remedy. They shall file simultaneous briefs on or before **January 30, 2012,** and simultaneous reply briefs on or before **February 13, 2012.** The matter will then be deemed submitted on the papers unless the Court subsequently orders oral argument. Alternatively, if the parties wish to appeal this order before litigating an appropriate remedy, the Court will consider a motion to make the requisite findings for an interlocutory appeal under 28 U.S.C. § 1292.

IT IS SO ORDERED.

Dated: 12/22/11

THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **PLAINTIFFS' SUPPLEMENTAL MEMORANDUM IN SUPPORT OF REQUEST FOR RELIEF**

I. INTRODUCTION

On December 22, 2011, this Court granted in part plaintiffs' Pacific Dawn LLC, Chellissa LLC, James and Sandra Schones, Da Yang Seafood Inc., and Jessie's Ilwaco Seafood Company (collectively, "plaintiffs'") motion for summary judgment regarding certain fishery management regulations promulgated by defendants John Bryson, National Oceanic and Atmospheric Administration ("NOAA") and National Marine Fisheries Service ("NMFS") (collectively, "defendants"). The Court found that defendants violated the Magnuson-Stevens Fishery

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

Conservation and Management Act ("MSA") by basing initial, individual fishing quotas ("IFQs") for Pacific whiting on fishing history only through 2003 for harvesters and 2004 for processors. *See* Order Granting in Part and Denying in Part Plaintiffs' and Defendants' Motions for Summary Judgment at 13, Docket No. 49, filed December 22, 2011 ("MSJ Order"). The Court found that defendants' failure to consider fishing history beyond these years in promulgating the regulations that implemented Amendments 20 and 21 to the Pacific Groundfish Fishery Management Plan ("FMP") for Pacific whiting in 2011 (the "IFQ Regulations") was therefore arbitrary and capricious. *Id.* at 12.

In connection with the Court's ruling, the Court requested that the parties submit supplemental briefs on the appropriate remedy. Plaintiffs therefore ask this Court to order an effective remedy to address defendants' failures, which resulted in deficient 2011 quotas for Pacific whiting. Defendants' management of Pacific whiting levels is ongoing and therefore, an order to reconsider the IFQ Regulations in compliance with the MSJ Order is necessary and appropriate.

II. ARGUMENT

Defendants' violations of the MSA represent their failure to comply with their own fishery management rules to the detriment of those participating in the fisheries. By failing to consider the proper fishing history in adopting the IFQ Regulations, defendants have demonstrated the need for a court order directing them to comply with the MSA and review the IFQ Regulations.

A. **The Timing of Current Regulation Process Provides an Opportunity for Defendants to Reconsider the IFQ Regulations in Time for the Start of the Upcoming Pacific Whiting Season.**

The Pacific whiting season starts on May 15 for harvesters and processors in the mothership sector and June 15 for shoreside processors. 50 C.F.R. §660.373(b)(1)(iii)(B) and (C)(1).[2] Ordinarily, the rulemaking regarding allocation and harvest levels coincides with the start of the season. First, the Pacific Fishery Management Council (the "Council") will meet in March to develop recommendations for NMFS regarding allocations of Pacific whiting existing stock

[2] A copy of 50 C.F.R. §660.373 is attached as Exhibit 1.

levels.[3] *See e.g.*, 76 Fed. Reg. 18709 (April 5, 2011) (describing Council recommendations for optimum yield for Pacific whiting fishery);[4] 76 Fed. Reg. 28897 (May 19, 2011) (describing process vis-a-vis the Council's March 2011 and 2012 meetings).[5] Then, over the next two months, NMFS will publish a proposed rule and NOAA will adopt a final rule around the time of the start of the season. For example, in 2011, NMFS published the proposed rule for the 2011 Pacific whiting fishery on April 5. *See* Exh. 2 (76 Fed. Reg. 18709). NMFS accepted comments on the proposed rule until April 19, 2011. *Id.* NOAA subsequently adopted the final rule establishing the 2011 fishery harvest specifications for Pacific whiting on May 19, 2011, deemed effective as of May 15, 2011 – the start of Pacific whiting season. Exh. 3 (76 Fed. Reg. 28897).

This timeline provides the opportunity in the present case for the IFQ Regulations to go back to NMFS for reconsideration in time for the current, 2012 season. There is sufficient time for the defendants to implement revised, final regulations for Pacific whiting by May 15, or thereabouts, consistent with the MSA and the MSJ Order. Essentially, all that is required is a new calculation of the IFQ taking the expanded historical fishing years into account. A quantity of the IFQ is allocated to each permit holder for the vessel based on its relative catch history. Under the existing regulations, the permit holder is allowed to drop out two history years and the allocation is based on this final number.

It will cause no delay given the expected 2012 rulemaking for harvest calculations if, at the same time, defendants are ordered to calculate new IFQ allocations for the 2012 Pacific whiting season based on the most recent history. Defendants do not need to collect any data about fishing history because they already have the history through 2010 that they need to do the calculations. These records are already in their possession and they simply need to adjust the formula to re-run the numbers. Thus, there is little reason to think they could not implement the final rules by May 15 in time for the start of the season.

[3] According to the Council's website, the next Council meeting is scheduled for March 2-7, 2012. *See* http://www.pcouncil.org/council-operations/council-meetings/current-meeting/

[4] A copy of 76 Fed. Reg. 18709-18712 (April 5, 2011) is attached as Exhibit 2.

[5] A copy of 76 Fed. Reg. 28897-28909 (May 19, 2011) is attached as Exhibit 3.

Thus, plaintiffs request that defendants be ordered to use all available authority and their best efforts to effectuate the above-changes and implement revised, final 2012 IFQ Regulations by May 15, 2012. Specifically, plaintiffs request an order that requires:

1. The IFQ Regulations to be remanded to NMFS for reconsideration and revision based on "current and historical harvest" for harvesters and processors for Pacific whiting within the meaning of 16 U.S.C. §1853a(c)(5)(A)(i) and consistent with the MSA and MSJ Order;

2. Defendants to use their best efforts and all available authority to implement revised, final IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012 for the start of the season;

3. The existing IFQ Regulations to remain in effect pending the implementation of revised, final IFQ Regulations for the 2012 Pacific whiting season in compliance with the MSA and MSJ Order; provided, however, that if defendants fail to implement revised IFQ Regulations for the 2012 Pacific whiting season by December 1, 2012, the existing IFQ Regulations will be vacated;

4. The Court to retain jurisdiction over defendants' actions on remand; and

5. Within three months of the date of issuance of the Order on Remedy, and every three months after that until the earlier of the adoption of final, revised 2012 IFQ Regulations or December 1, 2012, defendants to submit a report to the Court regarding their efforts to comply with the Order on Remedy.

B. <u>The Court Should Order Remand Without Immediate Vacatur of the IFQ Regulations</u>.

Defendants' violations of the MSA require reconsideration of the IFQ Regulations to take into account fishing history beyond the 2003 (harvesters) and 2004 (processors) control years for Pacific whiting. Nevertheless, plaintiffs do not seek vacatur of the IFQ Regulations but only remand. As described above, the schedule for adopting new, revised IFQ Regulations gives defendants time to effect the necessary changes in the regulations by May 15, 2012, without delaying the timeline that defendants have traditionally followed. Although the Court found that promulgation of the IFQ Regulations was "arbitrary and capricious," the IFQ Regulations should remain in effect pending remand and revision.

Remand without vacating the IFQ Regulations is appropriate here. Generally, regulations are invalid when they are found to have not been promulgated in compliance with the Administrative Procedures Act. *Idaho Farm Bureau Fed'n v. Babbitt*, 58 F.3d 1392, 1405 (9th Cir.

1995) (finding Endangered Species Act ("ESA") listing rule invalid for failure to provide notice and comment period but leaving rule in place pending remand to Fish and Wildlife Service to provide adequate notice); *see also*, *Modesto Irrig. Dist. v. Evans*, 2004 U.S. Dist. LEXIS 30304, *56 (N.D. Cal. 2004) (granting motion to stay vacating of flawed listing of steelhead under ESA by NMFS.) "However, when equity demands, the regulation can be left in place while the agency follows the necessary procedures." *Idaho Farm*, 58 F.3d at 1405. Courts have also refused to vacate rules where substantive errors existed, such as when a decision was found to be arbitrary and capricious. *See e.g.*, *Allied-Signal, Inc. v. U.S. Nuclear Regulatory Comm'n*, 988 F.2d 146, 150 (D.C. Cir. 1993) (stating inadequately supported agency rules need not necessarily be vacated); *Pac. Bell v. Pac-West Telecomm.*, Inc., 325 F.3d 1114, 1122-1123 (9th Cir. 2003) (citing *Allied-Signal* decision for authority to leave agency decision in effect pending remand); *United Mine Workers v. Fed. Mine Safety & Health Admin.*, 920 F.2d 960, 966 (D.C. Cir. 1990) ("We have commonly remanded without vacating an agency's rule or order where the failure lay in lack of reasoned decisonmaking…but also where the order was otherwise arbitrary and capricious….") (citations omitted).

Here, remand would serve an important purpose. The fact that defendants' own refusal to consider "current" fishing history as of the time of promulgating the 2011 IFQ Regulations demonstrates the necessity for defendants to revisit and address the issue. Thus, equity supports a finding that the existing IFQ Regulations should be preserved pending remand. First, the deficiencies in the IFQ Regulations – that defendants failed to consider fishing history beyond 2003 for harvesters and 2004 for processors – is curable after defendants reconsider the IFQs in compliance with the MSA and the MSJ Order.

Second, as described above, no delay in the current process would occur and plaintiffs and the public therefore would not face the imminent prospect of injury if the existing IFQ Regulations, which set quotas for 2011, remain in place during remand. To reiterate, the allocation process for the 2012 Pacific whiting season has not yet begun. The current, 2012 Pacific whiting season is set to start on May 15 for harvester/processors, including motherships, and on June 15 for shoreside processors. Exh. 1 (50 C.F.R. §660.373(b)(1)(iii)). The Council, which meets in March, has not yet met to recommend allocations to NMFS. Moreover, the final regulations will not be implemented until May 15, 2012. The public also will have an opportunity to comment on the proposed rules that take the expanded history into account. This remedy is within the Court's equitable authority, which includes the power to mandate affirmative relief that serves the interests of justice and the public interest. *See generally, U.S. v. Alisal Water Corp.*, 431 F.3d 643, 654 (9th Cir. 2005) (noting that "Where the public interest is involved, equitable powers assume an even broader and more flexible character than when only a private controversy is at stake.") The remedy is also consistent with the MSA's statutory scheme, which empowers reviewing courts to take any action "in the interests of justice." 16 U.S.C. §1861(d).

C. The IFQ Regulations Should Be Vacated if Defendants Fail to Use Their Best Efforts and Take Action within a Reasonable Amount of Time.

Plaintiffs also request that the Court order defendants to use their best efforts and all available authority to implement the revised regulations in by May 15, 2012 in line with their past timetable, but no later than December 1, 2012. This will insure that the revised IFQ Regulations for 2012 are completed by a date certain while also providing time for analysis of the new information regarding the expanded fishing history years. In the event that defendants fail to adopt revised IFQ Regulations by December 1, 2012, the existing IFQ Regulations should be vacated.

D. The Court Should Retain Jurisdiction Over Defendants' Actions to Ensure Compliance.

The Court should retain jurisdiction over defendants to enforce the terms of its order on relief. First, plaintiffs need to be able to return to Court if defendants do not comply expeditiously. Second, if defendants fail to comply with the terms of the MSJ Order and the MSA, plaintiffs may need to move for additional relief during this time. Retaining jurisdiction would avoid undue delay and prejudice as well as greater harm if defendants fail to comply with the MSJ Order.

III. CONCLUSION

For these reasons, plaintiffs respectfully request that the Court grant the above-described relief to remedy the violations of law while defendants take legally required corrective action.

DATED: January 30, 2012.

Respectfully submitted,

/s/ James P. Walsh
James P. Walsh
DAVIS WRIGHT TREMAINE LLP

Attorneys for Plaintiffs, Pacific Dawn LLC, Chellissa LLC, James and Sandra Schones, Da Yang Seafood, Inc. and Jessie's Ilwaco Fish Company

Exhibit 1

with that vessel. A vessel that is eligible to participate in the primary sablefish season may participate in the daily trip limit fishery for sablefish once that vessels' primary season sablefish limit(s) have been taken, or after the end of the primary season, whichever occurs earlier. Any subsequent sablefish landings by that vessel will be subject to the restrictions and limits of the limited entry daily and/or trip limit fishery for sablefish for the remainder of the calendar year.

(3) No vessel may land sablefish against both its primary season cumulative sablefish limits and against the daily and/or weekly trip limit fishery limits within the same 24 hour period of 0001 hours l.t. to 2400 hours l.t. If a vessel has taken all of its tier limit except for an amount that is smaller than the daily trip limit amount, that vessel's subsequent sablefish landings are automatically subject to daily and/or weekly trip limits.

(4) Vessels registered for use with a limited entry, fixed gear permit that does not have a sablefish endorsement may participate in the limited entry, daily and/or weekly trip limit fishery for as long as that fishery is open during the year, subject to routine management measures imposed under § 660.370(c). Daily and/or weekly trip limits for the limited entry fishery north and south of 36° N. lat. are provided in Tables 4 (North) and 4 (South) of this subpart.

(5) Open access vessels may participate in the open access, daily trip limit fishery for as long as that fishery is open during the year, subject to the routine management measures imposed under § 660.370(c). Daily and/or weekly trip limits for the open access fishery north and south of 36° N. lat. are provided in Tables 5 (North) and 5 (South) of this subpart.

(d) *Trip limits.* Trip and/or frequency limits may be imposed in the limited entry fishery on vessels that are not participating in the primary season under § 660.370(c). Trip and/or size limits to protect juvenile sablefish in the limited entry or open-access fisheries also may be imposed at any time under § 660.370(c). Trip limits may be imposed in the open-access fishery at any time under § 660.370(c).

[69 FR 42352, July 15, 2004, as amended at 69 FR 77032, Dec. 23, 2004; 70 FR 16149, Mar. 30, 2005; 70 FR 23045, May 4, 2005; 71 FR 10624, Mar. 2, 2006; 71 FR 24604, Apr. 26, 2006; 71 FR 78656, Dec. 29, 2006; 74 FR 9888, Mar. 6, 2009; 74 FR 19013, Apr. 27, 2009; 75 FR 23617, May 4, 2010]

§ 660.373 Pacific whiting (whiting) fishery management.

(a) *Sectors.* In order for a vessel to participate in a particular whiting fishery sector after May 11, 2009, that vessel must be registered for use with a sector-specific Pacific whiting vessel license under § 660.336.

(1) The catcher/processor sector is composed of catcher/processors, which are vessels that harvest and process whiting during a calendar year.

(2) The mothership sector is composed of motherships and catcher vessels that harvest whiting for delivery to motherships. Motherships are vessels that process, but do not harvest, whiting during a calendar year.

(3) The shore-based sector is composed of vessels that harvest whiting for delivery to Pacific whiting shoreside first receivers. Notwithstanding the other provisions of 50 CFR Part 660, subpart G, a vessel that is 75 feet or less LOA that harvests whiting and, in addition to heading and gutting, cuts the tail off and freezes the whiting, is not considered to be a catcher/processor nor is it considered to be processing fish. Such a vessel is considered a participant in the shorebased whiting sector, and is subject to regulations and allocations for that sector.

(b) *Seasons.* The primary seasons for the whiting fishery are: For the shore-based sector, the period(s) when the large-scale target fishery is conducted (when trip limits under paragraph (b) of this section are not in effect); for catcher/processors, the period(s) when at-sea processing is allowed and the fishery is open for the catcher/processor sector; and for vessels delivering to motherships, the period(s) when at-sea processing is allowed and the fishery is open for the mothership sector. Before and after the primary seasons, trip landing or frequency limits may be imposed under §660.370(c). The sectors are defined at §660.370(a).

(1) *North of 40°30′ N. lat.* Different starting dates may be established for the catcher/processor sector, the mothership sector, catcher vessels delivering to shoreside processors north of 42° N. lat., and catcher vessels delivering to shoreside processors between 42°-40°30′ N. lat.

(i) *Procedures.* The primary seasons for the whiting fishery north of 40°30′ N. lat. generally will be established according to the procedures of the PCGFMP for developing and implementing harvest specifications and apportionments. The season opening dates remain in effect unless changed, generally with the harvest specifications and management measures.

(ii) *Criteria.* The start of a primary season may be changed based on a recommendation from the Council and consideration of the following factors, if applicable: Size of the harvest guidelines for whiting and bycatch species; age/size structure of the whiting population; expected harvest of bycatch and prohibited species; availability and stock status of prohibited species; expected participation by catchers and processors; environmental conditions; timing of alternate or competing fisheries; industry agreement; fishing or processing rates; and other relevant information.

(iii) *Primary whiting seasons.* After the start of a primary season for a sector of the whiting fishery, the season remains open for that sector until the quota is taken or a bycatch limit is reached and the fishery season for that sector is closed by NMFS. The starting dates for the primary seasons for the whiting fishery are as follows:

(A) Catcher/processor sector—May 15.

(B) Mothership sector—May 15.

(C) Shore-based sector

(*1*) North of 42° N. lat.—June 15;

(*2*) Between 42°-40°30′ N. lat.—April 1; and

(*3*) South of 40°30′ N. lat.—April 15.

(2) *South of 40°30′ N. lat.* The primary season starts on April 15 south of 40°30′ N. lat.

(3) *Trip limits in the whiting fishery.* The "per trip" limit for whiting before and after the regular (primary) season for the shore-based sector is announced in Table 3 of this subpart, and is a routine management measure under §660.370(c). This trip limit includes any whiting caught shoreward of 100-fm (183-m) in the Eureka, CA area.The "per trip" limit for other groundfish species before, during, and after the regular (primary) season are announced in Table 3 (North) and Table 3 (South) of this subpart and apply as follows:

(i) During the groundfish cumulative limit periods both before and after the primary whiting season, vessels may use either small and/or large footrope gear, but are subject to the more restrictive trip limits for those entire cumulative periods.

(ii) If, during a primary whiting season, a whiting vessel harvests a groundfish species other than whiting for which there is a midwater trip limit, then that vessel may also harvest up to another footrope-specific limit for that species during any cumulative limit period that overlaps the start or end of the primary whiting season.

(4) *Bycatch limits in the whiting fishery.* The bycatch limits for the whiting fishery may be established, adjusted, and used inseason to close a sector or sectors of the whiting fishery to achieve the rebuilding of an overfished or depleted stock. These limits are routine management measures under §660.370(c) and, as such, may be adjusted inseason or may have new species added to the list of those with bycatch limits. Closure of a sector or sectors when a bycatch limit is projected to be reached is an automatic action under §660.370(d).

(i) The whiting fishery bycatch limit is apportioned among the sectors identified in paragraph (a) of this section based on the same percentages used to allocate whiting among the sectors, established in §660.323(a). The sector specific bycatch limits are: for catcher/processors 4.8 mt of canary rockfish, 95 mt of widow rockfish, and 8.5 mt of darkblotched rockfish; for motherships 3.3 mt of canary rockfish, 67 mt of widow rockfish, and 6.0 mt of darkblotched rockfish; and for shore-based 5.9 mt of canary rockfish, 117 mt of widow rockfish, and 10.5 mt of darkblotched rockfish.

(ii) The Regional Administrator may make available for harvest to the other sectors of the whiting fishery identified in § 660.323, the amounts of a sector's bycatch limit species remaining when a sector is closed because its whiting allocation or a bycatch limit has been reached or is projected to be reached. The remaining bycatch limit species shall be redistributed in proportion to each sector's initial whiting allocation. When considering redistribution of bycatch limits between the sectors of the whiting fishery, the Regional Administrator will take into consideration the best available data on total projected fishing impacts on the bycatch limit species, as well as impacts on other groundfish species.

(iii) If a bycatch limit is reached or is projected to be reached, the following action, applicable to the sector may be taken.

(A) Catcher/processor sector. Further taking and retaining, receiving, or at-sea processing of whiting by a catcher/processor is prohibited. No additional unprocessed whiting may be brought on board after at-sea processing is prohibited, but a catcher/processor may continue to process whiting that was on board before at-sea processing was prohibited.

(B) Mothership sector. Further receiving or at-sea processing of whiting by a mothership is prohibited. No additional unprocessed whiting may be brought on board after at-sea processing is prohibited, but a mothership may continue to process whiting that was on board before at-sea processing was prohibited. Whiting may not be taken and retained, possessed, or landed by a catcher vessel participating in the mothership sector.

(C) Shore-based sector. Whiting may not be taken and retained, possessed, or landed by a catcher vessel participating in the shore-based sector except as authorized under a trip limit specified under § 660.370(c).

(iv) The Regional Administrator will announce in the FEDERAL REGISTER when a bycatch limit is reached, or is projected to be reached, specifying the action being taken as specified under paragraph (b)(4) of this section. The Regional Administrator will announce in the FEDERAL REGISTER any reapportionment of bycatch limit species. In order to prevent exceeding the bycatch limits or to avoid underutilizing the Pacific whiting resource, prohibitions against further taking and retaining, receiving, or at-sea processing of whiting, or reapportionment of bycatch limits species may be made effective immediately by actual notice to fishers and processors, by e-mail, Internet (*http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Whiting-Management/index.cfm*), phone, fax, letter, press release, and/or USCG Notice to Mariners (monitor channel 16 VHF), followed by publication in the FEDERAL REGISTER.

(c) *Closed areas.* Pacific whiting may not be taken and retained in the following portions of the fishery management area:

(1) *Klamath River Salmon Conservation Zone.* The ocean area surrounding the Klamath River mouth bounded on the north by 41°38.80′ N. lat. (approximately 6 nm north of the Klamath River mouth), on the west by 124°23′ W. long. (approximately 12 nm from shore), and on the south by 41°26.80′ N. lat. (approximately 6 nm south of the Klamath River mouth).

(2) *Columbia River Salmon Conservation Zone.* The ocean area surrounding the Columbia River mouth bounded by a line extending for 6 nm due west from North Head along 46°18′ N. lat. to 124°13.30′ W. long., then southerly along a line of 167 True to 46°11.10′ N. lat. and 124°11′ W. long.(Columbia River Buoy), then northeast along Red Buoy Line to the tip of the south jetty.

(3) *Ocean Salmon Conservation Zone.* All waters shoreward of a boundary line approximating the 100 fm (183 m) depth contour. Latitude and longitude coordinates defining the boundary line approximating the 100 fm (183 m) depth contour are provided at § 660.393(a). This closure will be implemented through automatic action, defined at 660.370(d), when NMFS projects the Pacific whiting fishery may take in excess of 11,000 Chinook within a calendar year.

(4) *Pacific Whiting Bycatch Reduction Areas.* Vessels using limited entry midwater trawl gear during the primary whiting season may be prohibited from fishing shoreward of a boundary

line approximating the 75-fm (137-m), 100-fm (183-m) or 150-fm (274-m) depth contours. Latitude and longitude coordinates for the boundary lines approximating the depth contours are provided at §660.393(a). Closures may be implemented inseason for a sector(s) through automatic action, defined at §660.370(d), when NMFS projects that a sector will exceed a bycatch limit specified for that sector before the sector's whiting allocation is projected to be reached.

(d) *Eureka area trip limits.* Trip landing or frequency limits may be established, modified, or removed under §660.370 or §660.373, specifying the amount of Pacific whiting that may be taken and retained, possessed, or landed by a vessel that, at any time during a fishing trip, fished in the fishery management area shoreward of the 100 fathom (183 m) contour (as shown on NOAA Charts 18580, 18600, and 18620) in the Eureka area (from 43 00′ to 40 30′ N. lat.). Unless otherwise specified, no more than 10,000 lb (4,536 kg) of whiting may be taken and retained, possessed, or landed by a vessel that, at any time during a fishing trip, fished in the fishery management area shoreward of the 100 fm (183 m) contour (as shown on NOAA Charts 18580, 18600, and 18620) in the Eureka management area (defined at §660.302).

(e) *At-sea processing.* Whiting may not be processed at sea south of 42°00′ N. lat. (Oregon-California border), unless by a waste-processing vessel as authorized under paragraph (i) of this section.

(f) *Time of day.* Pacific whiting may not be taken and retained by any vessel in the fishery management area south of 42°00′ N. lat. between 0001 hours to one-half hour after official sunrise (local time). During this time south of 42°00′ N. lat., trawl doors must be on board any vessel used to fish for whiting and the trawl must be attached to the trawl doors. Official sunrise is determined, to the nearest 5° lat., in The Nautical Almanac issued annually by the Nautical Almanac Office, U.S. Naval Observatory, and available from the U.S. Government Printing Office.

(g) *Bycatch reduction and full utilization program for at-sea processors (optional).* If a catcher/processor or mothership in the whiting fishery carries more than one NMFS-approved observer for at least 90 percent of the fishing days during a cumulative trip limit period, then groundfish trip limits may be exceeded without penalty for that cumulative trip limit period, if the conditions in paragraph (g)(1) of this section are met. For purposes of this program, "fishing day" means a 24-hour period, from 0001 hours through 2400 hours, local time, in which fishing gear is retrieved or catch is received by the vessel, and will be determined from the vessel's observer data, if available. Changes to the number of observers required for a vessel to participate in the program will be announced prior to the start of the fishery, generally concurrent with the harvest specifications and management measures. Groundfish consumed on board the vessel must be within any applicable trip limit and recorded as retained catch in any applicable logbook or report. [Note: For a mothership, non-whiting groundfish landings are limited by the cumulative landings limits of the catcher vessels delivering to that mothership.]

(1) *Conditions.* Conditions for participating in the voluntary full utilization program are as follows:

(i) All catch must be made available to the observers for sampling before it is sorted by the crew.

(ii) Any retained catch in excess of cumulative trip limits must either be: Converted to meal, mince, or oil products, which may then be sold; or donated to a bona fide tax-exempt hunger relief organization (including food banks, food bank networks or food bank distributors), and the vessel operator must be able to provide a receipt for the donation of groundfish landed under this program from a tax-exempt hunger relief organization immediately upon the request of an authorized officer.

(iii) No processor or catcher vessel may receive compensation or otherwise benefit from any amount in excess of a cumulative trip limit unless the overage is converted to meal, mince, or oil products. Amounts of fish in excess of cumulative trip limits may only be sold as meal, mince, or oil products.

(iv) The vessel operator must contact the NMFS enforcement office nearest to the place of landing at least 24 hours before landing groundfish in excess of cumulative trip limits for distribution to a hunger relief agency. Cumulative trip limits and a list of NMFS enforcement offices are found on the NMFS, Northwest Region homepage at *www.nwr.noaa.gov*.

(v) If the meal plant on board the whiting processing vessel breaks down, then no further overages may be retained for the rest of the cumulative trip limit period unless the overage is donated to a hunger relief organization.

(vi) Prohibited species may not be retained.

(vii) Donation of fish to a hunger relief organization must be noted in the transfer log (Product Transfer/Offloading Log (PTOL)), in the column for total value, by entering a value of "0" or "donation," followed by the name of the hunger relief organization receiving the fish. Any fish or fish product that is retained in excess of trip limits under this rule, whether donated to a hunger relief organization or converted to meal, must be entered separately on the PTOL so that it is distinguishable from fish or fish products that are retained under trip limits. The information on the Mate's Receipt for any fish or fish product in excess of trip limits must be consistent with the information on the PTOL. The Mate's Receipt is an official document that states who takes possession of offloaded fish, and may be a Bill of Lading, Warehouse Receipt, or other official document that tracks the transfer of offloaded fish or fish product. The Mate's Receipt and PTOL must be made available for inspection upon request of an authorized officer throughout the cumulative limit period during which such landings occurred and for 15 days thereafter.

(h) *Additional restrictions on catcher/processors.* (1) A catcher/processor may receive fish from a catcher vessel, but that catch is counted against the catcher/processor allocation unless the catcher/processor has been declared as a mothership under paragraph (h)(3) of this section.

(2) A catcher/processor may not also act as a catcher vessel delivering unprocessed whiting to another processor in the same calendar year.

(3) When renewing its limited entry permit each year under § 660.335, the owner of a catcher/processor used to take and retain whiting must declare if the vessel will operate solely as a mothership in the whiting fishery during the calendar year to which its limited entry permit applies. Any such declaration is binding on the vessel for the calendar year, even if the permit is transferred during the year, unless it is rescinded in response to a written request from the permit holder. Any request to rescind a declaration must be made by the permit holder and granted in writing by the Regional Administrator before any unprocessed whiting has been taken on board the vessel that calendar year.

(i) *Processing fish waste at sea.* A vessel that processes only fish waste (a "waste-processing vessel") is not considered a whiting processor and therefore is not subject to the allocations, seasons, or restrictions for catcher/processors or motherships while it operates as a waste-processing vessel. However, no vessel may operate as a waste-processing vessel 48 hours immediately before and after a primary season for whiting in which the vessel operates as a catcher/processor or mothership. A vessel must meet the following conditions to qualify as a waste-processing vessel:

(1) The vessel makes meal (ground dried fish), oil, or minced (ground flesh) product, but does not make, and does not have on board, surimi (fish paste with additives), fillets (meat from the side of the fish, behind the head and in front of the tail), or headed and gutted fish (head and viscera removed).

(2) The amount of whole whiting on board does not exceed the trip limit (if any) allowed under § 660.370(c).

(3) Any trawl net and doors on board are stowed in a secured and covered manner, and detached from all towing lines, so as to be rendered unusable for fishing.

(4) The vessel does not receive codends containing fish.

(5) The vessel's operations are consistent with applicable state and Federal law, including those governing disposal of fish waste at sea.

(j) *Additional requirements for participants in the Pacific Whiting Shoreside fishery*—(1) *Pacific whiting shoreside first receiver responsibilities*—(i) *Weights and measures.* All groundfish weights reported on fish tickets must be recorded from scales with appropriate weighing capacity that ensures accuracy for the amount of fish being weighed. For example: amounts of fish less than 1,000 lb (454 kg) should not be weighed on scales that have an accuracy range of 1,000 lb–7,000 lb (454 - 3,175 kg) and are therefore not capable of accurately weighing amounts less than 1,000 lb (454 kg).

(ii) *Electronic fish tickets*—(A) *Hardware and software requirements.* First receivers using the electronic fish ticket software provided by Pacific States Marine Fish Commission are required to meet the hardware and software requirements below. Those whiting first receivers who have NMFS-approved software compatible with the standards specified by Pacific States Marine Fish Commission for electronic fish tickets are not subject to any specific hardware or software requirements.

(*1*) A personal computer with Pentium 75–MHz or higher. Random Access Memory (RAM) must have sufficient megabyte (MB) space to run the operating system, plus an additional 8 MB for the software application and available hard disk space of 217 MB or greater. A CD-ROM drive with a Video Graphics Adapter(VGA) or higher resolution monitor (super VGA is recommended).

(*2*) Microsoft Windows 2000 (64 MB or greater RAM required), Windows XP (128 MB or greater RAM required) or later operating system.

(*3*) Microsoft Access 2003 or newer for:

(*i*) *NMFS Approved Software Standards and Internet Access.*

The Pacific whiting shoreside first receiver is responsible for obtaining, installing and updating electronic fish tickets software either provided by Pacific States Marine Fish Commission, or compatible with the data export specifications specified by Pacific States Marine Fish Commission and for maintaining internet access sufficient to transmit data files via email. Requests for data export specifications can be submitted to: Attn: Frank Lockhart, National Marine Fisheries Service, Northwest Region Sustainable Fisheries Division, 7600 Sand Point Way NE, Seattle, WA 98115, or via email to *frank.lockhart@noaa.gov.*

(*ii*) *Maintenance.* The Pacific whiting shoreside first receiver is responsible for ensuring that all hardware and software required under this subsection are fully operational and functional whenever the Pacific whiting primary season deliveries are accepted.

(2) Pacific whiting shoreside first receivers and processors that receive groundfish species other than Pacific whiting in excess of trip limits from Pacific whiting shoreside vessels fishing under an EFP issued by the Assistant Regional Administrator are authorized to possess the catch.

(3) Vessel owners and operators, first receivers, or shoreside processor owners, or managers may contact NMFS in writing to request assistance in improving data quality and resolving monitoring issues. Requests may be submitted to: Attn: Frank Lockhart, National Marine Fisheries Service, Northwest Region Sustainable Fisheries Division, 7600 Sand Point Way NE, Seattle, WA 98115, or via email to *frank.lockhart@noaa.gov.*

[69 FR 42353, July 15, 2004]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §660.373, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and on GPO Access.

§660.380 Groundfish harvest specifications.

Fishery specifications include ABCs, the designation of OYs (which may be represented by harvest guidelines (HGs) or quotas for species that need individual management,) and the allocation of commercial OYs between the open access and limited entry segments of the fishery. These specifications include fish caught in state ocean waters (0–3 nm offshore) as well as fish caught in the EEZ (3–200 nm offshore). Specifications and management measures

Exhibit 2

affixed to each vessel subject to this section in block Arabic numerals at least 10 inches (25.40 cm) in height for vessels more than 25 ft (7.62 m) but equal to or less than 65 ft (19.81 m) in length; and 18 inches (45.72 cm) in height for vessels longer than 65 ft (19.81 m) in length. Markings must be legible and of a color that contrasts with the background.

(b) [Reserved].

[FR Doc. 2011–8075 Filed 4–4–11; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 110311192–1204–01]

RIN 0648–BA95

Magnuson-Stevens Act Provisions; Fisheries Off West Coast States; Pacific Coast Groundfish Fishery; 2011 Tribal Fishery for Pacific Whiting

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

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS is issuing this proposed rule for the 2011 Pacific whiting tribal fishery under the authority of the Pacific Coast Groundfish Fishery Management Plan (FMP) and the Magnuson Stevens Fishery Conservation and Management Act (Magnuson Act). Washington coastal treaty Indian tribes mean the Hoh, Makah, and Quileute Indian Tribes and the Quinault Indian Nation. This proposed rule establishes an interim tribal allocation of Pacific whiting for the 2011 season only, based on discussions with the Makah and Quileute tribes and Quinault Indian Nation regarding their fishing plans. At the March, 2011 Pacific Fishery Management Council (Council) meeting, the Council recommended a coastwide Optimum Yield (OY) of 393,751 mt. This would result in a U.S. OY of 290,903 mt. The proposed rule, based on communications to date with the tribes, proposes a tribal allocation of 66,908 mt, for 2011 only, given the Council's recommended OY.

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on April 19, 2011.

ADDRESSES: You may submit comments, identified by RIN 0648–BA95 by any one of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal *http://www.regulations.gov.*
- *Fax:* 206–526–6736, *Attn:* Kevin C. Duffy
- *Mail:* William W. Stelle, Jr., Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115–0070, *Attn:* Kevin C. Duffy.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments. Attachments to electronic comments will be accepted in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Kevin C. Duffy (Northwest Region, NMFS), *phone:* 206–526–4743, *fax:* 206–526–6736 and *e-mail: kevin.duffy@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Electronic Access

This proposed rule is accessible via the Internet at the Office of the Federal Register's Web site at *http://www.gpoaccess.gov/fr/index.html.* Background information and documents are available at the Pacific Fishery Management Council's Web site at *http://www.pcouncil.org/.*

Background

The regulations at 50 CFR 660.50(d) establish the process by which the tribes with treaty fishing rights in the area covered by the Pacific Coast Groundfish Fishery Management Plan (FMP) request new allocations or regulations specific to the tribes, in writing, during the biennial harvest specifications and management measures process. The regulations state "the Secretary will develop tribal allocations and regulations under this paragraph in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus." These procedures employed by NOAA in implementing tribal treaty rights under the FMP, in place since May 31, 1996, were designed to provide a framework process by which NMFS can accommodate tribal treaty rights by setting aside appropriate amounts of fish in conjunction with the Pacific Fishery Management Council (Council) process for determining harvest specifications and management measures. The Council's groundfish fisheries require a high degree of coordination among the tribal, state, and federal co-managers in order to rebuild overfished species and prevent overfishing, while allowing fishermen opportunities to sustainably harvest over 90 species of groundfish managed under the FMP.

Since 1996, NMFS has been allocating a portion of the U.S. OY of Pacific whiting to the tribal fishery following the process established in 50 CFR 660.50(d). The tribal allocation is subtracted from the whiting OY before allocation to the non-tribal sectors. To date, there has been no determination of the total amount of whiting for which the tribes are entitled to fish under their treaty right. Therefore, allocations to date have been on an interim basis, and are not considered to set precedent with respect to the amount of the treaty right.

To date, only the Makah Tribe has prosecuted a tribal fishery for Pacific whiting. The Makah Tribe has annually harvested a whiting allocation every year since 1996 using midwater trawl gear. From 1999 until 2009, the tribal allocation was based on a statement of need for their tribal fishery. In recent years prior to 2009, the specific tribal amount was generally, although not always, determined using a sliding scale relative to the U.S. whiting OY of between 14 and 17.5 percent, depending on the specific OY determined by the Council. In general, years with a relatively low OY resulted in a tribal allocation closer to 17.5 percent, and years with a relatively high OY result in a tribal allocation closer to 14 percent.

Between 2000 and 2008, the U.S. OY ranged from a high of 269,545 mt in 2008 to a low of 129,600 mt in 2002. In absolute amounts, the tribal allocation from 2000 to 2008 ranged from a high of 35,000 mt in 2005, 2007, and 2008 to a low of 22,680 mt in 2002.

For the 2009 fishery, the Quileute Tribe first stated their intent to participate in the fishery. That year, the U.S. OY was 135,939 mt, and the tribal allocation was set at 50,000 mt (36.78 percent of the U.S. OY). A set-aside of 42,000 mt was established for the Makah, and an 8,000 mt set-aside was established for the Quileute. The final rule in 2009 anticipated the Makah managing their fisheries to achieve a harvest of no more than 42,000 mt, and the Quileute managing their fisheries to achieve a harvest of no more than 8,000 mt. For 2010, both the Makah and

Quileute stated their intent to participate in the Pacific whiting fishery. Based on the formula for the tribal allocation used in the proposed rule, and taking into account public comments received on the proposed rule, the tribal allocation of Pacific whiting in 2010 was 49,939 mt (25.75 percent of the U.S. OY). Although an allocation was made to account for participation by two tribes, only the Makah actually participated in the 2009 and 2010 tribal whiting fisheries.

NMFS and the co-managers have been involved in a process designed to determine the long-term tribal allocation for whiting. At the September 2008 Council meeting, NMFS, the states and the Quinault, Quileute, and Makah tribes met and agreed on a process in which NMFS would pull together the current information regarding whiting, circulate it among the co-managers, seek comment on the information and possible analyses, and then prepare analyses of the information to be used by the co-managers in developing a tribal allocation for use in 2010 and beyond. The goal was agreement among the co-managers on a total tribal allocation for incorporation into the Council's planning process for the 2010 season. The further goal was to provide the tribes the time and information to develop an inter-tribal allocation or other necessary management agreement. The process has been moving forward but final agreement on a long-term tribal allocation has not been reached. In 2009, NMFS shared a preliminary report summarizing scientific information available on the migration and distribution of Pacific whiting on the west coast. The co-managers have met to discuss this information and plan further meetings. During 2010, NMFS finalized the report summarizing scientific information available on the migration and distribution of Pacific whiting on the west coast. In addition, NMFS responded in writing to requests from the tribes for clarifications on the paper and requests for additional information. Additionally, NMFS met with each of the tribes in the fall of 2010 to discuss the paper and to discuss a process for negotiation of the long-term tribal allocation of Pacific whiting. Those discussions are ongoing and it is not anticipated that these issues will be resolved prior to the start of the 2011 Pacific whiting tribal fishery.

Tribal Allocation for 2011

Over the last three months, NMFS has met individually with each of the coastal tribes that have expressed a potential interest in fishing for whiting in 2011 to discuss this year's tribal fishery as well as the process for negotiating a long-term tribal allocation. For 2011, the Makah and the Quileute Tribes have indicated that they plan to participate in the 2011 fishery. The Quinault Indian Nation informed NMFS that while they are still pursuing entering the fishery in 2011, they have not yet made a final decision. Because the co-managers have not negotiated a long term tribal allocation, NMFS is again moving forward with this proposed rule as an interim measure to address the allocation for and management of the 2011 tribal Pacific whiting fishery. As with the 2010 allocation, this proposed rule is not intended to establish any precedent for future whiting seasons or for the long-term tribal allocation of whiting.

The proposed rule would be implemented under authority of Section 305(d) of the Magnuson Act, which gives the Secretary responsibility to "carry out any fishery management plan or amendment approved or prepared by him, in accordance with the provisions of this Act." With this proposed rule, NMFS, acting on behalf of the Secretary, would ensure that the FMP is implemented in a manner consistent with treaty rights of the Washington tribes to fish in their "usual and accustomed grounds and stations" in common with non-tribal citizens. (*United States* v. *Washington,* 384 F. Supp. 313 (W.D. 1974)).

At the March, 2011 Pacific Fishery Management Council (Council) meeting, the Council recommended a coastwide Optimum Yield (OY) of 393,751 mt. This would result in a U.S. OY of 290,903 mt. The Makah Tribe has requested the opportunity to harvest up to 17.5 percent of the U.S. OY of whiting in 2011. The Quileute Tribe has stated that it plans to have two boats participating in the 2011 fishery, and that it believes that 8,000 mt of whiting per boat is necessary to ensure the economic viability of each boat.

Given past tribal allocations, the recent conversations with the Quinault Indian Nation, the Quileute Tribe, and the Makah Tribe, and the whiting U.S. OY recommendation from the Pacific Council, NMFS is proposing a 2011 interim tribal allocation of no higher than 66,908 mt, which is 23.00 percent of the recommended U.S. OY. NMFS is still in communication with the tribes on the 2011 interim allocation and the final allocation amount may differ from this proposal. In addition, NMFS has yet to consider and adopt the Council's recommendation for the U.S. OY of whiting. NMFS believes the proposed amount will allow for the anticipated 2011 participation in the fishery by the Makah and Quileute tribes, and for the potential 2011 participation by the Quinault Indian Nation.

Regarding the 2011 tribal whiting allocation, NMFS believes the proposed allocation, although higher than the absolute amounts of prior tribal allocations, is well within the range of past percentages (12.08–36.78 percent). As described above, while further negotiation on the long-term tribal allocation of Pacific whiting will occur in 2011, NMFS believes that current knowledge on the distribution and abundance of the coastal Pacific whiting stock supports a conclusion that the proposed tribal allocation of 66,908 mt lies within the range of the tribal treaty right to Pacific whiting.

Classification

At this time, NMFS has preliminarily determined that the management measures for the 2011 Pacific whiting tribal fishery are consistent with the national standards of the Magnuson-Stevens Act and other applicable laws. NMFS, in making the final determination, will take into account the data, views, and comments received during the comment period.

NMFS has initially determined that this proposed rule is not significant for purposes of Executive Order 12866.

An Initial Regulatory and Flexibility Act (IRFA) was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A summary of the analysis follows. A copy of this analysis is available from NMFS (*see* ADDRESSES).

Under the RFA, the term "small entities" includes small businesses, small organizations, and small governmental jurisdictions. The Small Business Administration (SBA) has established size criteria for all major industry sectors in the U.S., including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $4.0 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. A wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. For marinas and charter/party boats, a small business is one with annual receipts not in excess of $7.0 million. The RFA defines small organizations as any nonprofit enterprise that is independently owned and operated and is not dominant in its field. The RFA defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000.

In recent years the number of participants engaged in the Pacific whiting fishery has varied with changes in the whiting OY and economic conditions. Pacific whiting shoreside vessels (26 to 29), mothership processors (4 to 6), mothership catcher vessels (11 to 20), catcher/processors (5 to 9), Pacific whiting shoreside first receivers (8 to 16), and five whiting vessels participating in the Makah portion of the tribal whiting fishery, are the major units of this fishery. For 2011, there may be additional vessels participating in the tribal whiting fishery. NMFS records suggest the gross annual revenue for each of the catcher/processor and mothership operations participating in the Pacific coast whiting fishery exceeds $4.0 million. Therefore, they are not considered small businesses. NMFS records also show that 10–43 catcher vessels have taken part in the mothership fishery on an annual basis since 1994. These companies are all assumed to be small businesses, although some of these vessels may be affiliated with larger processing companies. Since 1994, 26–31 catcher vessels have annually participated in the shoreside whiting fishery. These companies are all assumed to be small businesses, although some of the vessels may be affiliated with larger processing companies. Vessels participating in the tribal whiting fishery are presumed to be small businesses, whereas the Tribes are presumed to be small government jurisdictions.

Pacific whiting has grown in importance, especially in recent years. Through the 1990s, the volume of Pacific whiting landed in the fishery increased. In 2002 and 2003, landings of Pacific whiting declined due to information showing the stock was depleted and the subsequent regulations that restricted harvest in order to rebuild the species. Over the years 2003–2007, estimated Pacific whiting ex-vessel values averaged about $29 million. In 2008, these participants harvested about 248,000 mt of whiting worth about $63 million in ex-vessel value based on shoreside ex-vessel prices of $254 per ton—the highest ex-vessel revenues and prices on record. In comparison, the 2007 fishery harvested about 224,000 mt worth $36 million at an average ex-vessel price of about $160 per mt. In 2009, tribal and non-tribal fleets harvested about 122,000 mt of Pacific whiting, worth approximately $14 million. During 2009, ex-vessel prices declined to about $119.00 per ton, presumably due to the worldwide recession. For 2010, the preliminary ex-vessel price returned to $160.00 per mt, leading to approximately $27 million in revenues, based on a total harvest of 170,000 mt.

For 2010, the tribes were initially allocated 49,939 mt. In September and October, NMFS reapportioned a total of 16,000 mt from the tribal allocation to the non-tribal shorebased, mothership, and catcher processor sectors.

Based on conversations with the tribes regarding their intent for the 2011 tribal whiting fishery, a proposed tribal allocation of 66,908 mt is being considered. Using the average ex-vessel price of $160.00 per ton, the ex-vessel value is estimated to be approximately $10,705,280.

NMFS did not consider a broad range of alternatives to the proposed allocation because the tribal allocation is based primarily on the requests of the tribes for a level of participation in the fishery that will allow them to exercise their treaty right to fish for whiting. Consideration of amounts lower than the tribal requests is not appropriate here, where based on the information available to NMFS the requested amount appears to be within the amount to which the tribes are entitled. A higher amount would arguably be within the scope of the treaty right, but would unnecessarily limit the non-tribal fishery. A no action alternative was considered, but the regulatory structure provides for a tribal allocation on an annual basis only. Therefore, no action would result in no allocation of Pacific whiting to the tribal sector in 2011, inconsistent with NMFS' obligation to manage the fishery consistent with the tribes' treaty rights. Given that the Makah and Quileute tribes have made specific requests for allocations in 2011, this alternative received no further consideration.

With the implementation of Fishery Management Plan amendments 20 and 21, the ability to reapportion Pacific whiting from tribal to non-tribal fisheries was eliminated. Similarly, unharvested whiting allocated to the non-tribal shoreside, mothership, and catcher-processor sectors cannot be reapportioned among these sectors. So, unlike 2010, the regulations do not provide NMFS a specific mechanism to reapportion unharvested tribal whiting to the non-tribal sectors, and will not be able to reapportion among the non-tribal sectors. Pending markets, available bycatch, and the ability of tribal fleets to develop the capacity to harvest the tribal allocation may result in unharvested Pacific whiting because there is no regulatory mechanism to reapportion. Similarly, there may be unharvested Pacific whiting in the other sectors as well.

Tribal fisheries include a mixture of activities similar to the non-tribal fisheries, where tribal fisheries will deliver shoreside for processing or to a mothership for at-sea processing. The processing facilities that the tribes use also process fish harvested by non-tribal fisheries. Increased allocations to tribal harvesters (harvest vessels are small entities, tribes are small jurisdictions) implies decreased allocations to non-tribal harvesters (a mixture of small and large businesses).

There are no reporting, recordkeeping or other compliance requirements in the proposed rule.

No Federal rules have been identified that duplicate, overlap, or conflict with this action.

NMFS issued Biological Opinions under the Endangered Species Act (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 Pacific Coast groundfish FMP fisheries 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). These biological opinions have concluded that implementation of the FMP for the Pacific Coast groundfish fishery was 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.

NMFS reinitiated a formal section 7 consultation under the ESA in 2005 for both the Pacific whiting midwater trawl fishery and the groundfish bottom trawl fishery. The December 19, 1999, Biological Opinion had defined an 11,000 Chinook incidental take threshold for the Pacific whiting fishery. During the 2005 Pacific whiting season, the 11,000 fish Chinook incidental take threshold was exceeded, triggering reinitiation. Also in 2005, new data from the West Coast Groundfish Observer Program became available, allowing NMFS to complete an analysis of salmon take in the bottom trawl fishery.

NMFS prepared a Supplemental Biological Opinion dated March 11, 2006, which addressed salmon take in both the Pacific whiting midwater trawl and groundfish bottom trawl fisheries. In its 2006 Supplemental Biological Opinion, NMFS concluded that catch rates of salmon in the 2005 whiting fishery were consistent with expectations considered during prior consultations. Chinook bycatch has averaged about 7,300 fish over the last 15 years and has only occasionally exceeded the reinitiation trigger of 11,000 fish.

Since 1999, annual Chinook bycatch has averaged about 8,450 fish. The Chinook ESUs most likely affected by the whiting fishery has generally improved in status since the 1999 ESA section 7 consultation. Although these species remain at risk, as indicated by their ESA listing, NMFS concluded that the higher observed bycatch in 2005 does not require a reconsideration of its prior "no jeopardy" conclusion with respect to the fishery. For the groundfish bottom trawl fishery, NMFS concluded that incidental take in the groundfish fisheries is within the overall limits articulated in the Incidental Take Statement of the 1999 Biological Opinion. The groundfish bottom trawl limit from that opinion was 9,000 fish annually. NMFS will continue to monitor and collect data to analyze take levels. NMFS also reaffirmed its prior determination that implementation of the Groundfish FMP is not likely to jeopardize the continued existence of any of the affected ESUs.

Lower Columbia River coho (70 FR 37160, June 28, 2005) were recently listed and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead.

The Southern Distinct Population Segment (DPS) of green sturgeon was listed as threatened under the ESA (71 FR 17757, April 7, 2006). The southern DPS of Pacific eulachon was listed as threatened on March 18, 2010, under the ESA (75 FR 13012). NMFS has reinitiated consultation on the fishery, including impacts on green sturgeon, eulachon, marine mammals, and turtles. After reviewing the available information, NMFS has concluded that, consistent with Sections 7(a)(2) and 7(d) of the ESA, the proposed action would not jeopardize any listed species, would not adversely modify any designated critical habitat, and would not result in any irreversible or irretrievable commitment of resources that would have the effects of foreclosing the formulation or implementation of any reasonable and prudent alternative measures.

Pursuant to Executive Order 13175, this proposed rule was developed after meaningful consultation and collaboration with tribal officials from the area covered by the FMP. Under the Magnuson-Stevens Act at 16 U.S.C. 1852(b)(5), one of the voting members of the Pacific Council must be a representative of an Indian tribe with federally recognized fishing rights from the area of the Council's jurisdiction. NMFS has met and continues to meet with tribal officials and/or senior staff to address both their short and long term interests regarding Pacific whiting.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, Indian fisheries.

Dated: March 31, 2011.

John Oliver,

Deputy Assistant Administrator for Operations, 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

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

Authority: 16 U.S.C. 1801 *et seq.*, 16 U.S.C. 773 *et seq.*, and 16 U.S.C. 7001 *et seq.*

2. In § 660.50 paragraph (f)(4) is revised to read as follows:

§ 660.50 Pacific Coast treaty Indian fisheries.

* * * * *

(f) * * *

(4) *Pacific whiting.* The tribal allocation for 2011 is 66,908 mt.

* * * * *

[FR Doc. 2011–8077 Filed 4–4–11; 8:45 am]

BILLING CODE 3510–22–P

Exhibit 3

designated representative will inform the public through broadcast notices to mariners of the enforcement period for the safety zone as well as any changes in the planned schedule.

(d) *Regulations.* (1) In accordance with the general regulations in § 165.23 of this part, entry into this zone is prohibited unless authorized by the Captain of the Port Pittsburgh.

(2) Persons or vessels requiring entry into or passage through a safety zone must request permission from the Captain of the Port Pittsburgh or a designated representative. They may be contacted on VHF–FM Channel 13 or 16, or through Coast Guard Sector Ohio Valley at 1–800–253–7465.

(3) All persons and vessels shall comply with the instructions of the Captain of the Port Pittsburgh and designated on-scene U.S. Coast Guard patrol personnel. On-scene U.S. Coast Guard patrol personnel includes Commissioned, Warrant, and Petty Officers of the U.S. Coast Guard.

Dated: April 12, 2011.

R.V. Timme,

Commander, U.S. Coast Guard Captain of the Port Pittsburgh.

[FR Doc. 2011–12281 Filed 5–18–11; 8:45 am]

BILLING CODE 9110–04–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 110311192–1279–02]

RIN 0648–BA01 and 0648–BA95

Magnuson-Stevens Act Provisions; Fisheries Off West Coast States; Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures

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

ACTION: Final rule; Pacific whiting harvest specifications and tribal allocation.

SUMMARY: This final rule establishes the 2011 fishery harvest specifications for Pacific whiting in the U.S. exclusive economic zone (EEZ) and state waters off the coasts of Washington, Oregon, and California, as authorized by the Pacific Coast Groundfish Fishery Management Plan (FMP). These specifications include the overfishing level (OFL), catch limits, and allocation for the non-tribal commercial sectors. This final rule also announces the tribal allocation of Pacific whiting for 2011.

DATES: This rule is effective May 16, 2011, and is applicable beginning May 15, 2011.

FOR FURTHER INFORMATION CONTACT: Kevin C. Duffy (Northwest Region, NMFS), *phone:* 206–526–4743, *fax:* 206–526–6736 and *e-mail: kevin.duffy@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Electronic Access

This final rule is accessible via the Internet at the Office of the Federal Register's Web site at *http://www.gpoaccess.gov/fr/index.html.* Background information and documents are available at the Pacific Fishery Management Council's Web site at *http://www.pcouncil.org/.*

Copies of the final environmental impact statement (FEIS) for the 2011–2012 Groundfish Specifications and Management Measures are available from Donald McIsaac, Executive Director, Pacific Fishery Management Council (Council), 7700 NE Ambassador Place, Portland, OR 97220, *phone:* 503–820–2280.

Copies of additional reports referred to in this document may also be obtained from the Council. Copies of the Record of Decision (ROD), final regulatory flexibility analysis (FRFA), and the Small Entity Compliance Guide are available from William W. Stelle, Jr., Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way, NE, Seattle, WA 98115–0070.

Background

On November 3, 2010, NMFS published a proposed rule to implement the 2011–2012 specifications and management measures for the Pacific Coast groundfish fishery (75 FR 67810). A final rule was published on May 11, 2011 (76 FR 27508) that responded to public comments and codified the specifications and management measures in the CFR (50 CFR part 660, subparts C through G), except for the final Pacific whiting harvest specifications because the information necessary for the annual updated stock assessment for Pacific whiting was not available until January or February, which necessarily delays the preparation of the stock assessment until February.

Due to the inability to establish the final Pacific whiting harvest specifications during the preparation of the proposed and final rules, both rules announced a range of Pacific whiting harvest specifications that were being considered for 2011 and 2012, and also announced the intent to adopt final specifications for whiting on an annual basis after the Council's March 2011 and 2012 meetings. Because the stock assessment is now available, this final rule establishes the 2011 harvest specifications for Pacific whiting. The Council's adoption of Pacific whiting harvest specifications in March is consistent with the U.S.-Canada agreement for Pacific whiting. The U.S.-Canada agreement for Pacific whiting was signed in November 2003. This agreement addresses the conservation, research, and catch sharing of Pacific whiting. Presently, both countries are taking steps to fully implement the agreement. Until full implementation occurs, the negotiators recommended that each country apply the agreed-upon provisions to their respective fisheries. In addition to the time frame in which stock assessments are to be considered and harvest specifications established, the U.S.-Canada agreement specifies how the catch is to be shared between the two countries. The Pacific whiting catch sharing arrangement provides 73.88 percent of the coastwide total catch to the U.S. fisheries, and 26.12 percent to the Canadian fisheries. This action accounts for this division of catch share allocation between the U.S. and Canada.

This final rule also establishes the tribal allocation of Pacific whiting for 2011. NMFS issued a proposed rule for the allocation and management of the 2011 tribal Pacific whiting fishery on April 5, 2011 (75 FR 18709). This action finalizes the allocation and management measures published in the April 5, 2011 proposed rule. A summary of the comments received during the comment period and NMFS' responses are provided below.

Pacific Whiting Stock Status

The joint U.S.-Canada Stock Assessment Review (STAR) panel met February 7–11, 2011, in Seattle, Washington to review a draft stock assessment (Stewart *et al.*, 2011) that had been prepared by the joint Canada-U.S. stock assessment team (STAT). Two draft stock assessment models were evaluated by the STAT: One prepared by Stewart (Stock Synthesis III model, 2011) and a second prepared by Martell (TINSS, 2011). The joint STAT and STAR Panel discussed features of the new TINSS and SS base models. Specifically, comparisons of the updated TINSS and SS model revealed that: (1) Agreement in fit to the acoustic survey biomass was better between the models than in previous years; (2) there was a closer alignment in the spawning biomass trajectories and their associated confidence intervals; (3) depletion at the beginning of the time series became closer (while depletion at the end of the time series became more divergent); (4) the agreement in the recruitment time series was much improved; (5) recruitment deviations in log space showed much closer agreement; and (6) the fishing intensity time series showed much closer agreement. Overall, it was observed that current spawning biomass estimates and the associated confidence intervals showed good agreement between the two models, although uncertainty remained large for both models. The Joint STAT and the STAR Panel generally concluded that the current configurations of the TINSS and SS models represented the best base-case models for development of management advice. There was recognition, however, that uncertainty in the strength of the 2008 year class was very high and alternative model structures (such as parameterizations with time-varying selectivity) could be put forward that would very likely give less optimistic characterizations of current stock status.

At the March 2011 Council meeting, the Council's Scientific and Statistical Committee (SSC) reviewed the Pacific whiting stock assessment, which was based on the two models identified above. The SSC recommended both model results as equally plausible and recommended key management quantities such as the maximum sustainable yield harvest level and stock depletion in 2011 (126 percent of virgin biomass) be derived using model-averaging with equal weight. Using this approach, the stock assessment estimated that the Pacific whiting biomass was at 126 percent of its unfished biomass in 2011.

Harvest Specification Recommendations

The U.S. harvest levels analyzed in the FEIS for 2011 and 2012 specifications and management measures varied between a low of 96,969 mt and a high of 290,903 mt. This range represents 50 to 150 percent of the 2010 U.S. Optimum Yield (OY) of 193,935 mt. These broad ranges in Pacific whiting harvest levels were analyzed in order to assess the potential range of the effects of the harvest of Pacific whiting on incidentally-caught overfished species, and the economic effects to coastal communities.

The Council adopted the Pacific whiting stock assessment (Stewart *et al.*, 2011) recommended by the STAR panel and the SSC. After consideration of additional input from Council advisory bodies and public comment, the Council adopted a coastwide (U.S. plus Canada) OFL of 973,700 mt for 2011 and a coastwide ACL of 393,751 mt.

The final Overfishing Level (OFL) and ACL values recommended by the Council for 2011 are based on the new stock assessments, and are consistent with the U.S.-Canada agreement and the impacts considered in the FEIS for the 2011 and 2012 management measures.

The U.S. share of the OFL is 719,370 mt (or 73.88 percent of the coastwide OFL). The U.S. share of the ACL is 290,903 mt (or 73.88 percent of the coastwide ACL).

Tribal Fishery Allocations

This final rule establishes the tribal allocation of Pacific whiting for 2011. Since 1996, NMFS has been allocating a portion of the U.S. OY of Pacific whiting to the tribal fishery using the process established in 50 CFR 660.50(d)(1). The tribal allocation is subtracted from the total U.S. Pacific whiting OY before it is allocated to the non-tribal sectors. The tribal Pacific whiting fishery is a separate fishery, and is not governed by the limited entry or open access regulations or allocations. To date, only the Makah Tribe has prosecuted a tribal fishery for Pacific whiting. For 2011, both the Makah and Quileute have stated their intent to participate in the Pacific whiting fishery. The Quinault Nation has indicated that they do not plan to participate in the 2011 fishery, unless their circumstances change.

This final rule is not intended to establish any precedent for future Pacific whiting seasons, or for the long-term tribal allocation of whiting. Based on the formula for the tribal allocation used in the proposed rule, and taking into account public comments received on the proposed rule, the tribal allocation of Pacific whiting in 2011 is [17.5 percent * (U.S. ACL)] + 16,000 mt. With a U.S. ACL of 290,903 mt, the tribal allocation for the 2011 tribal Pacific whiting fishery is 66,908 mt.

Non-Tribal Allocations

The 2011 commercial (non-tribal) harvest guideline (HG) for Pacific whiting is 220,995 mt. This amount was determined by deducting from the total U.S. ACL of 290,903 mt, the 66,908 mt tribal allocation, along with 3,000 mt for research catch and bycatch in non-groundfish fisheries. These Pacific whiting fishery allocations are described in regulations at Table 1a to Part 660, subpart C, and footnote e/ and are being revised with this final rule. Regulations at 50 CFR 660.55(i)(2) allocate the commercial HG among the non-tribal catcher/processor, mothership, and shorebased sectors of the Pacific whiting fishery. The catcher/processor sector is allocated 34 percent (75,138 mt for 2011), the mothership sector is allocated 24 percent (53,039 mt for 2011), and the shorebased sector is allocated 42 percent (92,818 mt for 2011). The fishery south of 42° N. lat. may not take more than 4,641 mt (5 percent of the shorebased allocation) prior to the start of the primary Pacific whiting season north of 42° N. lat.

Regarding the shorebased sector, NMFS issued a temporary rule under emergency authority on December 30, 2010 (75 FR 82296) implementing interim measures for the Pacific coast groundfish fisheries beginning in January, 2011. The measures were necessary due to a delay in the finalization of the 2011–2012 harvest specifications and management measures. As part of the December 30, 2010 emergency action, 18,467 mt of Pacific whiting was allocated to the shorebased sector. Therefore, this final rule provides an additional 74,351 mt of Pacific whiting to the shorebased sector, so that the total 2011amount is 92,818 mt.

Allocations of Pacific Ocean perch, canary rockfish, darkblotched rockfish, and widow rockfish to the whiting fishery were published in the 2011–2012 Biennial Harvest Specifications and Management Measures Final rule, on May 11, 2011 (76 FR 27508). The Pacific whiting fishery allocations for these species are described in § 660.55(c)(1)(i) and in Table 1b, subpart C.

Comments and Responses

On April 5, 2011, NMFS issued a proposed rule for the allocation and management of the 2011 tribal Pacific whiting fishery (75 FR 18709). The comment period on this proposed rule closed on April 19, 2011. During the comment period, NMFS received four letters of comment. The U.S. Department of Interior submitted a letter of "no comment" associated with their review of the proposed rule. The Washington Department of Fish and Wildlife, American Seafoods Company, and Pacific Whiting Conservation Cooperative also submitted comments. Comments received on the proposed rule for the allocation and management of the 2011 tribal Pacific whiting fishery are addressed below.

Washington Department of Fish and Wildlife

Comment 1: The Washington Department of Fish and Wildlife (WDFW) expressed concern that the NMFS implementing regulations for

Fishery Management Plan (FMP) Amendment 20, the trawl rationalization program, inadvertently removed the regulatory provisions allowing for the rollover of unused tribal whiting to the non-tribal whiting sectors. They state that the Council discussions regarding whiting rollover provisions during development of Amendment 20 focused solely on unused whiting among the non-tribal sectors, with the expectation that non-tribal whiting would be fully harvested under the trawl rationalization program.

Response: NMFS disagrees with the WDFW interpretation of events leading to regulations implementing FMP Amendment 20 that do not authorize "reapportionment" (regulatory term used historically) of whiting between the tribal sector and the non-tribal sector. This issue was broadly addressed in Appendix B of the Amendment 20 FEIS (Section B–1.2, p. B–15), which describes two options in front of the Council.

Option 1 stated that there would not be a rollover of unused whiting from one sector to another. Option 2 described how each year, rollovers to other sectors may occur if sector participants are surveyed by NMFS and no participants intend to harvest remaining sector allocations in that year. Option 2 would have maintained existing provisions for NMFS to reallocate unused sector allocations of whiting from sectors no longer active in the fishery to other sectors still active in the fishery. This option included reference to the regulations at former 50 CFR 660.323(c) on reapportionments, which stated "[t]hat portion of a sector's allocation that the Regional Administrator determines will not be used by the end of the fishing year shall be made available for harvest by the other sectors, if needed, in proportion to their initial allocations, on September 15 or as soon as practicable thereafter. NMFS may release whiting again at a later date to ensure full utilization of the resource. Whiting not needed in the fishery authorized under 50 CFR 660.324 may also be made available." The regulations at former 50 CFR 660.324, Pacific Coast treaty Indian fisheries, included the tribal whiting fishery. However, the Council chose Option 1, which did not include a rollover or reapportionment mechanism. NMFS concluded that this Council decision included the tribal sector as well, since reapportionment from the tribal to the non-tribal sector was included in Option 2. In addition, the regulations implementing Amendment 20 were deemed as necessary and appropriate under the MSA through the Council process, with many industry and agency representatives reviewing the regulations in great detail, paragraph by paragraph.

Comment 2: WDFW states that the roll-over or reapportionment unused tribal whiting to the non-tribal fishery allows for full utilization of the harvestable yield, consistent with the groundfish FMP and National Standards. WDFW also expresses a desire for a mechanism for "fixing" the rollover issue by the fall of 2011.

Response: As described above, the Council adopted a motion during the process of adopting Amendment 20 that there would be no rollover of whiting between sectors. NMFS interpreted the motion to include the tribal fishery and worked through a very public process, which included representatives from the whiting sectors, for the Council to deem the regulations not including reapportionment between the tribal and non-tribal fisheries. If the Council decides to recommend a reapportionment mechanism through the Council process, the regulations may be modified if appropriate.

Comment 3: WDFW expresses concern about lack of communication on the part of NMFS with WDFW regarding tribal whiting set asides, fishing plans and bycatch avoidance measures.

Response: NMFS acknowledges that interagency communications can be improved, and will work towards establishing more frequent and effective dialogue. NMFS, the treaty tribes, and the States of Washington and Oregon have initiated a process to determine a potential long term tribal allocation of Pacific whiting, and NMFS anticipates improved communications with all parties as that process moves forward.

American Seafoods Company

Comment 4: American Seafoods states that the 66,908 mt tribal allocation amount identified in the proposed rule is approximately 50,000 mt higher than the actual 2010 tribal harvest of Pacific whiting. American Seafoods states that the agency should conduct a good-faith evaluation of the realistic harvest by the tribes in 2011 in order to avoid unnecessarily limiting the allocation to the non-tribal whiting fishery.

Response: The tribal allocation identified in the proposed rule was based on the specific requests from the Makah and Quileute tribes. No comments were received from the two tribes during the comment period, and therefore NMFS has concluded that the tribal requests for 2011 have not changed. The allocation in the proposed rule is 23 percent of the U.S. OY. The proposed allocation, although higher than the absolute amounts of prior tribal allocations, is well within the range of past percentages (12.06–36.78 percent). While further negotiation on the long-term tribal allocation of Pacific whiting will occur among NMFS, the states, and the treaty Indian tribes, NMFS believes that current knowledge on the distribution and abundance of the coastal Pacific whiting stock supports a conclusion that the proposed tribal allocation of 66,908 mt lies within the range of the tribal treaty right to Pacific whiting.

The harvest of Pacific whiting by the Makah Tribe in 2010 was 18,255 mt. Although the final tribal allocation for 2011 is significantly higher than the 2010 harvest by the Makah tribe, there is no available information on which to base a conclusion that the 2011 tribal harvests, assuming participation by both the Makah and Quileute tribes, will be similar to the 2010 tribal whiting harvest.

Comment 5: American Seafoods also notes that the ability to rollover unused tribal whiting to the non-tribal sector was eliminated in the rulemaking process for FMP Amendments 20 and 21. They urge NMFS to promptly reinstate its rollover authority, stating their belief that there was no intent by the Council to remove that authority.

Response: See response to comments 1 and 2 above.

Comment 6: The combination of the proposed tribal allocation for 2011 and lack of a rollover procedure almost guarantees that the fisheries, collectively, will not achieve optimum yield. American Seafoods disagrees with NMFS' preliminary determination that management measures for the tribal fishery are consistent with MSA National Standards and other applicable laws. They state the proposed allocation and removal of rollover authority violates National Standards 1 and 8, preventing overfishing while achieving optimum yield, and taking into account the importance of fishery resources to fishing communities.

Response: NMFS disagrees with this comment. NMFS is obligated to establish a tribal allocation that is consistent with treaty rights as well as MSA national standards. As discussed in the proposed rule preamble, the tribal allocation in this rule is based on tribal requests and is within the likely amount of the total treaty right based on the best available scientific information regarding the migration of whiting through the tribes' usual and accustomed fishing grounds. NMFS believes that the tribal allocation in this final rule reflects a reasonable balance that provides for the tribes' exercise of their treaty right and complies with the MSA national standards. NMFS is not "limiting" the non-tribal harvest by allowing a higher tribal allocation in 2011 than in the past.

Comment 7: American Seafoods disagrees with the values of whiting NMFS used in the proposed rule ($160.00/mt), stating that Pacific whiting produces gross revenue of $1,000/mt. They state that if the tribal harvest remains similar to 2010, up to 50,000 mt of Pacific whiting would go unharvested, resulting in a direct revenue loss to the nation of approximately $50 million.

Response: American Seafoods is a major at-sea catcher-processor company. This response is tailored to some of the issues with establishing an ex-vessel price for at-sea companies and recognition that ex-vessel prices do not reflect wholesale or export prices. In the economic analysis to support this rulemaking, ex-vessel values were used to establish the value of the fishery. This is a fairly standard practice for Pacific Fishery Management Council economic analyses, as well as other documents. For example, the following is taken from a report by Northern Economics, Inc. "*The Seafood Industry in Alaska's Economy*" prepared for the Marine Conservation Alliance, At-Sea Processors Association, and Pacific Seafood Processors Association (January 2009.) "Ex-vessel value: This term nominally means the value of harvested but unprocessed fish as it transferred off of the harvesting vessel. Typically the ex-vessel value equals the amount of money that fishing vessels receive for unprocessed fish or shellfish; ex-vessel value is equal to the quantity of fish or shellfish retained for processing multiplied by the ex-vessel (dockside) per-unit price. Catcher processors do not technically generate an ex-vessel value, but a value may be imputed from catcher processor harvested fish." Elsewhere this report states "Catcher processors, because their fish are fed directly into their on-board processing lines do not generate a financial transaction in which fish are bought or sold. Technically, therefore, there is no ex-vessel price associated with the raw/unprocessed fish. In order to account for the value of this fish, so that it can be compared to other fisheries, an ex-vessel value is often imputed for them. The imputed ex-vessel value is equal to the price per pound of shore based fish of the same species caught in a similar location with a similar gear multiplied by the amount of catcher processor harvests." However, the commenter is correct in that use of ex-vessel values understates the total sales values (domestic or export). To impute a total sales value, several types of data are needed, including: total production of finished product by finished product; the average amount of raw fish used to make finished product (product recovery rate), and the average price of the finished product. For example, during 2010, according to U.S. foreign trade statistics, approximately 36,197 mt of headed and gutted product was exported at a value of $73.8 million. If the product recovery rate is 0.65 percent (1 lb of raw fish yields 0.65 lbs of finished product), 55,688 mt of raw hake yields 36,197 mt of headed and gutted product. (Headed and gutted fish is a major hake item. Unfortunately, export prices for surimi and fillets, the other major hake products, cannot be estimated as U.S. trade statistic categories on surimi and fillets do not distinguish between hake and other species such as pollock.) With a total finished value of $73.8 million, the imputed export price per ton of raw fish processed is $1,325 per mt ($73,800/55,686 mt).

At this time NMFS does not have very good data on the amount of finished products by sector (shoreside, tribal, mothership, and catcher-processor) or wholesale values and product recovery rates by finished product (headed and gutted, surimi, or fillets). NMFS anticipates that the industry will provide, possibly through the economic data collection processes associated with Amendment 20 to the Pacific Fishery Groundfish FMP, the data needed to develop wholesale values of industry production. For now, using the above example, NMFS will revise its analysis to include a statement that indicates that the use of ex-vessel values understates the total wholesale or export values associated with Pacific whiting products.

Pacific Whiting Conservation Cooperative (PWCC)

Comment 8: The PWCC urges NMFS to develop a remedy for 2011 that provides regulatory authority to reapportion unharvested whiting from the tribal to the non-tribal fishery, stating that Council intent during the Amendment 20 trawl rationalization process was that the decision to not allow reapportionment was applied solely to the non-tribal fishery. They feel that Council intent, past NMFS practice, and recent experience where tribal whiting has been stranded creates a situation where authority to reapportion potentially unharvested whiting should be reinstituted. They suggest action by NMFS to reassert and/or reinstitute its reapportionment authority.

Response: See response to comments 1 and 2 above.

Comment 9: PWCC urges NMFS to work with the states of Oregon, Washington, and the coastal treaty tribes, as well as consult with the fishing industry, to develop a long-term tribal whiting set aside.

Response: NMFS agrees with this suggestion, and intends to continue work on development of a long-term tribal whiting allocation for the future.

Comment 10: PWCC believes the proposed 2011 tribal whiting set aside is too high. PWCC points out that the proposed rule acknowledged that the tribal whiting set aside can unnecessarily limit the non-tribal fishery if set too high. Given past performance and lack of demonstrated fishing operations from the Quileute and Quinault tribes, whiting will be stranded, potentially foregoing tens of millions of dollars in gross revenue, in contravention of MSA National Standard 1. They suggest a realistic 2011 tribal whiting set aside.

Response: NMFS is obligated to establish a tribal allocation that is consistent with treaty rights as well as MSA national standards. NMFS believes that the tribal allocation in this final rule reflects a reasonable balance that provides for the tribes' exercise of their treaty right while maintaining compliance with the MSA national standards. See also response to comment 6 above.

Comment 11: PWCC acknowledges the Makah tribe's history in the fishery, including management plans, monitoring, and enforcement mechanisms, as compared to the Quileute and Quinault tribes, which have no experience or management plans. NMFS has provided no evidence that the Quileute and Quinault will have viable fishing operations with management plans addressing their potential fisheries, including plans for how bycatch and impacts on protected species will be minimized. PWCC suggests tangible fishing plans from each tribe.

Response: As discussed above, NMFS based its decision regarding the tribal allocation on the tribes' requests and statements of intent regarding participation in the fishery. During late 2010 and early 2011, NMFS held individual meetings with the Quileute and Makah tribes, as well as the Quinault Indian Nation. NMFS has discussed the tribes' fishing plans and preparations with them and understands that both the Makah and Quileute tribes have fishing plans that address operations, bycatch management, and catch reporting.

Classification

The final Pacific whiting specifications and management measures for 2011 are issued under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the Pacific Whiting Act of 2006, and are in accordance with 50 CFR part 660, subparts C through G, the regulations implementing the FMP. The Administrator, Northwest Region, NMFS, has determined that this rule is consistent with the national standards of the Magnuson-Stevens Act and other applicable laws.

Pursuant to the Administrative Procedure Act, 5 U.S.C. 553(b)(B), NMFS finds good cause to waive prior public notice and comment on the 2011 Pacific whiting specifications as delaying this rule would be contrary to the public interest. The FMP requires that fishery specifications be evaluated periodically using the best scientific information available. The annual harvest specifications for Pacific whiting must be implemented by the start of the primary Pacific whiting season, which begins on May 15, 2011 or the primary whiting season will effectively remain closed. Pacific whiting differs from other groundfish species in that it has a shorter life span and the population fluctuates more swiftly. Thus, it is important to use the most recent stock assessment for Pacific whiting when determining OFLs and ACLs.

Every year, NMFS conducts a Pacific whiting stock assessment in which U.S. and Canadian scientists cooperate. The 2011 stock assessment for Pacific whiting was prepared in early 2011, which is the optimal time of year to conduct stock assessments for this species because the new 2010 data for the assessment are not available until January, 2011. The new data that were analyzed in the assessment include: Updated total catch; length and age data from the U.S. and Canadian fisheries; and biomass indices from the Joint U.S.-Canadian acoustic/midwater trawl surveys. Because of the delay in obtaining the new data and conducting the assessment, the results of Pacific whiting stock assessments are not available for use in developing the new harvest specifications until just before the Council's annual March meeting.

The primary Pacific whiting season begins on May 15, 2011. Because of the delay in obtaining the best available data for the assessment, it was not possible to provide for notice and comment before the start of the Pacific whiting season on May 15.

A delay in implementing the higher Pacific whiting harvest specifications to allow for notice and comment would shorten the primary whiting season and could prevent the tribal and non-tribal fisheries from attaining their higher 2011 allocations, and thus would result in unnecessary short-term adverse economic effects for the Pacific whiting fishing vessels and the associated fishing communities.

NMFS also finds good cause to waive the 30-day delay in effectiveness 2011 Pacific whiting specifications and the 2011 tribal allocation of Pacific whiting pursuant to 5 U.S.C. 553(d)(3). A delay in implementing the higher Pacific whiting harvest specifications to allow for the 30-day delay in effectiveness would further shorten the primary whiting season and could prevent the tribal and non-tribal fisheries from attaining their higher 2011 allocations, and thus would result in unnecessary short-term adverse economic effects for the Pacific whiting fishing vessels and the associated fishing communities. For these reasons, this final rule is made effective upon publication.

The environmental impacts associated with the Pacific whiting harvest levels that are adopted by this action are within the impacts in the FEIS for the 2011–2012 specification and management measures. In approving the 2011–2012 groundfish harvest specifications and management measures, NMFS issued a Record of Decision (ROD). The ROD was signed on April 27, 2011. Copies of the FEIS and the ROD are available from the Council (see ADDRESSES).

Pursuant to the Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq.*, NMFS prepared an Initial Regulatory Flexibility Analysis (IRFA) and FRFA for the 2011–2012 harvest specifications and management measures. These analyses included the regulatory impacts of this action on small entities. The IRFA was summarized in the proposed rule published on November 3, 2010 (75 FR 67810). A summary of the FRFA analysis, which covers the entire groundfish regulatory scheme of which this is a part, was published in the final rule on May 11, 2011. An IRFA was also prepared for the proposed rule on the tribal fishery for Pacific whiting in 2011. This proposed rule was published on April 5, 2011 (76 FR 18709). A FRFA for that rule was also prepared, and a summary of that FRFA is contained below. A copy of this analysis is available from NMFS (see ADDRESSES). The need for and objectives of this final rule are contained in the SUMMARY and in the Background section under SUPPLEMENTARY INFORMATION.

The final 2011–2012 specifications and management measures were intended to allow West Coast commercial and recreational fisheries participants to fish the harvestable surplus of more abundant stocks, while also ensuring that those fisheries do not exceed the allowable catch levels intended to rebuild and protect overfished stocks. The harvest specifications are consistent with and based on the guidance of the Magnuson-Stevens Act, the National Standard guidelines, and the FMP for protecting and conserving fish stocks. Fishery management measures include trip and bag limits, size limits, time/area closures, gear restrictions, and others intended to allow year-round West Coast groundfish landings, without compromising overfished species rebuilding measures.

In recent years, the number of participants engaged in the Pacific whiting fishery has varied with changes in the Pacific whiting OY and economic conditions. Pacific whiting shoreside vessels (26 to 29), mothership processors (4 to 6), mothership catcher vessels (11–20), catcher/processors (5 to 9), Pacific whiting shoreside first receivers (8–16), and five tribal trawlers are the major units of this fishery. Additional tribal trawlers may enter the fishery. NMFS records suggest the gross annual revenue for each of the catcher/processor and mothership operations on the Pacific coast exceeds $4,000,000. Therefore, they are not considered small businesses. NMFS records also show that 10–43 catcher vessels have taken part in the mothership fishery yearly since 1994. These companies are all assumed to be small businesses as defined by the RFA (although some of these vessels may be affiliated with larger processing companies). Since 1994, 26–31 catcher vessels participated in the shoreside fishery annually. These companies are all assumed to be small businesses, although some of these vessels may be affiliated with larger processing companies. This is the first year of the new trawl rationalization program where: The shorebased trawler sector is managed by an individual fishing quota program; the catcher-processor sector will continue to be managed by a co-op; and all participants in the mothership program will be fishing under a single mothership co-op. Therefore, it is expected that through rationalization, the number of participants in these sectors will decrease from previous levels. Based on a review of the available data, tribal trawlers impacted by this rule are small entities, and the Tribes are small government jurisdictions.

Pacific whiting has grown in importance, especially in recent years. Through the 1990s the volume of Pacific whiting landed in the fishery increased. In 2002 and 2003, landings of Pacific whiting declined due to information showing the stock was depleted and the subsequent regulations that restricted harvest in order to rebuild the species. Over the years 2003–2007 estimated Pacific whiting ex-vessel values averaged about $29 million. In 2008, these participants harvested about 248,000 mt of whiting worth about $63 million in ex-vessel value, based on shoreside ex-vessel prices of $254 per mt—the highest ex-vessel revenues and prices on record. In comparison, the 2007 fishery harvested about 224,000 mt worth $36 million at an average ex-vessel price of about $160 per mt. In 2009, tribal and non-tribal fleets harvested about 122,000 mt of whiting worth about $14 million. During 2009, ex-vessel prices declined to about $119 per mt, presumably due to the worldwide recession. For 2010, the preliminary ex-vessel price returned to $160 per mt, leading to about $27 million in revenues in 2010, based on a total harvest of 170,000 mt. All sectors should see increased revenues as the total allowable level of harvest has increased from 193,935 mt in 2010 to 290,903 mt in 2011.

However, the use of ex-vessel values as a means to impute the value of the fishery does not take into account the wholesale or export value of the fishery or the costs of harvesting and processing whiting into a finished product. NMFS does not have adequate data to make a full assessment of these values. However, there are two indicators that show current trends: The export price of headed and gutted whiting and the price of fuel. Seafood processors convert Pacific whiting into surimi, fillets, fish meal, and headed and gutted products. Besides high OY levels in recent years, increased prices for headed and gutted Pacific whiting have contributed to the increase in ex-vessel revenues. From 2004–2007, wholesale prices for headed and gutted Pacific whiting product increased from about $1,200 per mt to $1,600 per mt. In 2008, wholesale prices averaged $1,980 per mt, according to U.S. Export Trade statistics, and in 2009, prices fell slightly to $1,950 per mt. In 2010, prices increased to almost $2,040 per mt. Fuel prices, a major expense for Pacific whiting vessels, also increased dramatically. For example, at the start of the primary fishery in June 2008 fuel prices were about $4.30 per gallon, compared to June 2007 levels of $2.70 per gallon. However, by 2009, these prices fell from their June, 2008 high to about $2.32 per gallon. As indicated by Newport, Oregon fuels prices, prices are increasing. In July of 2009, Newport, Oregon fuel prices were about $2.20 a gallon. In July of 2010 they increased to $2.50 per gallon, and as of April 2011, the price of fuel is $3.75 per gallon.

The fisheries' ability to harvest the entire 2011 Pacific whiting ACL will depend on how well the industry limits the bycatch of overfished species, as well as the ability of each sector to harvest their Pacific whiting allocation. For example, in 2008 the Pacific whiting shoreside fishery was closed prematurely because of overfished species bycatch issues, leaving a major portion of its allocation unharvested. Although NMFS transferred the unharvested allocations to the other nontribal fleets, by year's end, 7 percent of the 2008 Pacific whiting OY remained unharvested. Under this final rule, there is no legal mechanism to reapportion any sector's unutilized allocation. (See response to Comment 1.)

NMFS did not consider a broad range of alternatives to the tribal allocation because the allocation is based primarily on the requests of the tribes for a level of participation in the fishery that will allow them to exercise their treaty right to fish for whiting. Consideration of amounts lower than the tribal requests is not appropriate here, where based on the information available to NMFS the requested amount appears to be within the amount to which the tribes are entitled. A higher amount would arguably be within the scope of the treaty right, but would unnecessarily limit the non-tribal fishery. A no action alternative was considered, but the regulatory structure provides for a tribal allocation on an annual basis only. Therefore, no action would result in no allocation of Pacific whiting to the tribal sector in 2011, inconsistent with NMFS' obligation to manage the fishery consistent with the tribes' treaty rights. Given that the Makah and Quileute tribes have made specific requests for allocations in 2011, this alternative received no further consideration.

With the implementation of Fishery Management Plan amendments 20 and 21, the ability to reapportion Pacific whiting from tribal to non-tribal fisheries was eliminated. Similarly, unharvested whiting allocated to the non-tribal shoreside, mothership, and catcher-processor sectors cannot be reapportioned among these sectors. So, unlike 2010, the regulations do not provide NMFS a specific mechanism to reapportion unharvested tribal whiting to the non-tribal sectors, and will not be able to reapportion among the non-tribal sectors. Pending markets, available bycatch, and the ability of tribal fleets to develop the capacity to harvest the tribal allocation may result in unharvested Pacific whiting because there is no regulatory mechanism to reapportion. Similarly, there may be unharvested Pacific whiting in the other sectors as well.

Pursuant to Executive Order 13175, this action was developed after meaningful consultation and collaboration with tribal officials from the area covered by the FMP. Under the Magnuson-Stevens Act, 16 U.S.C. 1852(b)(5), one of the voting members of the Council must be a representative of an Indian tribe with federally recognized fishing rights from the area of the Council's jurisdiction. In addition, regulations implementing the FMP establish a procedure by which the tribes with treaty fishing rights in the area covered by the FMP request, in writing, new allocations or regulations specific to the tribes before the first of the two meetings at which the Council considers groundfish management measures. Both the Makah and Quileute Tribes requested a Pacific whiting allocation for 2011. The regulations at 50 CFR 660.50(d)(2) further state that, "the Secretary will develop tribal allocations and regulations under this paragraph in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus." Over the last eight months, NMFS has met with each of the tribes and have had additional discussions regarding their plans for 2011.

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

There are no reporting, recordkeeping or other compliance requirements in the final rule.

No Federal rules have been identified that duplicate, overlap, or conflict with this action.

NMFS issued Biological Opinions 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 PCGFMP fisheries 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). These biological opinions have concluded that implementation of the PCGFMP was 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.

NMFS reinitiated a formal section 7 consultation under the ESA in 2005 for both the Pacific whiting midwater trawl fishery and the groundfish bottom trawl fishery. The December 19, 1999 Biological Opinion had defined an 11,000 Chinook incidental take threshold for the Pacific whiting fishery. During the 2005 Pacific whiting season, the 11,000 fish Chinook incidental take threshold was exceeded, triggering reinitiation. Also in 2005, new data from the West Coast Groundfish Observer Program became available, allowing NMFS to complete an analysis of salmon take in the bottom trawl fishery.

NMFS prepared a Supplemental Biological Opinion dated March 11, 2006, which addressed salmon take in both the Pacific whiting midwater trawl and groundfish bottom trawl fisheries. In its 2006 Supplemental Biological Opinion, NMFS concluded that catch rates of salmon in the 2005 whiting fishery were consistent with expectations considered during prior consultations. Chinook bycatch has averaged about 7,300 over the last 15 years and has only occasionally exceeded the reinitiation trigger of 11,000.

Since 1999, annual Chinook bycatch has averaged about 8,450. The Chinook ESUs most likely affected by the whiting fishery have generally improved in status since the 1999 section 7 consultation. Although these species remain at risk, as indicated by their ESA listing, NMFS concluded that the higher observed bycatch in 2005 does not require a reconsideration of its prior "no jeopardy" conclusion with respect to the fishery. For the groundfish bottom trawl fishery, NMFS concluded that incidental take in the groundfish fisheries is within the overall limits articulated in the Incidental Take Statement of the 1999 Biological Opinion. The groundfish bottom trawl limit from that opinion was 9,000 fish annually. NMFS will continue to monitor and collect data to analyze take levels. NMFS also reaffirmed its prior determination that implementation of the PCGFMP is not likely to jeopardize the continued existence of any of the affected ESUs.

Lower Columbia River coho (70 FR 37160, June 28, 2005) were recently listed and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead.

The Southern Distinct Population Segment (DPS) of green sturgeon was listed as threatened under the ESA (71 FR 17757, April 7, 2006). The southern DPS of Pacific eulachon was listed as threatened on March 18, 2010, under the ESA (75 FR 13012). NMFS has reinitiated consultation on the fishery, including impacts on green sturgeon, eulachon, marine mammals, and turtles. After reviewing the available information, NMFS has concluded that, consistent with sections 7(a)(2) and 7(d) of the ESA, the proposed action would not jeopardize any listed species, would not adversely modify any designated critical habitat, and would not result in any irreversible or irretrievable commitment of resources that would have the effects of foreclosing the formulation or implementation of any reasonable and prudent alternative measures.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, and Indian fisheries.

Dated: May 16, 2011.

Samuel D. Rauch III,

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

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

PART 660—FISHERIES OFF WEST COAST STATES

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

Authority: 16 U.S.C. 1801 *et seq.*, 16 USC 773 *et seq.*, and 16 U.S.C. 7001 *et seq.*

■ 2. In § 660.50 paragraph (f)(4) is revised to read as follows:

§ 660.50 Pacific Coast treaty Indian fisheries.

* * * * *

(f) * * *

(4) *Pacific whiting.* The tribal allocation for 2011 is 66,908 mt.

* * * * *

■ 3. In part 660, subpart C,

■ a. Revise Table 1a,

■ b. Revise Table 1b to read as follows:

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Table 1a. To Part 660, Subpart C - 2011, Specifications of OFL, ABC, ACL, ACT and Fishery Harvest guidelines(weights in metric tons).

Species	OFL	ABC	ACL a/	ACT	Fishery HG a/
ROUNDFISH:					
Lingcod	2,438	2,330	2,330		2,059
	2,523	2,102	2,102		2,095
Pacific Cod d/	3,200	2,222	1,600		1,200
Pacific Whiting e/	719,370		290,903		220,995
Sablefish	8,808	8,418	5,515	See Table 1c	
			1,298		1,264
Cabezon	52	50	50		50
	187	179	179		179
FLATFISH:					
Dover sole j/	44,400	42,436	25,000		23,410
English sole k/	20,675	19,761	19,761		19,661
Petrale sole l/	1,021	976	976		910.6
Arrowtooth flounder m/	18,211	15,174	15,174		13,096
Starry Flounder n/	1,802	1,502	1,352		1,345
Other flatfish o/	10,146	7,044	4,884		4,686
ROCKFISH:					
Pacific Ocean Perch p/	1,026	981	180	157	144.2
Shortbelly q/	6,950	5,789	50		49
Widow r/	5,097	4,872	600		539.1
Canary s/	614	586	102		82
Chilipepper t/	2,073	1,981	1,981		1,966
Bocaccio u/	737	704	263		249.6
Splitnose v/	1,529	1,461	1,461		1,454
Yellowtail w/	4,566	4,364	4,364		3857
Shortspine thornyhead x/	2,384	2,279	1,573		1,528
			405		363
Longspine thornyhead y/	3,577	2,981	2,119		2,075
			376		373
Cowcod z/	13	10	3		2.7
Darkblotched aa/	508	485	298		279.3
Yelloweye bb/	48	46	17		11.1
California Scorpionfish cc/	141	135	135		133
Black North of 40 10' N. lat.	445	426	426		412
	1,217	1,163	1,000		1,000
Minor Rockfish North ff/	3,767	3,363	2,227		2,116
Nearshore	116	99	99		99
Shelf	2,188	1,940	968		925
Slope	1,462	1,324	1,160		1,092
Minor Rockfish South gg/	4,302	3,723	2,341		2,301
Nearshore	1,156	1,001	1,001		1,001
Shelf	2,238	1,885	714		701
Slope	907	836	626		599
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate hh/	3,128	2,990	1,349		1,220
Other fish ii/	11,150	7,742	5,575		5,575

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a/ ACLs and HGs are specified as total catch values. Fishery harvest guidelines (HGs) means the harvest guideline or quota after subtracting from the ACL or ACT any allocation for the Pacific Coast treaty Indian Tribes, projected research catch, deductions for fishing mortality in non-groundfish fisheries, as necessary, and set-asides for EFPs.

b/ Lingcod north (Oregon and Washington). A new lingcod stock assessment was prepared in 2009. The lingcod north biomass was estimated to be at 62 percent of its unfished biomass in 2009. The OFL of 2,438 mt was calculated using an FMSYproxy of F45%. The ABC of 2,330 mt was based on a 4 percent reduction from the OFL (σ = 0.36/P* = 0.45) as it's a category 1 species. Because the stock is above B40% coastwide, the ACL is set equal to the ABC.

ACL is further reduced for the Tribal fishery (250 mt), incidental open access fishery (16 mt) and research catch (5 mt), resulting in a fishery HG of 2,059 mt.

c/ Lingcod south (California). A new lingcod stock assessment was prepared in 2009. The lingcod south biomass was estimated to be at 74 percent of its unfished biomass in 2009. The OFL of 2,523 mt was calculated using an FMSYproxy of F45%. The ABC of 2,102 mt was based on a 17 percent reduction from the OFL (σ = 0.72/P* = 0.40) as it's a category 2 species. Because the stock is above B40% coastwide, the ACL is set equal to the ABC. An incidental open access set-aside of 7 mt is deducted from the ACL, resulting in a fishery HG of 2,095 mt.

d/ Pacific Cod. The 3,200 mt OFL is based on the maximum level of historic landings. The ABC of 2,222 mt is a 31 percent reduction from the OFL (σ = 1.44/P* = 0.40) as it's a category 3 species. The 1,600 mt ACL is the OFL reduced by 50 percent as a precautionary adjustment. A set-aside of 400 mt is deducted from the ACL for the Tribal fishery resulting in a fishery HG of 1,200 mt.

e/Pacific whiting. The most recent stock assessment was prepared in January 2011. The stock assessment estimated the Pacific whiting biomass to be at 126 percent (50th percentile estimate of depletion, using two equally plausible models that were averaged together) of its unfished biomass in 2011. The U.S.-Canada coastwide OFL is 973,700 mt. The U.S. share of the OFL is 719,370 mt (73.88 percent of the coastwide OFL). The U.S.-Canada coastwide ACL is 393,751 mt, with a corresponding U.S. ACL (73.88 percent of the coastwide ACL) of 290,903 mt. The ACL is reduced by 66,908 mt for the tribal allocation, and a set-aside of 3,000 mt is deducted for the incidental open access fishery and research catch, resulting in a fishery HG of 220,995 mt.

f/Sablefish north. A coastwide sablefish stock assessment was prepared in 2007. The coastwide sablefish biomass was estimated to be at 38.3 percent of its unfished biomass in 2007. The coastwide OFL of 8,808 mt was based on the 2007 stock assessment with a FMSYproxy of F45%. The ABC of 8,418 mt is a 4 percent reduction from the OFL (σ = 0.36/P* = 0.45) as it's a category 1 species. The 40–10 harvest policy was applied to the ABC to derive the coastwide ACL and then the ACL was apportioned north and south of 36° N. lat. using the average of annual swept area biomass (2003–2008) from the NMFS NWFSC trawl survey, between the northern and southern areas with 68 percent going to the area north of 36° N. lat. and 32 percent going to the area south of 36° N. lat. The northern portion of the ACL is 5,515 mt and is reduced by 552 mt for the Tribal allocation (10 percent of the ACL north of 36° N. lat.) The 552 mt Tribal allocation is reduced by 1.5 percent to account for discard mortality. Detailed sablefish allocations are shown in Table 1c.

g/Sablefish South. That portion of the coastwide ACL apportioned to the area south of 36° N. lat. is 2,595 mt (32 percent). An additional 50 percent reduction was made for uncertainty resulting in an ACL of 1,298 mt. A set-aside of 34 mt is deducted from the ACL for EFP catch (26 mt), the incidental open access fishery (6 mt) and research catch (2 mt), resulting in a fishery HG of 1,264 mt.

h/Cabezon (Oregon). A new cabezon stock assessment was prepared in 2009. The cabezon biomass in Oregon was estimated to be at 51 percent of its unfished biomass in 2009. The OFL of 52 mt was calculated using an FMSYproxy of F45%. The ABC of 50 mt was based on a 4 percent reduction from the OFL (σ = 0.36/P* = 0.45) as it's a category 1 species. Because the stock is above B40% coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 50 mt. Cabezon in waters off Oregon were removed from the "other fish" complex, while cabezon of Washington will continue to be managed within the "other fish" complex.

i/Cabezon (California). A new cabezon stock assessment was prepared in 2009. The cabezon south biomass was estimated to be at 48 percent of its unfished biomass in 2009. The OFL of 187 mt was calculated using an FMSYproxy of F45%. The ABC of 179 mt was based on a 4 percent reduction from the OFL (σ = 0.36/P* = 0.45) as it's a category 1 species. Because the stock is above B40% coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 179 mt.

j/Dover sole. A 2005 Dover sole assessment estimated the stock to be at 63 percent of its unfished biomass in 2005. The OFL of 44,400 mt is based on the results of the 2005 stock assessment with an FMSYproxy of F30%. The ABC of 42,436 mt is a 4 percent reduction from the OFL (σ = 0.36/P* = 0.45) as it's a category 1 species. Because the stock is above B25% coastwide, the ACL could be set equal to the ABC. However, the ACL of 25,000 mt is set at a level below the ABC and higher than the maximum historical landed catch. A set-aside of 1,590 mt is deducted from the ACL for the Tribal fishery (1,497 mt), the incidental open access fishery (55 mt) and research catch (38 mt), resulting in a fishery HG of 23,410 mt.

k/English sole. A stock assessment update was prepared in 2007 based on the full assessment in 2005. The stock was estimated to be at 116 percent of its unfished biomass in 2007. The OFL of 20,675 mt is based on the results of the 2007 assessment update with an FMSYproxy of F30%. The ABC of 19,761 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above B25%, the ACL was set equal to the ABC. A set-aside of 100 mt is deducted from the ACL for the Tribal fishery (91 mt), the incidental open access fishery (4 mt) and research catch (5 mt), resulting in a fishery HG of 19,661 mt.

l/Petrale sole. A petrale sole stock assessment was prepared for 2009. In 2009 the petrale sole stock was estimated to be at 12 percent of its unfished biomass coastwide, resulting in the stock being declared as overfished. The OFL of 1,021 mt is based on the 2009 assessment with a F30% FMSYproxy. The ABC of 976 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL is set equal to the ABC and corresponds to an SPR harvest rate of 31 percent. A set-aside of 65.4 mt is deducted from the ACL for the Tribal fishery (45.4 mt), the incidental open access fishery (1 mt), EFP catch (2 mt) and research catch (17 mt), resulting in a fishery HG of 911 mt.

m/Arrowtooth flounder. The stock was last assessed in 2007 and was estimated to be at 79 percent of its unfished biomass in 2007. The OFL of 18,211 mt is based on the 2007 assessment with a F30% FMSYproxy. The ABC of 15,174 mt is a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. Because the stock is above B25%, the ACL is set equal to the ABC. A set-aside of 2,078 mt is deducted from the ACL for the Tribal fishery (2,041 mt), the incidental open access fishery (30 mt), and research catch (7 mt), resulting in a fishery HG of 13,096 mt.

n/Starry Flounder. The stock was assessed for the first time in 2005 and was estimated to be above 40 percent of its unfished biomass in 2005. For 2011, the coastwide OFL of 1,802 mt is based on the 2005 assessment with a FMSYproxy of F30%. The ABC of 1,502 mt is a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. Because the stock is above B25%, the ACL could have been set equal to the ABC. As a precautionary measure, the ACL of 1,352 mt is a 25 percent reduction from the OFL, which is a 10 percent reduction from the ABC. A set-aside of 7 mt is deducted from the ACL for the Tribal fishery (2 mt), the incidental open access fishery (5 mt), resulting in a fishery HG of 1,345 mt.

o/"Other flatfish" are the unassessed flatfish species that do not have individual OFLs/ABC/ACLs and include butter sole, curlfin sole, flathead sole, Pacific sand dab, rex sole, rock sole, and sand sole. The other flatfish OFL of 10,146 mt is based on the summed contribution of the OFLs determined for the component stocks. The ABC of 7,044 mt is a 31 percent reduction from the OFL (σ=1.44/P*=0.40) as all species in this complex are category 3 species. The ACL of 4,884 mt is equivalent to the 2010 OY, because there have been no significant changes in the status or management of stocks within the complex. A set-aside of 198 mt is deducted from the ACL for the Tribal fishery (60 mt), the incidental open access fishery (125 mt), and research catch (13 mt), resulting in a fishery HG of 4,686 mt.

p/POP. A POP stock assessment update was prepared in 2009, based on the 2003 full assessment, and the stock was estimated to be at 29 percent of its unfished biomass in 2009. The OFL of 1,026 mt for the Vancouver and Columbia areas is based on the 2009 stock assessment update with an F50% FMSYproxy. The ABC of 981 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 180 mt is based on a rebuilding plan with a target year to rebuild of 2020 and an SPR harvest rate of 86.4 percent. An ACT of 157 mt is being established to address management uncertainty and increase the likelihood that total catch remains within the ACL. A set-aside of 12.8 mt is deducted from the ACT for the Tribal fishery (10.9 mt), EFP catch (0.1 mt) and research catch (1.8 mt), resulting in a fishery HG of 144.2 mt.

q/Shortbelly rockfish. A non-quantitative assessment was conducted in 2007. The spawning stock biomass of shortbelly rockfish was estimated at 67 percent of its unfished biomass in 2005. The OFL of 6,950 mt was recommended for the stock in 2011 with an ABC of 5,789 mt (σ=0.72 with a P* of 0.40). The 50 mt ACL is slightly higher than recent landings, but much lower than previous OYs in recognition of the stock's importance as a forage species in the California Current ecosystem. A set-aside of 1 mt for research catch results in a fishery HG of 49 mt.

r/Widow rockfish. The stock was assessed in 2009 and was estimated to be at 39 percent of its unfished biomass in 2009. The OFL of 5,097 mt is based on the 2009 stock assessment with an F50% FMSYproxy. The ABC of 4,872 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. A constant catch strategy of 600 mt, which corresponds to an SPR harvest rate of 91.7 percent, will be used to rebuild the widow rockfish stock consistent with the rebuilding plan and a TTARGETof 2010. A set-aside of 61 mt is deducted from the ACL for the Tribal fishery (45 mt), the incidental open access fishery (3.3 mt), EFP catch (11 mt) and research catch (1.6 mt), resulting in a fishery HG of 539.1 mt.

s/Canary rockfish. A canary rockfish stock assessment update, based on the full assessment in 2007, was completed in 2009 and the stock was estimated to be at 23.7 percent of its unfished biomass coastwide in 2009. The coastwide OFL of 614 mt is based on the new assessment with a FMSYproxy of F50%. The ABC of 586 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 102 mt is based on a rebuilding plan with a target year to rebuild of 2027 and a SPR harvest rate of 88.7 percent. A set-aside of 20 mt is deducted from the ACL for the Tribal fishery (9.5 mt), the incidental open access fishery (2 mt), EFP catch (1.3 mt) and research catch (7.2 mt) resulting in a fishery HG of 82 mt. Recreational HGs are being specified as follows: Washington recreational, 2.0; Oregon recreational 7.0 mt; and California recreational 14.5 mt.

t/Chilipepper rockfish. The coastwide chilipeppor stock was assessed in 2007 and estimated to be at 71 percent of its unfished biomass coastwide in 2006. Given that chilipepper rockfish are predominantly a southern species, the stock is managed with stock-specific harvest specifications south of 40°10′ N. lat. and within minor shelf rockfish north of 40°10′ N. lat. South of 40°10′ N. lat., the OFL of 2,073 mt is based on the 2007 assessment with an FMSYproxy of F50%. The ABC of 1,981 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the biomass is estimated to be above 40 percent of the unfished biomass, the ACL was set equal to the ABC. The ACL is reduced by the incidental open access fishery (5 mt), and research catch (9 mt), resulting in a fishery HG of 1,966 mt.

u/Bocaccio. A bocaccio stock assessment was prepared in 2009 from Cape Mendocino to Cape Blanco (43° N. lat.) Given that bocaccio rockfish are predominantly a southern species, the stock is managed with stock-specific harvest specifications south of 40°10′ N. lat. and within minor shelf rockfish north of 40°10′ N. lat. The bocaccio stock was estimated to be at 28 percent of its unfished biomass in 2009. The OFL of 737 mt is based on the 2009 stock assessment with an FMSYproxy of F50%. The ABC of 704 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The 263 mt ACL is based on a rebuilding plan with a target year to rebuild of 2022 and a SPR harvest rate of 77.7 percent. A set-aside of 13.4 mt is deducted from the ACL for the incidental open access fishery (0.7 mt), EFP catch (11 mt) and research catch (1.7 mt), resulting in a fishery HG of 249.6 mt.

v/Splitnose rockfish. A new coastwide assessment was prepared in 2009 that estimated the stock to be at 66 percent of its unfished biomass in 2009. Splitnose in the north is managed under the minor slope rockfish complex and south of 40°10′ N. lat. with species-specific harvest specifications. South of 40°10′ N. lat. the OFL of 1,529 mt is based on the 2009 assessment with an FMSYproxy of F50%. The ABC of 1,461 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the unfished biomass is estimated to be above 40 percent of the unfished biomass, the ACL is set equal to the ABC. A set-aside of 7 mt is deducted from the ACL for research catch, resulting in a fishery HG of 1,454 mt.

w/Yellowtail rockfish. A yellowtail rockfish stock assessment was last prepared in 2005 for the Vancouver, Columbia, and Eureka areas. Yellowtail rockfish was estimated to be at 55 percent of its unfished biomass in 2005. The OFL of 4,566 mt is based on the 2005 stock assessment with the FMSYproxy of F50%. The ABC of 4,364 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, because the stock is above B40%. A set-aside of 507 mt is deducted from the ACL for the Tribal fishery (490 mt), the incidental open access fishery (3 mt), EFP catch (10 mt) and research catch (4 mt), resulting in a fishery HG of 3,857 mt.

x/Shortspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 63 percent of its unfished biomass in 2005. A coastwide OFL of 2,384 mt is based on the 2005 stock assessment with a F50% FMSYproxy. The coastwide ABC of 2,279 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 1,573 mt, 66 percent of the coastwide OFL. A set-aside of 45 mt is deducted from the ACL for the Tribal fishery (38 mt), the incidental open access fishery (2 mt), and research catch (5 mt) resulting in a fishery HG of 1,528 mt for the area north of 34°27′ N. lat. For that portion of the stock south of 34°27′ N. lat. the ACL is 405 mt which is 34 percent of the coastwide OFL, reduced by 50 percent as a precautionary adjustment. A set-aside of 42 mt is deducted from the ACL for the incidental open access fishery (41 mt), and research catch (1 mt) resulting in a fishery HG of 363 mt for the area south of 34°27′ N. lat. The sum of the northern and southern area ACLs (1,978 mt) is a 13 percent reduction from the coastwide ABC.

y/Longspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 71 percent of its unfished biomass in 2005. A coastwide OFL of 3,577 mt is based on the 2005 stock assessment with a F50% FMSYproxy. The ABC of 2,981 mt is a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 2,119 mt, and is 79 percent of the coastwide OFL for the biomass found in that area reduced by an additional 25 percent as a precautionary adjustment. A set-aside of 44 mt is deducted from the ACL for the Tribal fishery (30 mt), the incidental open access fishery (1 mt), and research catch (13 mt) resulting in a fishery HG of 2,075 mt. For that portion of the stock south of 34°27′ N. lat. the ACL is 376 mt and is 21 percent of the coastwide ABC reduced by 50 percent as a precautionary adjustment. A set-aside of 3 mt is deducted from the ACL for the incidental open access fishery (2 mt), and research catch (1 mt) resulting in a fishery HG of 373 mt. The sum of the northern and southern area ACLs (2,495 mt) is a 16 percent reduction from the coastwide ABC.

z/Cowcod. A stock assessment update was prepared in 2009 and the stock was estimated to be 5 percent (bounded between 4 and 21 percent) of its unfished biomass in 2009. The OFLs for the Monterey and Conception areas were summed to derive the south of 40°10 N.′ lat. OFL of 13 mt. The ABC for the area south of 40°10′ N. lat. is 10 mt. The assessed portion of the stock in the Conception Area was considered category 2, with a Conception Area contribution to the ABC of 5 mt, which is a 17 percent reduction from the OFL (σ=0.72/P*=0.35). The unassessed portion of the stock in the Monterrey area was considered a category 3 stock, with a contribution to the ABC of 5 mt, which is a 29 percent reduction from the OFL (σ=1.44/P*=0.40). A single ACL of 3 mt is being set for both areas combined. The ACL of 3 mt is based on a rebuilding plan with a target year to rebuild of 2068 and an SPR rate of 82.7 percent. The amount anticipated to be taken during research activity is 0.1 mt and the amount expected to be taken during EFP activity is 0.2 mt, which results in a fishery HG of 2.7 mt.

aa/Darkblotched rockfish. A stock assessment update was prepared in 2009, based on the 2007 full assessment, and the stock was estimated to be at 27.5 percent of its unfished biomass in 2009. The OFL is projected to be 508 mt and is based on the 2009 stock assessment with an FMSYproxy of F50%. The ABC of 485 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 298 mt is based on a rebuilding plan with a target year to rebuild of 2025 and an SPR harvest rate of 64.9 percent. A set-aside of 18.7 mt is deducted from the ACL for the Tribal fishery (0.1 mt), the incidental open access fishery (15 mt), EFP catch (1.5 mt) and research catch (2.1 mt), resulting in a fishery HG of 279.3 mt.

bb/Yelloweye rockfish. The stock was assessed in 2009 and was estimated to be at 20.3 percent of its unfished biomass in 2009. The 48 mt coastwide OFL was derived from the base model in the new stock assessment with an FMSYproxy of F50%. The ABC of 46 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The 17 mt ACL is based on a rebuilding plan with a target year to rebuild of 2074 and an SPR harvest rate of 76 percent. A set-aside of 5.9 mt is deducted from the ACT for the Tribal fishery (2.3 mt), the incidental open access fishery (0.2 mt), EFP catch (0.1 mt) and research catch (3.3 mt) resulting in a fishery HG of 11.1 mt. Recreational HGs are being established as follows: Washington recreational, 2.6; Oregon recreational 2.4 mt; and California recreational 3.1 mt.

cc/California Scorpionfish was assessed in 2005 and was estimated to be at 80 percent of its unfished biomass in 2005. The OFL of 141 mt is based on the new assessment with a harvest rate proxy of F50%. The ABC of 135 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above B40%, the ACL is set equal to the ABC. A set-aside of 2 mt is deducted from the ACL for the incidental open access fishery, resulting in a fishery HG of 133 mt.

dd/Black rockfish north (Washington). A stock assessment was prepared for black rockfish north of 45°56′ N. lat. (Cape Falcon, Oregon) in 2007. The biomass in the north was estimated to be at 53 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of F50%. The resulting OFL for the area north of 46°16′ N. lat. (the Washington/Oregon Border) is 445 mt and is 97 percent of the OFL from the assessed area. The ABC of 426 mt for the north of 46°16′ N. Lat. is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, since the stock is above B40%. A set-aside of 14 mt for the Tribal fishery results in a fishery HG of 412 mt.

ee/Black rockfish south (Oregon and California). A 2007 stock assessment was prepared for black rockfish south of 45°56′ N. lat. (Cape Falcon, Oregon) to the southern limit of the stock's distribution in Central California in 2007. The biomass in this area was estimated to be at 70 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of F50%. Three percent of the OFL from the stock assessment prepared for black rockfish north of 45°56′ N. lat. is added to the OFL from the assessed area south of 45° 56′ N. lat. The resulting OFL for the area south of 46°16′ N. lat. is 1,217 mt. The ABC of 1,163 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set at 1,000 mt, which is a constant catch strategy designed to keep the stock biomass above B40%. There are no set-asides thus the fishery HG is equal to the ACL. The black rockfish ACL in the area south of 46°16′ N. lat., is subdivided with separate HGs being set for the area north of 42° N. lat. (580 mt/58 percent) and for the area south of 42° N. lat. (420 mt/42 percent).

ff/Minor rockfish north is comprised of three minor rockfish sub-complexes: Nearshore, shelf, and slope rockfish. The OFL of 3,767 mt is the sum of OFLs for nearshore (116 mt), shelf (2,188 mt) and slope (1,462 mt) north sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (splitnose and chilipepper rockfish), 0.72 for category 2 stocks (greenstriped rockfish and blue rockfish in California) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish north ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex (nearshore, shelf, and slope) is 3,363 mt. The ACL of 2,227 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 99 mt. The set-aside for the shelf sub-complex is 43 mt—Tribal fishery (9 mt), the incidental open access fishery (26 mt), EFP catch (4 mt) and research catch (4 mt) resulting in a shelf fishery HG of 925 mt. The set-aside for the slope sub-complex is 68 mt—Tribal fishery (36 mt), the incidental open access fishery (19 mt), EFP catch (2 mt) and research catch (11 mt), resulting in a slope fishery HG of 1,092 mt.

gg/Minor rockfish south is comprised of three minor rockfish sub-complexes: Nearshore, shelf, and slope. The OFL of 4,302 mt is the sum of OFLs for nearshore (1,156 mt), shelf (2,238 mt) and slope (907 mt) south sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (gopher rockfish north of 34°27′ N. lat., blackgill), 0.72 for category 2 stocks (blue rockfish in the assessed area, greenstriped rockfish, and bank rockfish) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish south ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex, is 3,723 mt (1,001 mt nearshore, 1,885 mt shelf, and 836 mt slope). The ACL of 2,341 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 1,001 mt. The set-aside for the shelf sub-complex is 13 mt for the incidental open access fishery (9 mt), EFP catch (2 mt) and research catch (2 mt), resulting in a shelf fishery HG of 701 mt. The set-aside for the slope sub-complex is 27 mt for the incidental open access fishery (17 mt), EFP catch (2 mt) and research catch (8 mt), resulting in a slope fishery HG of 599 mt.

hh/Longnose skate. A stock assessment was prepared in 2007 and the stock was estimated to be at 66 percent of its unfished biomass. The OFL of 3,128 mt is based on the 2007 stock assessment with an FMSYproxy of F45%. The ABC of 2,990 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 1,349 is equivalent to the 2010 OY and represents a 50% increase in the average 2004–2006 mortality (landings and discard mortality). The set-aside for longnose skate is 129 mt for the Tribal fishery (56 mt), incidental open access fishery (65 mt), and research catch (8 mt), resulting in a fishery HG of 1,220 mt.

ii/ "Other fish" contains all unassessed groundfish FMP species that are neither rockfish (family Scorpaenidae) nor flatfish. Those species include big skate, California skate, leopard shark, soupfin shark, spiny dogfish, finescale codling, Pacific rattail, ratfish, cabezon off Washington, and kelp greenling. The OFL of 11,150 mt is equivalent to the 2010 MSY harvest level minus the 50 mt contribution made for cabezon off Oregon, which is a newly assessed stock to be managed with stock-specific specifications. The ABC of 7,742 mt is a 31 percent reduction from the OFL (σ = 1.44/P* = 0.40) as all of the stocks in the "other fish" complex are category 3 species. The ACL of 5,575 mt is equivalent to the 2010 OY, minus half of the OFL contribution for Cabezon off of Oregon (25 mt). The fishery HG is equal to the ACL.

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Table 1b. To Part 660, Subpart C - 2011, Allocations by Species or Species Group. (Weights in Metric Tons)

Species	Fishery HG	Allocations			
		Trawl		Non-trawl	
		%	Mt	%	Mt
ROUNDFISH:					
Lingcod					
N of 42° N. lat.	2,059	45%	927	55%	1,132
S of 42° N. lat.	2,095	45%	943	55%	1,152
Pacific cod	1,200	95%	1,140	5%	60
Pacific whiting	220,995	100%	220,995	0%	0
Sablefish					
N of 36° N. lat.	See Table 1c of this subpart				
S of 36° N. lat.	1,264	42%	531	58%	733
FLATFISH:					
Dover sole	23,410	95%	22,240	5%	1,170
English sole	19,661	95%	18,678	5%	983
Petrale sole a/	910.6		876		35
Arrowtooth flounder	13,096	95%	12,441	5%	655
Starry Flounder	1,345	50%	673	50%	672
Other flatfish	4,686	90%	4,217	10%	469
ROCKFISH:					
Pacific Ocean Perch b/	144.2	95%	137	5%	7
Widow e/	539.1	91%	491	9%	49
Canary a/ c/	82		34.1		29.8
Chilipepper - S of 40°10 N. Lat.	1,966	75%	1,475	25%	492
Bocaccio - S of 40°10 N. Lat. a/	249.6		60		189.6
Splitnose - S of 40°10 N. Lat.	1,454	95%	1,381	5%	73
Yellowtail - N of 40°10 N. Lat.	3857	88%	3394	12%	463
Shortspine thornyhead					
N of 34°27' N. lat.	1,528	95%	1,452	5%	76
S of 34°27' N. lat.	363	NA	50	NA	313
Longspine thornyhead					
N of 34°27' N. lat.	2,075	95%	1,971	5%	104
Cowcod - S of 40°10 N. Lat. a/	2.7		1.8		0.9
Darkblotched d/	279.3	95%	265	5%	14
Yelloweye a/	11.1		0.6		10.5
Minor Rockfish North					
Shelf a/	925	60.2%	557	39.8%	368
Slope	1,092	81%	885	19%	207
Minor Rockfish South					
Shelf a/	701	12.2%	86	87.8%	615
Slope	599	63%	377	37%	222
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate a/	1,220	95%	1,159	5%	61

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a/ Allocations decided through the biennial specification process.

b/ 30 mt of the total trawl allocation for POP is allocated to the whiting fisheries, as follows: 12.6 mt for the shorebased IFQ fishery, 7.2 mt for the mothership fishery, and 10.2 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140(d)(1)(ii)(D).

c/ 14.1 mt of the total trawl allocation of canary rockfish is allocated to the whiting fisheries, as follows: 5.9 mt for the shorebased IFQ fishery, 3.4 mt for the mothership fishery, and 4.8 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140(d)(1)(ii)(D).

d/ 25 mt of the total trawl allocation for darkblotched rockfish is allocated to the whiting fisheries, as follows: 10.5 mt for the shorebased IFQ fishery, 6.0 mt for the mothership fishery, and 8.5 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140(d)(1)(ii)(D).

e/ 52 percent (255 mt) of the total trawl allocation for widow rockfish is allocated to the whiting fisheries, as follows: 107.1 mt for the shorebased IFQ fishery, 61.2 mt for the mothership fishery, and 86.7 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140(d)(1)(ii)(D).

■ 4. In § 660.140, paragraph (d)(1)(ii)(D) is revised as follows:

§ 660.140 Shorebased IFQ program.

* * * * *

(d) * * *

(1) * * *

(ii) * * *

(D) For the 2011 trawl fishery, NMFS will issue QP based on the following shorebased trawl allocations:

IFQ Species	Management area	Shorebased trawl allocation (mt)
Lingcod		1,863.30
Pacific cod		1,135.00
Pacific Whiting		92,817.90
Sablefish	North of 36° N. lat.	2,546.34
Sablefish	South of 36° N. lat.	530.88
Dover sole		22,234.50
English sole		18,672.95
PETRALE SOLE		871.00
Arrowtooth flounder		12,431.20
Starry flounder		667.50
Other flatfish		4,197.40
PACIFIC OCEAN PERCH	North of 40°10′ N. lat.	119.36
WIDOW ROCKFISH		342.62
CANARY ROCKFISH		25.90
Chilipepper rockfish	South of 40°10′ N. lat.	1,475.25
BOCACCIO ROCKFISH	South of 40°10′ N. lat.	60.00
Splitnose rockfish	South of 40°10′ N. lat.	1,381.30
Yellowtail rockfish	North of 40°10′ N. lat.	3,094.16
Shortspine thornyhead	North of 34°27′ N. lat.	1,431.60
Shortspine thornyhead	South of 34°27′ N. lat.	50.00
Longspine thornyhead	North of 34°27′ N. lat.	1,966.25
COWCOD	South of 40°10′ N. lat.	1.80
DARKBLOTCHED ROCKFISH		250.64
YELLOWEYE ROCKFISH		0.60
Minor shelf rockfish complex	North of 40°10′ N. lat.	522.00
Minor shelf rockfish complex	South of 40°10′ N. lat.	86.00
Minor slope rockfish complex	North of 40°10′ N. lat.	829.52
Minor slope rockfish complex	South of 40°10′ N. lat.	377.37

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **[PROPOSED] ORDER ON REMEDY**

After consideration of the parties' cross-motions for summary judgment, supplemental briefings on remedy, and the record in this case, and for the reasons set forth in its December 22, 2011 Order (Docket No. 49) (the "MSJ Order"), the Court hereby declares and orders:

1. Defendants John Bryson, National Oceanic and Atmospheric Administration ("NOAA") and National Marine Fisheries Service ("NMFS") (collectively, "Defendants") violated the Magnuson-Stevens Fishery Management and Conservation Act ("MSA"), 16 U.S.C. §1853a(c)(5)(A)(i), by failing to consider the fishing history beyond 2003 for harvesters and 2004

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

for processors in issuing their initial 2011 individual fishing quotas ("IFQs") as part of the implementing regulations for the fishery management plan for Pacific Whiting levels for 2011 (the "IFQ Regulations").

2. The IFQ Regulations are hereby REMANDED to NMFS for reconsideration and revision based on "current and historical harvest" for harvesters and processors for Pacific whiting within the meaning of 16 U.S.C. §1853a(c)(5)(A)(i) and consistent with the MSA and the MSJ Order.

3. Defendants shall use their best efforts and all available authority to implement revised, final IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012.

4. The existing IFQ Regulations shall remain in effect pending the implementation of revised, final IFQ Regulations for the 2012 Pacific whiting season in compliance with Paragraph 2 above; provided, however, that if Defendants fail to implement revised IFQ Regulations for the 2012 Pacific whiting season by December 1, 2012, the existing IFQ Regulations will be vacated.

5. The Court will retain jurisdiction over Defendants' actions on remand.

6. Defendants will report regularly on their progress to meet the requirements of this Order on Remedy. Within three months of the date of issuance of this Order on Remedy, and every three months after that until the earlier of the adoption of revised, final IFQ Regulations for the 2012 Pacific whiting season or December 1, 2012, Defendants will submit a report to the Court regarding their efforts to comply with the Order on Remedy.

IT IS SO ORDERED.

DATED: ______________________

____
THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

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IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

San Francisco Division

PACIFIC DAWN, L.L.C., *et al.*, Plaintiffs, vs. JOHN BRYSON, *et al.*, Defendants.	3:10-cv-04829-TEH FEDERAL DEFENDANTS' SUPPLEMENTAL BRIEF ON THE APPROPRIATE REMEDY

INTRODUCTION

Federal Defendants John Bryson, in his official capacity as Secretary of Commerce, National Oceanic and Atmospheric Administration, and National Marine Fisheries Service ("NMFS") (collectively "Federal Defendants") submit this brief pursuant to the Court's December 22, 2011 Order, which ordered the parties to simultaneously file supplemental briefs on the appropriate remedy by January 30, 2012. Order (ECF No. 49) at 13.[1] In its Order, the Court held that, on the administrative record before it, NMFS' "failure to consider fishing history beyond 2003 for harvesters and 2004 for processors was arbitrary and capricious" within the meaning of the Administrative Procedure Act ("APA"), 5 U.S.C. § 706(2)(A). Order at 12. As explained more fully below, the only appropriate remedy in light of the Court's decision is a remand of those portions of the current regulations containing the specific years used to determine the harvest and processing history for initial allocations of quota shares of whiting in the Pacific shore-based Individual Fishing Quota ("IFQ") program, and the specific years used to determine the qualifying criteria and harvesting history for initial allocation of whiting catch history assignments in the mothership coop program, to determine if a new rulemaking process under the Magnuson-Stevens Fishery Conservation and Management Act ("Magnuson-Stevens Act"), 16 U.S.C. § 1853(c), and the trawl rationalization regulations, is appropriate.[2] Remand

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[1] The Court permitted the parties to, alternatively, file a motion for the Court "to make the requisite findings for an interlocutory appeal under 28 U.S.C. § 1292." Order at 14. By submitting the instant brief, Federal Defendants do not waive any claim or defense, nor do they waive any right to seek appellate review of the Court's December 22, 2011 Order (ECF No. 49) and/or any subsequent order on remedy and/or final judgment. Instead, Federal Defendants believe it is premature to consider whether it is in the interest of the United States to pursue an appeal until a remedy order is entered. Federal Defendants also note that the government can appeal a remand order without seeking certification for an interlocutory appeal pursuant to 28 U.S.C. § 1292. *Alsea Valley Alliance v. Department of Commerce*, 358 F.3d 1181, 1184 (9th Cir. 2004) (administrative agencies are permitted to appeal remand orders as "final decisions" for purposes of 28 U.S.C. § 1291).

[2] The years used in the following parts of the regulations would be reconsidered: 50 C.F.R. § 660.140(d)(8)(ii)(B) (eligibility criteria for shoreside processors); 50 C.F.R. § 660.140(d)(8)(iv)(C)(2)(i) (initial allocation of whiting quota shares for shoreside harvesters); 50 C.F.R. § 660.140(d)(8)(iv)(G) (initial allocation of whiting quota shares for shoreside

should be without vacatur. Vacatur of the regulations would be extremely disruptive to the fishery and its participants, and difficult for NMFS to administer, and the costs would far outweigh any benefit to Plaintiffs. Furthermore, vacatur, would negatively impact the goals of the trawl rationalization program, such as individual accountability for catch, which could cause additional incidental catch of overfished species, a result that would be contrary to the goals of the Magnuson-Stevens Act.

DISCUSSION

I. THE APPROPRIATE REMEDY HERE IS TO REMAND THE REGULATION SPECIFIC TO WHITING ALLOCATIONS FOR FURTHER CONSIDERATION CONSISTENT WITH THE COURT'S DECISION.

Because this case was brought pursuant to the judicial review provision of the Magnuson-Stevens Act, 16 U.S.C. § 1855(f), which adopts the standard of review set forth in the APA, 5 U.S.C. § 706, the legally appropriate remedy is governed by administrative law principles. It is well-established that, in APA cases, the reviewing court "'is not generally empowered to conduct a de novo inquiry into the matter being reviewed and to reach its own conclusions based on such an inquiry.'" *INS v. Ventura*, 537 U.S. 12, 16 (2002) (quoting *Florida Power & Light Co. v. Lorion*, 470 U.S. 729, 744 (1985)). "Rather, 'the proper course, except in rare circumstances, is to remand to the agency for additional investigation or explanation.'" *Ventura* at 16. (quoting *Florida Power*, 470 U.S. at 744).

An administrative agency ordered to reconsider a prior decision retains the discretion to determine how it "may best proceed to develop the needed evidence and how its prior decision should be modified in light of such evidence as [it] develops." *Federal Power Comm'n v. Transcon. Gas Pipe Line Corp.*, 423 U.S. 326, 333-34 (1976). As the Supreme Court noted in *Federal Power Comm'n*, in the absence of substantial justification for doing otherwise, a

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processors); 50 C.F.R. § 660.140(d)(8)(v)(A)(2) (prequalified application for shoreside processors); 50 C.F.R. § 660.150(f)(6)(ii) (qualifying criteria for mothership permit); 50 C.F.R. § 660.150(g)(1)(i) (catch history assignments for mothership catcher vessel ("MS/CV") endorsed permits); 50 C.F.R. § 660.150(g)(6)(ii) (qualifying criteria for MS/CV endorsement); 50 C.F.R. § 660.150(g)(6)(iii)(B) (qualifying criteria for catch history assignment); and any other regulations identified through the rulemaking process.

reviewing court may not dictate to the agency "the methods, procedures, and time dimension of the needed inquiry." *Id.* at 333. Nor may a court demand that an agency reach a particular result on remand. *See NLRB v. Food Store Emp. Union*, 417 U.S. 1, 10 (1974) ("[W]hen a reviewing court concludes that an agency invested with broad discretion . . . has apparently abused that discretion . . . remand to the agency for reconsideration, and not enlargement of the agency order, is ordinarily the reviewing court's proper course"); *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947); *National Tank Truck Carriers v. EPA*, 907 F.2d 177, 185 (D.C. Cir. 1990) (citations omitted) ("We will not, indeed we cannot, dictate to the agency what course it must ultimately take"). Such a procedure "clearly runs the risk of 'propel[ling] the court into the domain which Congress has set aside exclusively for the administrative agency.'" *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, 435 U.S. 519, 544-45 (1978) (quoting *Chenery*, 332 U.S. at 196); *accord Ventura*, 537 U.S. at 16 (noting that a "judicial judgment cannot be made to do service for an administrative judgment" and that a reviewing court may not "intrude upon the domain which Congress has exclusively entrusted to an administrative agency").

The Ninth Circuit has affirmed these principles, concluding that, where a "court determines that the agency's course of inquiry was insufficient or inadequate, it should remand the matter to the agency for further consideration and not compensate for the agency's dereliction by undertaking its own inquiry into the merits." *Asarco v. EPA*, 616 F.2d 1153, 1160 (9th Cir. 1980). The Ninth Circuit also has admonished that "intervention into the process of environmental regulation, a process of great complexity, should be accomplished with as little intrusiveness as feasible." *Western Oil & Gas Ass'n v. EPA*, 633 F.2d 803, 813 (9th Cir. 1980). Thus, in a case where the Ninth Circuit found violations of the National Forest Management Act and the National Environmental Policy Act in connection with the Forest Service's approval of a wildlife habitat improvement project involving a timber sale, the Ninth Circuit, following *Federal Power Comm'n*, 423 U.S. 326, decided to "remand this case to the Forest Service for further proceedings consistent with this opinion." *Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 965-66 (9th Cir. 2005). Analogously, in a case where an immigration judge failed to make a required finding as to whether or not an applicant for political asylum had demonstrated past persecution on account of a protected ground, the Ninth Circuit "remand[ed] to the agency for a determination of the merits of the persecution question" and explained that it would not itself make the missing finding because "[t]he law entrusts the agency to make this asylum eligibility decision." *Phonekeo v. Gonzales*, 238 Fed. Appx. 235, 237 (9th Cir. 2007).

In this case, having ruled that NMFS' "failure to consider fishing history beyond 2003 for harvesters and 2004 for processors was arbitrary and capricious" within the meaning of the APA, the Court should remand this case to NMFS for further consideration consistent with the Court's opinion. The Court should decline what Federal Defendants anticipate will be Plaintiffs' invitation to order NMFS to engage in a specific process with a specific completion date, as doing so would improperly dictate what course the agency must take, *National Tank Truck Carriers*, 907 F.2d at 185, and run the risk of "intrud[ing] upon the domain which Congress has exclusively entrusted to an administrative agency," *Ventura*, 537 U.S. at 16, by stripping the federal agency of its statutory authority and discretion to determine how best to carry out its responsibilities under the Magnuson-Stevens Act.

North Carolina Fisheries Ass'n, Inc. v. Gutierrez, 550 F.3d 16 (D.C. Cir. 2008) is instructive here. In *North Carolina Fisheries*, the district court had found that regulations promulgated by NMFS to end overfishing of certain species were unlawful because they failed to include rebuilding plans as required by the Magnuson-Stevens Act. As a remedy, the district court ordered that the challenged regulations be left in place while the matter was remanded to NMFS for the preparation of rebuilding plans by a date certain, which the court found would "address[] the chief legal infirmity that this Court identified in its Memorandum Opinion [i.e., the lack of rebuilding plans] and [would do] so promptly and in a manner that is consistent with the agency's own guidelines for developing an adequate rebuilding plan." *North Carolina Fisheries Ass'n, Inc. v. Gutierrez*, 518 F. Supp. 2d 105, 107 (D.D.C. 2007). On appeal, the D.C. Circuit found that the district court's remedy was too detailed, noting that a "simple remand for proceedings consistent with the court's opinion would have been preferable." *North Carolina Fisheries Ass'n*, 550 F.3d at 20. The D.C. Circuit explained that:

> [T]he district court, sitting as a court in review of agency action under the [Magnuson-Stevens] Act and APA, should have done what a court of appeals normally does when it identifies an agency error: remand to the agency for further proceedings. As we have said, "[u]nder settled principles of administrative law, when a court reviewing agency action determines that an agency made an error of law, the court's inquiry is at an end: the case must be remanded to the agency for further action consistent with the corrected legal standards" . . . . Only in extraordinary circumstances do we issue detailed remedial orders, and this maxim applies equally to district courts acting in an agency review capacity.

Id. (citations omitted).

The Ninth Circuit's opinion in *Midwater Trawlers Coop. v. Dep't of Commerce*, 282 F.3d 710, 720-21 (9th Cir. 2002) also is instructive. In that case, the plaintiffs challenged a regulation issued by NMFS under the Magnuson-Stevens Act that allocated whiting to certain Indian tribes based on tribal treaty rights. The Court concluded that "the specific allocation in 1999 to the Makah Tribe was inconsistent with the scientific principles set forth in the Magnuson-Stevens Act." 282 F.3d at 718. Instead of being based on the "best scientific information available," the allocation was "the product of pure political compromise. *Id.* at 720. As a remedy, the Court remanded to NMFS "to either promulgate a new allocation consistent with the law and based on the best available science, or to provide further justification for the current allocation that conforms to the requirements of the Magnuson-Stevens Act and the Treaty of Neah Bay." *Id.* at 721.

The authorities discussed above instruct that, in this case, having found that NMFS acted in a manner that was "arbitrary and capricious" within the meaning of the APA by failing to consider fishing history beyond 2003 for harvesters and 2004 for processors (Order at 12), the only appropriate remedy is for the Court to remand the specific regulations at issue to NMFS for further consideration consistent with the Court's decision. The Court should not dictate what course the agency must take on remand, nor, as explained below, should it vacate the regulation.

II. EVEN IF THE COURT IS INCLINED TO ISSUE A SPECIFIC REMEDY ORDER, IT SHOULD SIMPLY SET A DATE FOR COMPLETION OF REMAND.

Although the above authorities reflect that a specific remand order should not be issued, if the Court disagrees it should at most set a date for completion of remand that NMFS believes is achievable and would comply with all legal requirements. NMFS believes remand would require a reconsideration of the specific years used to determine the harvest and processing history for initial allocations of quota shares of whiting in the shore-based IFQ program, and the specific years used to determine the qualifying criteria and the harvesting history for initial allocation of whiting catch history assignments in the mothership coop program. Under the process NMFS would most likely follow, the soonest NMFS could complete remand is by the start of the whiting season, April 2013.[3]

As explained in the attached declaration, the Pacific Fishery Management Council ("Council") must reconsider the relevant time periods first, and then, if the Council recommends any regulatory changes to NMFS, NMFS would have to engage in a notice-and-comment rulemaking process to implement those changes. Declaration of Frank D. Lockhart ("Lockhart Decl.") (attached hereto as Exhibit 1) ¶¶ 5, 6, 10. The Council would need to reconsider the time periods during at least two council meetings. *Id.* ¶ 8; Pacific Coast Groundfish Fishery Management Plan § 6.2.D (attached hereto as Exhibit 2). Due to the anticipated timing of the Court's remedy order, the earliest the Council could take up this issue is its April 1-6, 2012 meeting. Lockhart Decl. ¶¶ 5, 7, 8. If the Council is able to identify a preliminary preferred alternative at the April 2012 meeting and take action on a final preferred alternative at its June 2012 meeting, NMFS anticipates it could complete any rulemaking process by December 2012. *Id.* ¶¶ 5-10. Assuming a December 2012 final rule, NMFS could complete the application and issuance process for any new initial allocations in time for the start of whiting season on April 1, 2013. *Id.* ¶ 11.

Any shorter time period for completion of remand would not be feasible. The whiting fishing season begins as early as April 1 each year. 50 C.F.R. § 660.131(b)(2)(iii); 50 C.F.R. § 660.150(c)(2)(i)(A). It would not be possible for NMFS to reconsider the time periods for the initial allocations of quota share and catch history assignments prior to the start of the 2012

[3] This date is contingent on each of a number of events occurring within specific time-frames, some of which are out of NMFS' control. Therefore, if the Court determines to order that remand be completed by a date certain, NMFS requests that the Court also indicate that it will grant reasonable extensions of any such deadline.

season in a manner that would comply with all legal and public involvement requirements.[4] Lockhart Decl. ¶ 5-8, 10-12. Furthermore, once NMFS completes the issuance of whiting quota pounds for the 2012 season, and participants in the shorebased IFQ fishery begin fishing for whiting and transferring quota pounds, it is virtually impossible for NMFS to take those quota pounds back in response to any adjusted quota share amounts. *See* 50 C.F.R. § 660.140(d)(1)(ii)(B)(2); Lockhart Decl. ¶ 12. Therefore, in addition to not being feasible, there would be little point to requiring completion of remand mid-season, *i.e.*, after the April 2012 start date. Completion of reconsideration in time for the 2013 fishing season is the earliest date that is both feasible and would allow NMFS to meet all requirements under the law.

III. REMAND SHOULD BE WITHOUT VACATUR.

While the regulations are on remand to NMFS for further consideration, the regulations should remain in place, and not be "set aside" (Pls' SJ Reply Br. (ECF No. 41) at 9). The factors controlling the decision whether to vacate regulations during the remand are: 1) the purpose of the substantive statute under which the agency was acting; 2) the consequences of invalidating the agency action; 3) potential prejudice to those who will be affected by maintaining the status quo; 4) the magnitude of the administrative error and how extensive or substantive it was. *See Natural Res. Def. Council v. U.S. Dep't of Interior*, 275 F. Supp. 2d 1136, 1144 (C.D. Cal. 2002); *accord National Ass'n of Home Builders v. Norton*, Civ. No. 00-0903-PHX-SRB, 2004 WL 3740765, at *3 (D. Ariz. June 28, 2004) (enunciating five factors, including "the possibility that the agency will be able to substantiate its rule and do so without altering the substance of the rule").[5] A review of these factors demonstrates that all favor leaving the regulations in place.

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[4] The only way for NMFS to make changes to the initial allocations by the start of the 2012 whiting season would be to use its authority to promulgate emergency regulations or interim measures. *See* 16 U.S.C. § 1855(c)(1). For the reasons provided above, and because the use of this authority is discretionary, the Court should not dictate that NMFS must use its emergency authority. Moreover, use of this authority may not be appropriate and, even if appropriate, NMFS may not be able to feasibly put new allocations in place prior to April 1, 2012. *See* 62 Fed. Reg. 44,421 (Aug. 21, 1997) (policy guidelines for the use of emergency rules).

[5] The D.C. Circuit similarly considers: (1) the "seriousness of the order's deficiencies (and thus the extent of doubt whether the agency chose correctly)" and (2) the "disruptive consequences of

The Ninth Circuit and the D.C. Circuit have allowed agency actions to remain in place pending completion of a remand, even where those actions have been found to be "arbitrary and capricious." *See, e.g., Pacific Bell v. Pac West Telecomm.*, 325 F.3d 1114, 1123 (9th Cir. 2003); *United Mine Workers v. Fed. Mine Safety & Health Admin.*, 920 F.2d 960, 966-67 (D.C. Cir. 1990) (remanding agency order without vacatur). Courts repeatedly have applied this rule to avoid the vacatur of an agency action where such vacatur would cause serious disruption of an affected industry. *See, e.g. Chamber of Commerce of the United States v. SEC*, 443 F.3d 890, 908-09 (D.C. Cir. 2006); *Northeast Md. Waste Disposal Auth. v. EPA*, 358 F.3d 936, 949-50 (D.C. Cir. 2004). Courts have also allowed agency actions taken under the Magnuson-Stevens Act to remain in place during remand. *See North Carolina Fisheries Ass'n*, 518 F. Supp. 2d at 103-104; *Oceana v. Locke*, --- F. Supp. 2d ----, Civ. No. 10-744 (JEB), 2011 WL 6357795, at *35 (D.D.C. Dec. 20, 2011).

North Carolina Fisheries Ass'n, 518 F. Supp. 2d at 103-05, is instructive. There, the court found the challenged Magnuson-Stevens Act regulations invalid but left them in place pending remand. The court found that "[v]acating or otherwise enjoining the operation of the affected regulations would be highly disruptive, difficult to administer, and would be contrary to the MSA's goal of expeditiously ending overfishing." *Id.* at 104. Because the plaintiffs there succeeded only in challenging one portion of a larger regulatory amendment, the court further noted that "[i]t is not clear which of the regulations (or the subparts thereof) the Court would have to vacate even were it to grant plaintiffs the broadest relief that they seek." *Id.*

The same factors that motivated the *North Carolina Fisheries Ass'n* court to leave the regulations challenged in that case in place pending remand also are present in this case. First, Plaintiffs challenged only a portion of a larger regulatory amendment, and succeeded only in

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an interim change that may itself be changed." *Milk Train v. Veneman*, 310 F.3d 747, 755-56 (D.C. Cir. 2002) (citations omitted). As a district court in the Ninth Circuit recently noted, it is reasonable to look to the Court of Appeals for the District of Columbia Circuit for guidance with respect to formulating remedies in administrative law cases because the D.C. Circuit "hears many federal agency matters [and] has provided helpful guidance." *Grand Canyon Trust v. U.S. Bureau of Reclamation*, Civ. No. 07-8164, 2009 WL 1458784, at *23 (D. Ariz. May 26, 2009).

part. While it may be clearer in this case which specific portions of the regulations the Court would have to vacate, it is not entirely clear how the remaining regulations would function with these limited portions excised.

Second, vacating the specific parts of the regulations at issue in this case would be extremely disruptive to the Fishery and its participants, and difficult for Federal Defendants to administer. Vacatur likely would result in two major disruptions to the regulatory regime – one interim change reverting to the prior management system (but only for the shorebased whiting and mothership coop programs) while the Council and NMFS reconsider the years used in determining initial allocations for whiting quota shares and catch history assignments, and another implementing potentially modified regulations. Reverting to the prior management system would require participants in the shorebased IFQ and mothership coop programs to fundamentally change their business practices, and would negatively affect existing business plans and capital investments that have been developed based on the existing regulations. Lockhart Decl. ¶ 13-15.

Third, the costs of this cumbersome approach far outweigh any possible benefits to Plaintiffs. Plaintiffs apparently want a trawl rationalization program that provides them with quota shares and catch history assignments, they just disagree that those quota shares and catch history assignments should be based on history ending in 2003 or 2004. *See, e.g.*, Declaration of James Schones (ECF No. 35) ¶ 4 (stating that his company's initial allocation of IFQ in the Pacific whiting fishery should be increased); Declaration of Joseph Ham (ECF No. 32) ¶ 4 (stating that he should have received an initial allocation "that reflected our investment and recent, as well as historic, participation in the fishery."). This is not surprising, since under the prior management regime, there were no individual shares of the total catch of whiting. Lockhart Decl. ¶ 14. Rather, all those owning permits in the limited entry trawl fishery were competing with each other to harvest an amount of whiting allocated to the entire trawl sector. *Id.* No individual permit owner was guaranteed any particular amount. To the extent any modifications to the existing regulations may be deemed necessary, they could be developed while leaving the current regulations in place, thereby providing stability and certainty to both

Plaintiffs and the rest of the participants in the fishery. *Id.* If the regulations were vacated, those regulated by the current trawl rationalization program would have to contend with a confused, conflicting, and constantly changing management regime. In addition, Plaintiffs' requested remedy would be burdensome to Federal Defendants, who would have to develop and promulgate interim measures that comply with Magnuson-Stevens Act and other legal requirements while simultaneously reconsidering the initial allocations to the shorebased whiting and mothership coop programs. NMFS is prepared to complete remand by no later than the 2013 fishing season, which is a very expedited schedule. Any asserted hardships to Plaintiffs from leaving the regulations in place would be minor in comparison to the hardships to the rest of the participants in the fishery and the agency if the regulations were set aside. Lockhart Decl. ¶ 13-15.

Fourth, enjoining the whiting portion of the trawl rationalization program would likely undermine the Magnuson-Stevens Act's goals of rebuilding overfished stocks, as well as achieving optimum yield and efficiency in the utilization of fishery resources. *See* 16 U.S.C. § 1851(a)(1), (5), (8); Lockhart Decl. ¶ 13. In addition to the program's efficiency purposes, one of the chief conservation benefits of the program is reducing incidental catch of overfished groundfish stocks. *See* B22:iv; B22:237. Preliminary information indicates that the program has improved the performance of the shorebased whiting fishery by providing individuals the incentive to carefully target species while avoiding overfished stocks. Lockhart Decl. ¶ 13. Accordingly, vacating the regulations would "defeat, not further" Congressional intent. *See North Carolina Fisheries Ass'n*, 518 F. Supp. 2d at 103 (citation omitted). *See also* Lockhart Decl. ¶¶ 13, 15 (explaining the benefits of the current program and the difficulties under the prior management regime).

CONCLUSION

For all the foregoing reasons, Federal Defendants respectfully request that the Court remand to NMFS for further consideration consistent with the Court's opinion the portions of the regulations containing the specific years used to determine the harvest and processing history for initial allocations of quota shares of whiting in the shorebased IFQ program, and the specific years used to determine the qualifying criteria and harvesting history for initial allocation of whiting catch history assignments in the mothership coop program. If the Court determines to issue a more detailed remedy order, Federal Defendants respectfully request that the Court order NMFS to complete remand by no later than April 1, 2013. Under either scenario, the Court should leave the current regulations in place pending completion of remand.

Dated: January 30, 2012

Respectfully submitted,

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IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

San Francisco Division

PACIFIC DAWN, L.L.C., *et al.*, Plaintiffs, vs. JOHN BRYSON, *et al.*, Defendants.	)	3:10-cv-04829-TEH DECLARATION OF FRANK D. LOCKHART IN SUPPORT OF FEDERAL DEFENDANTS' SUPPLEMENTAL BRIEF ON THE APPROPRIATE REMEDY

I, Frank D. Lockhart, declare as follows:

1. I am the Assistant Regional Administrator (ARA) for Sustainable Fisheries for the Northwest Region within the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. I have served in that capacity since September 18, 2005. The Pacific Coast Groundfish Fishery Management Plan (FMP) is within my area of responsibility.

2. This declaration is based on matters within my personal knowledge or information available to me in my official capacity.

3. As ARA for Sustainable Fisheries, I provide recommendations to the Regional Administrator. The Regional Administrator has been delegated the authority (with the concurrence of NOAA's Assistant Administrator for Fisheries) to approve and implement FMPs and FMP amendments developed by the Pacific Fishery Management Council (Council) pursuant to the Magnuson-Stevens Act. As designee of the Regional Administrator for groundfish management, I 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 FMPs, FMP amendments, and regulations to

NMFS for approval and implementation. Both Council staff and agency staff, particularly the Division that I oversee, are responsible for drafting documents such as FMP amendments, and regulations that implement those amendments; documents required by the National Environmental Policy Act (NEPA); and documents required by other applicable federal statutes such as the Regulatory Flexibility Act and the Paperwork Reduction Act. The agency also compiles data for use by the Council and NMFS, provides guidance on regulatory requirements, and reviews and comments on the Council's proposals.

4. NMFS believes the most appropriate course is for the Court to remand the particular regulations at issue for further consideration consistent with its opinion.

5. To the extent the Court may decide to issue a more specific remand order, NMFS believes remand will require a reconsideration of the specific years used to determine the harvesting and processing history for initial allocation of quota shares of whiting in the Pacific shorebased Individual Fishing Quota (IFQ) program, and the specific years used to determine the harvesting history for initial allocation of whiting catch history assignments in the mothership coop program. Reconsideration of the specific years used for these programs will require that NMFS work through the complex public process established for fishery management in the Magnuson-Stevens Act. NMFS intends to complete this process as quickly as possible. However, as described below, reconsideration of the time periods used in making initial allocations of whiting quota shares and catch history assignments, and implementation of revised initial allocations, if any, can be accomplished no earlier than April 1, 2013, which is the start of the first primary whiting season for the shorebased whiting fishery for that year and prior to the start of mothership coop season on May 15, 2013. Meeting this deadline would require expedited analysis and action by the Council and by the agency, and would require modifying the current Council agendas for 2012 meetings. It would also require reprioritizing Council and agency activities for 2012 and 2013.

6. To be consistent with the Magnuson-Stevens Act and other applicable law, reconsideration of the time periods used in making initial allocations of whiting quota shares to harvesters and processors in the shorebased IFQ sector, and in determining catch history

assignments of whiting in the mothership coop program, requires actions by the both the Council and by NMFS. The first steps would be taken by the Council. Council action would be followed by agency consideration and notice and comment rulemaking; typically, the combined Council/agency process takes a minimum of two full years.

7. The Council has five meetings per year. In 2012, the Council is scheduled to meet March 2-7, 2012; April 1-6, 2012; June 21-26, 2012; September 13-18, 2012; and November 2-7, 2012. As described on the Council's website at http://www.pcouncil.org/council-operations/briefing-books/#deadlines, two and one half weeks prior to every Council meeting, documents relevant to the issues to be discussed at the Council meeting are posted on the Council website; this enables the Council members, the advisory bodies, and the public to prepare for the numerous issues addressed at each Council meeting. Absent an emergency, the Magnuson-Stevens Act also requires timely public notice of the meeting agenda, with no additional matters being added within 14 days prior to the meeting. 16 U.S.C. § 1852(i)(2)(C).

8. Consistent with the provisions of the groundfish FMP, the Council would need to reconsider the time periods during at least two council meetings. NMFS would request that the Council add this reconsideration to its April and June 2012 agendas. Prior to the April meeting, NMFS staff, in consultation with Council staff, would develop and submit alternatives for consideration, and analysis of impacts of those alternatives. At the April meeting, based on the analytical documents, public comments, and recommendations from the various groundfish advisory bodies, the Council would identify its preliminary preferred alternative. At the June Council meeting, the Council, again based on additional public comment and the advice of the advisory bodies, would select its final preferred alternative for recommendation to NMFS. In order for NMFS to complete any necessary action prior to April 1, 2013, the Council would need to take final action at its June 2012 Council meeting. Following the June Council meeting, Council staff would work with NMFS staff to ensure that the analytical documents are sufficient for agency review, and to develop any proposed regulations consistent with the requirements of the Magnuson-Stevens Act at 16 U.S.C. § 1853(c).

9. NMFS, in coordination with the Council, would also need to determine if any other provisions of the trawl rationalization program would need to be delayed, pending resolution of the reconsideration process. There may be a need to delay the regulatory authority to sever mothership whiting catch history assignments from the corresponding limited entry permit, currently scheduled to start September 1, 2012. In addition there may be a need to delay allowing the transfer of whiting quota shares in the shorebased IFQ fishery, which is currently scheduled to begin on January 1, 2013. Any delays deemed necessary during the remand process could result in additional rulemakings and additional Council processes. Furthermore, there may be other actions necessary that NMFS has not identified at this time.

10. Subsequent to the Council recommending any proposed regulatory changes to NMFS, the Magnuson-Stevens Act and the Administrative Procedure Act require the agency to carry out notice and comment rulemaking, which takes a minimum of six months for a proposed rule with a public comment period, generally of 30 to 45 days, and a final rule with a 30-day delay in effective date. The time necessary to complete notice and comment rulemaking includes the time needed to comply with the Paperwork Reduction Act (PRA), Executive Order 12866, any remaining NEPA requirements, other applicable law, and the internal agency review processes. If the Council recommends and NMFS approves a change in the time period resulting in recalculating and reissuing initial whiting allocations, the agency would have to get approval from the Office of Management and Budget (OMB) for the new, one-time application and administrative appeals process necessary to implement the new regulations. Final approval by OMB of the paperwork requirements of any new application forms must be completed before the final rule could become effective. In addition, under Executive Order 12866, OMB review and clearance may slow publication of the final rule. As a result, the rulemaking process may take longer than 6 months. Assuming the Council makes a final recommendation to NMFS at its June 2012 meeting, and assuming that the rulemaking process can be completed in 6 months, then the agency could publish a final rule in December 2012 and start the application, issuance, and appeals process for any revised whiting quota share allocations and/or catch history assignments.

11. If a final rule to revise initial whiting allocations is published in December 2012, the application and issuance process would start at that time. Mirroring the process that NMFS followed when the trawl rationalization program was initiated in 2010, steps would include developing the database with historic landings information for the three affected groups in the whiting fishery (shoreside harvesters, shoreside processors, and mothership catcher vessels); providing the fishers the opportunity to correct their data; developing any necessary computer programming and calculating the allocations; providing fishers with their allocations, including workbooks that detail the calculations; providing the fishers an opportunity to correct the calculations; and providing for appeals of the agency's determinations of initial allocations. During the process in 2010, fishers fished based on the initial allocations; appeals were concluded during the 2011 fishing year and the 2012 allocations were to have been modified accordingly at the start of the fishing year. NMFS would likely follow a similar procedure for this potential rulemaking.

12. Even if it were possible for the Council and NMFS to develop revised initial allocations of whiting at some point later in 2012, but prior to April 1, 2013, there are additional impediments to changing quota share amounts mid-season. The problems arise due to the interplay between quota shares and the corresponding quota pounds. Each owner of a whiting quota share permit receives two distributions of whiting quota pounds. The first limited distribution of 2012 whiting quota pounds occurred on December 29, 2011, based on the lower range of potential whiting harvest amounts. The final whiting harvest amount is known by March 25. Once the final harvest amount is known, another distribution of whiting quota pounds occurs so that the total quota pounds issued for that year is equal to the permit owner's whiting quota share multiplied by that year's whiting shorebased trawl allocation. As described above, the process for reconsideration could not be completed by the April 1, 2012 start date of the first shorebased whiting primary season. Accordingly, in order for the fishery to proceed, NMFS will need to distribute quota pounds for 2012 based on the existing quota share amounts. Once the quota pounds are distributed to quota share accounts, the quota pounds can be sold, transferred, or leased to other participants in the shorebased IFQ fishery. Any change in initial quota share

amounts that occurs during 2012 after the primary shorebased whiting fishery begins could be virtually impossible to implement. For example, if a permit owner's whiting quota share were reduced mid-season, the permit owner's corresponding whiting quota pounds would need to be reduced. However, if the quota share permit owner has already transferred quota pounds based on private business agreements, NMFS lacks the ability to determine who currently owns the quota pounds attributable to different quota share accounts, and also lacks the ability to determine if quota pounds already fished are attributable to a specific quota share account. Simply put, once quota pounds are issued and quota pound trading or fishing occurs, taking back quota pounds to adjust for changes in quota share amounts is impracticable mid-season.

13. NMFS believes it is important to keep the current regulations in place during the agency's reconsideration. The main purpose of Amendment 20 was to create a rationalization program for the trawl sector that increases net economic benefits, provides economic stability, makes full use of the harvest allocated to the trawl sector, considers environmental impacts, and makes individuals accountable for their catch, including bycatch. Based on preliminary information, having individual accountability for all catch appears to have resulted in improvements in the performance of the shorebased fishery. The trawl rationalization program has provided individuals the incentive to carefully target the species they want to target while avoiding overfished species and minimizing discards. Vacating the initial whiting allocations would undermine or reverse these goals for the affected sectors.

14. Vacating the regulations at issue would result in no individual quotas or catch history assignments of whiting. NMFS would have to issue new regulations that would clarify that for whiting, each sector would be governed by an overall harvest amount. Management of the shorebased and at-sea whiting fisheries would be dramatically altered from the status quo. No shorebased processors would receive individual whiting quota, which would result in lost revenue and less flexibility to adapt to the changes in the groundfish fishery expected under the trawl rationalization program. Whiting processors may also have the revisit any contracts that they have entered into with fishers, while vessels involved with the coop may have to revisit decisions on whether to remain in Alaska to fish Pollock or come down to fish Pacific whiting.

In addition, fishing strategies, business plans, capital investments, and other aspects of the whiting fishery that are currently being implemented based on the expectation that whiting will be managed with IFQs and coop programs, would all be affected if the existing regulations were vacated.

15. Under the prior management regime in which the "race for fish" was prevalent, NMFS was generally able to prevent overfishing of whiting and other bycatch species, but not without a high cost to NMFS and the fleet. For NMFS, preventing overfishing required two staff members to constantly monitor the fleet to track its highly variable behavior. Based on this monitoring, projections were made on catch rates. These projections were very difficult and often resulted in closing the fishery too early, resulting in millions of dollars of lost revenue to struggling coastal communities, or too late, with potential conservation costs to the affected stocks. Ultimately, leaving the existing regulations in place pending reconsideration is the only way to proceed without significant disruption to the fleet and potential adverse impacts to the resource.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

Signed January 30, 2012, at Seattle, Washington.

Frank D. Lockhart

EXHIBIT 2

PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN

FOR THE CALIFORNIA, OREGON, AND WASHINGTON GROUNDFISH FISHERY

AS AMENDED THROUGH AMENDMENT 23 INCLUDING SECRETARIAL AMENDMENT 1

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Changes to the FMP since Amendment 4 (July 1993)

Current Chapters	Previous Chapters (July 1993 Version)	Summary of Amendment Changes
Chapter 1 Introduction	Chapter 1 Introduction	Updated by Amendment 18
Chapter 2 Goals and Objectives	Chapter 2 Goals and Objectives	Amendments and additions, no substantial change in organization. (Amendments 12, 13, 16-1, 17, and 18.)
Chapter 3 Areas and Stocks Involved	Chapter 3 Areas and Stocks Involved	Amendments and additions, no substantial change in organization. (Amendment 16-1.)
Chapter 4 Optimum Yield	Chapter 4 Optimum Yield	Substantially changed and expanded by Amendment 16-1, which moved and revised material on determining OFL, OY, precautionary thresholds, and rebuilding overfished species that was in Chapter 5 into this chapter. Amendments 16-2 and 16-3 add rebuilding plan summaries to section 4.5.4. Amendment 16-4 revises rebuilding plans in section 4.5.4. Substantially changed and expanded by Amendment 23, which provided material on specifying OFLs, redefined ABCs, ACLs, and ACTs.
Chapter 5 Specification and Apportionment of Harvest Levels	Chapter 5 Specification and Apportionment of Harvest Levels	Substantially changed by Amendment 16-1, which moved material to Chapter 4, as noted above. Discussion of DAH, DAP, JVP, and TALFF deleted. (Also Amendments 12, 13, 17, and 18.) Substantially changed by Amendment 23, which incorporated new National Standard 1 guidelines and mandates of the 2006 reauthorization of the Magnuson-Stevens Act.
Chapter 6 Management Measures	Chapter 6 Management Measures	Substantially reorganized and changed by Amendment 18 and 19. (Also Amendments 10, 11, 13, 16-1, 17, 20, 21, 23.)
	Chapter 7 Experimental Fisheries	Renumbered Chapter 8
	Chapter 8 Scientific Research	Renumbered Chapter 9
Chapter 7 Essential Fish Habitat		New Chapter created by Amendment 19 from substantially revised material previously in Chapter 6.
Chapter 8 Experimental Fisheries		Renumbered and revised by Amendment 18.

Current Chapters	Previous Chapters (July 1993 Version)	Summary of Amendment Changes
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 by Amendment 18.
	Chapter 11 Appendices	Published under separate cover.
	Chapter 12 Management Measures that Continue in Effect with Implementation of Amendment 4	Deleted with material incorporated into Chapter 6.
	Chapter 13 References	Moved to an unnumbered section at the end of the document.
Chapter 11 Groundfish Limited Entry	Chapter 14 Groundfish Limited Entry	Renumbered; Amendment 15 modification to section 11.2.12, current section 11.5 inserted as new. Revisions under Amendment 20 including the removal of Amendment 15 text in section 11.2.12. Changed and expanded by Amendment 21.
References		Previously Chapter 13
Guide to Appendices		Previously Chapter 11 contained descriptive information brought forward from the original FMP. This material moved to Appendix A. Three new appendices (B-D) were added by Amendment 19. Appendix E by Amendment 20.

<u>A note on other annotations</u>: Amended parts of the FMP subsequent to Amendment 4, which substantially revised the original FMP, are denoted at the end of chapters or sections by amendment number.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABC	Acceptable biological catch
ACL	Annual catch limit
ACT	Annual catch target
AM(s)	Accountability measure(s)
BCCA	Bottom Contact Closed Area
BTCA	Bottom Trawl Closed Area
CCA	Cowcod Conservation Area
CDFG	California Department of Fish and Game
CPUE	Catch per unit of effort
CRCZ	Columbia River Conservation Zone
CRFS	California Recreational Fisheries Survey
CV	Catcher vessel
DAH	Domestic annual harvest
DAP	Domestic annual processing
EC	Ecosystem component
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMP	Fishery management plan
FMU	Fishery management unit
GAP	Groundfish Advisory Subpanel
GCA	Groundfish Conservation Area
GFA	Groundfish fishing area
GIS	Geographic information system
GMT	Groundfish Management Team
HAPC	Habitat area of particular concern
HAPC	Habitat Area of Particular Concern
HG	Harvest guideline
HSP	Habitat suitability probability
HUD	Habitat Use Database
IFQ	Individual fishing quota
IFQ	Individual fishing quota
INPFC	International North Pacific Fisheries Commission
JV	Joint-venture
JVP	Joint-venture processing
KRCZ	Klamath River Conservation Zone
LE	Limited entry
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MFMT	Maximum fishing mortality threshold
MHHW	Mean higher high water level
MLR	Minimum landing requirement
MMPA	Marine Mammal Protection Act
MPA	Marine protected area

MRFSS	Marine Recreational Fisheries Statistical Survey
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
OFL	Overfishing limit
ORBS	Ocean Recreational Boat Survey (Oregon Department of Fish and Wildlife)
OSP	Washington Department of Fish and Wildlife Ocean Sampling Program
OY	optimum yield
PacFIN	Pacific Fishery Information Network
POP	Pacific ocean perch
PRA	Paperwork Reduction Act
PSMFC	Pacific States Marine Fisheries Commission
RCA	Rockfish Conservation Area
RecFIN	Recreational Fisheries Information Network
SAFE	Stock Assessment and Fishery Evaluation
SDC	Status determination criteria
SEBS	Shore and Estuary Boat Survey (Oregon Department of Fish and Wildlife)
Secretary	U.S. Secretary of Commerce
SFA	Sustainable Fisheries Act
SPR	Spawning biomass per recruit
SSC	Scientific and Statistical Committee
SSC	Scientific and Statistical Committee
STT	Salmon Technical Team
USFWS	U.S. Fish and Wildlife Service
VMS	Vessel monitoring system
YRCA	Yelloweye Rockfish Conservation Area

CHAPTER 1 INTRODUCTION

1.1 History of the FMP

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 more than 100 years, with each state acting independently in both management and enforcement. Furthermore, many fisheries overlapped state boundaries and participants often operated in more than one state. Management and a lack of uniformity of 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. The 1977 Fishery Conservation and Management Act (later amended and renamed the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act) 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, 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. The U.S. later signed bilateral agreements with Japan and Poland 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.

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 20 times in response to changes in the fishery, reauthorizations of the Magnuson-Stevens Act, and litigation that invalidated provisions incorporated by earlier amendments. During the first 10 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 and reorganization of the FMP, it established additional framework procedures for establishing and modifying management measures. Another important change was implemented in 1992 with Amendment 6, which established a license limitation (limited entry) program intended to address overcapitalization 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 (LE) program by establishing a sablefish endorsement for longline and pot permits. Amendments 11, 12, and 13 were responses to changes in the Magnuson-Stevens Act due to the 1996 Sustainable Fisheries Act. 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 of any stocks that had become overfished. Amendment 14, implemented in 2001, built on Amendment 9 to further refine the LE permit system for the economically important fixed gear sablefish fishery. It allowed a vessel owner to "stack" up to three LE 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act. In response, Amendments 16-1, 16-2, and 16-3 established the current regime for managing these overfished species. 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. In 2005, a Court of Appeals ruling refined court interpretation of the Magnuson-Stevens Act rebuilding period requirements. Amendment 16-4, partially approved in 2006, revised the FMP to specify that rebuilding periods will be as short as possible, taking into account the status and biology of the stocks, the needs of fishing communities, and interactions of overfished stocks with the marine ecosystem. As a result of this ruling, Amendment 16-4 also revised the rebuilding periods for darkblotched rockfish, Pacific ocean perch, canary rockfish, bocaccio, cowcod, widow rockfish, and yelloweye rockfish.

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 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 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 (HAPCs), 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.

Amendment 15 was initiated in 1999 in response to provisions in the American Fisheries Act intended to shield west coast fisheries from certain effects of that legislation. Because of competing workload and no threatened imminent harm, the Council tabled action on Amendment 15 in 2001. Work on the amendment was re-initiated in 2007 in response to changes in the Pacific whiting fishery. Its purpose is to address conservation and socioeconomic issues in the shoreside, catcher/processor, and mothership sectors of the Pacific whiting fishery by requiring vessels to qualify for an additional license to participate in a given sector, based on their historical participation. It is an interim measure, which sunsets with trawl rationalization program (Amendment 20) implementation.

Amendment 20 was approved in 2010 and establishes the groundfish trawl rationalization program. Under this program, groundfish LE trawl vessels making shoreside deliveries are managed with individual fishing quotas. Motherships and associated catcher-vessels in the at-sea Pacific whiting sector are managed under a system of regulated cooperatives. Pacific whiting catcher-processors fish within a voluntary cooperative; the amendment establishes provisions to strengthen this cooperative. As noted above, Amendment 20 supersedes provisions in Amendment 15; corresponding text was replaced.

Amendment 21 was approved in 2010 and establishes long-term allocations between the trawl and nontrawl sectors of the groundfish fishery; establishes a short-term allocational split between the shoreside whiting and nonwhiting fishery, necessary for implementation of the individual fishing quota (IFQ) program (established through Amendment 20); establishes darkblotched rockfish, Pacific ocean perch and widow rockfish allocations among the at-sea trawl and shoreside trawl sectors; identifies the need for set-asides for the at-sea trawl sectors (and specifies the initial set-asides implemented for the rationalized fishery); and establishes a Pacific halibut bycatch allowance to be provided to the trawl fishery in the form of individual bycatch quota (established through Amendment 20).

Amendment 23 was initiated in 2009 to incorporate new National Standard 1 guidelines to prevent overfishing. These new National Standard 1 guidelines were developed in response to the Magnuson-Stevens Act re-authorization of 2006 which mandated an end to overfishing.

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 (FMU).

- Chapter 4 describes how the Council determines harvest levels. These harvest limits are related to the maximum sustainable yield (MSY) and overfishing limit (OFL) 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 annual catch limit (ACL), 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. 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 Magnuson-Stevens Act 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 LE 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.
- Appendix E contains a detailed description of the trawl rationalization program (see Section 6.9.3.1).
- Appendix F contains a description of overfished species rebuilding plans.

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 Magnuson-Stevens Act, they may be periodically updated without being subjected to the Secretarial review and approval process described in §304(a) of the Magnuson-Stevens Act. These appendices are published under separate cover.

[Amended: 11, 18, 19, 16-4, 15, 20, 21, 23]

CHAPTER 2 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 Act.

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.

Objective 3. For species or species groups that are overfished, develop a plan to rebuild the stock as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock within the marine ecosystem.

Objective 4. Where conservation problems have been identified for non-groundfish 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 non-groundfish 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 non-groundfish species, and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable law.

Objective 5. Describe and identify 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. Within the constraints of the conservation goals and objectives of the FMP, 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. Recognize 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. 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.

Social Factors.

Objective 12. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

Objective 13. Minimize gear conflicts among resource users.

Objective 14. 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 15. Avoid unnecessary adverse impacts on small entities.

Objective 16. 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 17. Promote the safety of human life at sea.

[Amended; 7, 11, 13, 16-1, 18, 16-4]

2.2 Operational Definition of Terms

Acceptable Biological Catch (ABC) is a harvest specification that accounts for the scientific uncertainty in the estimate of OFL, and any other scientific uncertainty.

Accountability Measures (AMs) are management controls, such as inseason adjustments to fisheries or annual catch targets, to prevent annual catch limits, including sector-specific annual catch limits, from being exceeded, and to correct or mitigate overages of the annual catch limit if they occur. AMs should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible.

Annual Catch Limit (ACL) is a harvest specification set equal to or below the ABC in consideration of conservation objectives, socioeconomic concerns, management uncertainty, ecological concerns, and other factors. The ACL is a harvest limit that includes all sources of fishing-related mortality including landings, discard mortality, research catches, and catches in exempted fishing permit activities. Sector-specific ACLs can be specified, especially in cases where a sector has a formal, long-term allocation of the harvestable surplus of a stock or stock complex. The ACL serves as the basis for invoking AMs.

Annual Catch Target (ACT) is a management target set below the ACL and may be used as an AM in cases where there is uncertainty in inseason catch monitoring to ensure against exceeding an ACL. Since the ACT is a target and not a limit it can be used in lieu of harvest guidelines or strategically to accomplish other management objectives. Sector-specific ACTs can also be specified to accomplish management objectives.

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.

Bottom-contact gear by design, or as modified, and through normal use makes contact with the sea floor.

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.

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.

Double-walled codend is a codend constructed of two walls of webbing.

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 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_{MSY} is the fishing mortality rate that maximizes catch biomass in the long term.

$F_{x\%}$ is the rate of fishing mortality that will reduce female spawning biomass per recruit (SPR) to x percent of its unfished level. $F_{100\%}$ is zero fishing mortality, and a reasonable proxy for F_{MSY} is likely to be in the range of $F_{30\%}$ to $F_{50\%}$.

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 economic 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 non-trawl gear) includes longline, trap or pot, set net, and stationary hook-and-line gear (including commercial vertical hook-and-line) gears.

Gillnet is a single-walled, rectangular net which is set upright in the water.

Harvest guideline (HG) is a specified numerical harvest objective which is not a quota. Attainment of a HG does not require closure of a fishery.

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).

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.

Longline is a stationary, buoyed, and anchored groundline with hooks attached, so as to fish along the seabed.

Maximum fishing mortality threshold (MFMT) is the level of fishing mortality (F), on an annual basis, above which overfishing is occurring. The MFMT or reasonable proxy may be expressed either as a single number (a fishing mortality rate or F value), or as a function of spawning biomass or other measure of reproductive potential.

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.

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 percent of the estimated unfished biomass, although other values based on the best scientific information are also authorized.

Minimum stock size threshold (MSST) is the level of biomass below which the stock or stock complex is considered to be overfished.

Nontrawl gear means all legal commercial gear other than trawl gear.

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 MSY 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 MSY in such fishery.

Overfished describes any stock or stock complex whose size is sufficiently diminished 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 percent of its estimated unfished biomass; however, other scientifically valid values are also authorized.

Overfishing means exceeding an OFL specified in regulations.

Overfishing limit (OFL) is the MSY harvest level or the annual abundance of exploitable biomass of a stock or stock complex multiplied by the maximum fishing mortality threshold or proxy thereof and is an estimate of the catch level above which overfishing is occurring.

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.

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 intended to keep the footrope above the seabed, thereby protecting the net.

Set net is a stationary, buoyed, and anchored gillnet or trammel net.

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 (SPR) 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.

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. 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).

Trammel net is a gillnet made with two or more walls joined to a common float line.

Trap (or pot) is a portable, enclosed device with one or more gates or entrances and one or more lines attached to surface floats.

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.

[Amended: 5, 11, 13, 17, 18, 19, 23]

CHAPTER 3 AREAS AND STOCKS INVOLVED

The management regime of this FMP applies to:

1. The U.S. EEZ of the northeast Pacific ocean that lies between the U.S.-Canada border (as specified in *Federal Register*, Volume 42, Number 44, March 7, 1977, page 12938) and the U.S.-Mexico border (Figure 3-1).

2. All foreign and domestic commercial and recreational vessels which are used to fish for groundfish in the management area.

3. All groundfish stocks which comprise this fishery management unit (see Section 3.1).

Management Areas. Upon consideration of stock distribution and domestic and foreign historical catch statistics, the following statistical areas (Figure 3-1) have been determined by the Pacific Fishery Management Council (Council) to be the most convenient administrative and biological management areas. These areas are based on International North Pacific Fisheries Commission (INPFC) statistical areas, but in some cases have been modified slightly. The areas are, from south to north:

Conception - Southern boundary of EEZ to 36°00' N. latitude
Monterey - 36°00' N. latitude to 40°30' N. latitude
Eureka - 40°30' N. latitude to 43°00' N. latitude
Columbia - 43°00' N. latitude to 47°30' N. latitude
Vancouver - 47°30' N. latitude to northern boundary of the EEZ

These areas may be modified or deleted and additional statistical reporting and management areas may be added, modified, or deleted if necessary to refine information or management of a species or species group. Changes will be implemented in accordance with the procedures in Chapters 5 and 6.

3.1 Species Managed by this Fishery Management Plan

Table 3-1 is the listing of species managed under this FMP.

Table 3-1. Common and scientific names of species included in this FMP.

Common Name	Scientific Name
SHARKS	
Big skate	*Raja binoculata*
California skate	*R. inornata*
Leopard shark	*Triakis semifasciata*

Common Name	Scientific Name
Longnose skate	*R. rhina*
Soupfin shark	*Galeorhinus zyopterus*
Spiny dogfish	*Squalus acanthias*
	RATFISH
Ratfish	*Hydrolagus colliei*
	MORIDS
Finescale codling	*Antimora microlepis*
	GRENADIERS
Pacific rattail	*Coryphaenoides acrolepis*
	ROUNDFISH
Cabezon	*Scorpaenichthys marmoratus*
Kelp greenling	*Hexagrammos decagrammus*
Lingcod	*Ophiodon elongatus*
Pacific cod	*Gadus macrocephalus*
Pacific whiting (hake)	*Merluccius productus*
Sablefish	*Anoplopoma fimbria*
	ROCKFISH[a/]
Aurora rockfish	*Sebastes aurora*
Bank rockfish	*S. rufus*
Black rockfish	*S. melanops*
Black and yellow rockfish	*S. chrysomelas*
Blackgill rockfish	*S. melanostomus*
Blue rockfish	*S. mystinus*
Bocaccio	*S. paucispinis*
Bronzespotted rockfish	*S. gilli*
Brown rockfish	*S. auriculatus*
Calico rockfish	*S. dallii*
California scorpionfish	*Scorpaena gutatta*
Canary rockfish	*Sebastes pinniger*
Chameleon rockfish	*S. phillipsi*
Chilipepper	*S. goodei*
China rockfish	*S. nebulosus*
Copper rockfish	*S. caurinus*
Cowcod	*S. levis*
Darkblotched rockfish	*S. crameri*
Dusky rockfish	*S. ciliatus*
Dwarf-red rockfish	*S. rufinanus*
Flag rockfish	*S. rubrivinctus*
Freckled rockfish	*S lentiginosus*
Gopher rockfish	*S. carnatus*
Grass rockfish	*S. rastrelliger*
Greenblotched rockfish	*S. rosenblatti*
Greenspotted rockfish	*S. chlorostictus*
Greenstriped rockfish	*S. elongatus*
Halfbanded rockfish	*S. semicinctus*
Harlequin rockfish	*S. variegatus*
Honeycomb rockfish	*S. umbrosus*
Kelp rockfish	*S. atrovirens*
Longspine thornyhead	*Sebastolobus altivelis*
Mexican rockfish	*Sebastes macdonaldi*
Olive rockfish	*S. serranoides*
Pink rockfish	*S. eos*
Pinkrose rockfish	*S. simulator*
Pygmy rockfish	*S. wilsoni*
Pacific ocean perch	*S. alutus*
Quillback rockfish	*S. maliger*
Redbanded rockfish	*S. babcocki*
Redstripe rockfish	*S. proriger*
Rosethorn rockfish	*S. helvomaculatus*
Rosy rockfish	*S. rosaceus*

Common Name	Scientific Name
Rougheye rockfish	*S. aleutianus*
Sharpchin rockfish	*S. zacentrus*
Shortbelly rockfish	*S. jordani*
Shortraker rockfish	*S. borealis*
Shortspine thornyhead	*Sebastolobus alascanus*
Silvergray rockfish	*Sebastes brevispinis*
Speckled rockfish	*S. ovalis*
Splitnose rockfish	*S. diploproa*
Squarespot rockfish	*S. hopkinsi*
Starry rockfish	*S. constellatus*
Stripetail rockfish	*S. saxicola*
Swordspine rockfish	*S. ensifer*
Tiger rockfish	*S. nigrocinctus*
Treefish	*S. serriceps*
Vermilion rockfish	*S. miniatus*
Widow rockfish	*S. entomelas*
Yelloweye rockfish	*S. ruberrimus*
Yellowmouth rockfish	*S. reedi*
Yellowtail rockfish	*S. flavidus*
FLATFISH	
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Butter sole	*Isopsetta isolepis*
Curlfin sole	*Pleuronichthys decurrens*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Flathead sole	*Hippoglossoides elassodon*
Pacific sanddab	*Citharichthys sordidus*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*

a/ The category "rockfish" includes all genera and species of the family Scorpaenidae, even if not listed, that occur in the Washington, Oregon, and California area. The Scorpaenidae genera are *Sebastes, Scorpaena, Sebastolobus, and Scorpaenodes.*

[Amended: 11, 16-1]

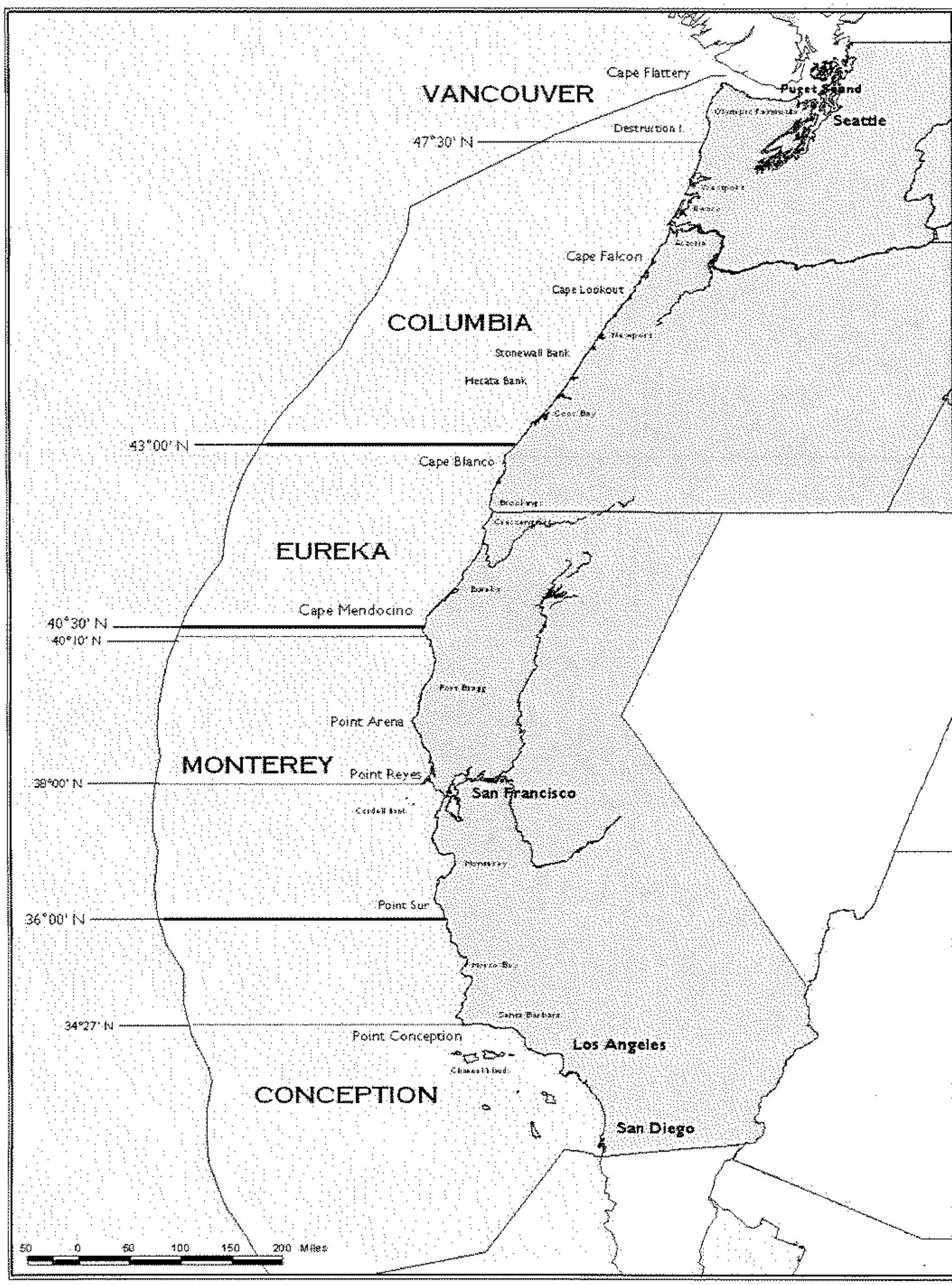

Figure 3-1. International North Pacific Fisheries Commission (INPFC) statistical areas in the U.S. exclusive economic zone seaward of Washington, Oregon, and California.

CHAPTER 4 PREVENTING OVERFISHING AND ACHIEVING OPTIMUM YIELD

4.1 National Standard 1 Guidelines

National Standard 1 requires that "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry" (@ 50 CFR 600.310(a)).

The determination of optimum yield (OY) is a decisional mechanism for resolving the Magnuson-Stevens Act's multiple purposes and policies, implementing an FMP's objectives and balancing the various interests that comprise the national welfare. OY is based on MSY or on MSY as it may be reduced ... [in consideration of social, economic or ecological factors]. The most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing @ (50 CFR Section 600.310(b)).

This chapter addresses the essential considerations suggested for National Standard 1, as identified in the NMFS guidelines on the standard (600.310):

- Estimating MSY, estimated the MSY biomass and setting the MSY control rule (50 CFR 600.310(c); Section 4.3 of this chapter).
- Specifying stock status determination criteria (maximum fishing mortality threshold and minimum stock size threshold, or reasonable proxies thereof) (50 CFR 600.310(d); Section 4.5 of this chapter).
- Actions for ending overfishing and rebuilding overfished stocks (including the development and adoption of rebuilding plans) (50 CFR 600.310(e); Section 4.6 of this chapter).
- Setting OY and apportionment of harvest levels (50 CFR 600.310(f); Section 4.7 of this chapter).

In establishing OYs for west coast groundfish, this FMP uses the interim step of calculating OFLs, acceptable biological catch (ABC), and ACLs for major stocks or management units (groups of species). OFL is the MSY harvest level associated with the current stock abundance. Over the long term, if OFLs are fully harvested, the average of the OFLs would be MSY. ABC is a threshold below the OFL, which accounts for scientific uncertainty in the estimate of OFL. ACL is a harvest specification set at or below ABC and is intended to prevent overfishing.

The ACLs are established to achieve OY in the fishery. The OY for a stock or stock complex is the long-term average of the stock or stock complexes ACLs.

OYs and ACLs are set and apportioned under the procedures outlined in Chapter 5.

[Added: 16-1, Amended 16-4 and 23]

4.2 Species Categories

B_{MSY}, OFL, and the overfished/rebuilding stock size threshold cannot be precisely defined for all species, because of the absence of available information for many species managed under the FMP. For the purpose of setting MSY, OFL, the maximum fishing mortality threshold (MFMT), the minimum stock size threshold (MSST), ABC, OY, ACL and rebuilding standards, three categories of species are identified. The first are the relatively few species for which a relatively data-rich, quantitative stock assessment can be conducted on the basis of catch-at-age, catch-at-length, or other data. OFLs and overfished/rebuilding thresholds can generally be calculated for these species. ABCs can also be calculated for these species based on the uncertainty of the biomass estimated within an assessment or the variance in biomass estimates between assessments for all species in this category. The second category includes a large number of species for which some biological indicators are available, including a relatively data-poor quantitative assessment or a nonquantitative assessment. It is difficult to estimate overfished and overfishing thresholds for the second category of species a priori, but indicators of long-term, potential overfishing can be identified. OFLs and ABCs for species in this category are typically set at a constant level and some monitoring is necessary to determine if this level of catch is causing a slow decline in stock abundance. The third category includes minor species which are caught, but for which there is, at best, only information on landed biomass. For species in this category, there is limited data to quantitatively determine MSY, OFL, or an overfished threshold. Typically, average catches are used to determine the OFL for category 3 species.

A fourth category of species is identified as ecosystem component (EC) species. These species are not "in the fishery" and therefore not actively managed. EC species are not targeted in any fishery and are not generally retained for sale or personal use. EC species are not determined to be subject to overfishing, approaching an overfished condition, or overfished, nor are they likely to become subject to overfishing or overfished in the absence of conservation and management measures. While EC species are not considered to be "in the fishery," the Council should consider measures for the fishery to minimize bycatch and bycatch mortality of EC species consistent with National Standard 9, and to protect their associated role in the ecosystem. EC species do not require specification of reference points but should be monitored to the extent that any new pertinent scientific information becomes available (e.g., catch trends, vulnerability, etc.) to determine changes in their status or their vulnerability to the fishery. If necessary, they should be reclassified as "in the fishery."

[Amended: 16-1, 23]

4.3 Determination of MSY, or MSY Proxy, and B_{MSY}

Harvest policies are to be specified according to standard reference points such as MSY (MSY, interpreted as a maximum average achievable catch under prevailing ecological and environmental conditions over a prolonged period). The long-term average biomass associated with fishing at F_{MSY} is B_{MSY}. In this FMP, MSY generally refers to a constant F control rule that is assumed to produce the maximum average yield over time while protecting the spawning potential of the stock. Thus the constant F control rule is generally the proxy for the MSY control rule. Fishing rates above F_{MSY} eventually result in biomass smaller than B_{MSY} and produce less harvestable fish on a sustainable basis. The biomass level that produces MSY (i.e., B_{MSY}) is generally unknown and assumed to be variable over time due to long-term fluctuations in ocean conditions, so that no single value is appropriate. During periods of unfavorable environmental conditions it is important to account for reduced sustainable yield levels.

The problem with an F_{MSY} control rule is that it is tightly linked to an assumed level of density-dependence in recruitment, and there is insufficient information to determine the level of density-dependence in recruitment for many west coast groundfish stocks. Therefore, the use of approximations or proxies is necessary. Absent a more accurate determination of F_{MSY}, the Council will apply default MSY proxies. The current (2010) proxies are: $F_{30\%}$ for flatfish, $F_{40\%}$ for whiting, $F_{50\%}$ for rockfish (including thornyheads), and $F_{45\%}$ for all species such as sablefish and lingcod. However, values ($F_{30\%}$, $F_{40\%}$, $F_{45\%}$, and $F_{50\%}$) are provided here as examples only and are expected to be modified from time to time as scientific knowledge improves. If available information is sufficient, values of F_{MSY}, B_{MSY}, and more appropriate harvest control rules may be developed for any species or species group.

At this time, it is generally believed that, for many species, $F_{45\%}$ strikes a balance between obtaining a large fraction of the MSY if recruitment is highly insensitive to reductions in spawning biomass and preventing a rapid depletion in stock abundance if recruitment is found to be extremely sensitive to reductions in spawning biomass. The long-term expected yield under an $F_{45\%}$ policy depends upon the (unknown) level of density-dependence in recruitment. The recommended level of harvest will reduce the average lifetime egg production by each female entering the stock to 45 percent of the lifetime egg production for females that are unfished.

Because the level of recruitment is expected to decline somewhat as a stock is fished at $F_{45\%}$, the expected B_{MSY} proxy is less than 45 percent of the unfished biomass. A biomass level of 40 percent is a reasonable proxy for B_{MSY}. The short-term yield under an $F_{45\%}$ policy will vary as the abundance of the exploitable stock varies. This is true for any fishing policy that is based on a constant exploitation rate. The abundance of the stock will vary, because of the effects of fishing, and because of natural variation in recruitment. When stock abundance is high (i.e., near its average unfished level), short-term annual yields can be approximately two to three times greater than the expected long-term average annual yield. For many of the long-lived groundfish species common on the west coast, this "fishing down" transition can take decades. Many of the declines in ABC that occurred during the 1980s were the result of this transition from a lightly exploited, high abundance stock level to a fully exploited, moderately abundant stock level. Further declines below the overfished levels in the 1990s were due in large part to harvest rate policies that were later discovered to not be sustainable. More recent stock assessments indicate that west coast groundfish stocks likely have lower levels of productivity than other similar species worldwide. Based on this retrospective information, harvest rate policies in the 1990s were too high to maintain stocks at B_{MSY}. The Council revised its harvest rate policies for lower levels of production, described below.

Scientific information as of 1997 (Clark 1993; Ianelli and Heifetz 1995; Mace 1994) indicated that $F_{35\%}$ may not be the best approximation of F_{MSY}, given more realistic information about recruitment than was initially used by Clark in 1991. In his 1993 publication Clark extended his 1991 results by improving the realism of his simulations and analysis. In particular he (1) modeled stochasticity into the recruitment process, (2) introduced serial correlation into recruitment time series, and (3) performed separate analyses for the Ricker and Beverton-Holt spawner-recruit functions. For rockfish, these changes improved the realism of his SPR harvest policy calculations, because these species are known to have stochastic recruitment and they appear to display serial correlation in recruitments (especially on interdecadal time scales), and because the Beverton-Holt spawner-recruit curve may be biologically the most plausible recruitment model. The effect of each of these changes, in isolation and in aggregate, was to decrease the estimate of F_{MSY}. Consequently, the estimated spawning biomass per recruit (SPR) reduction needed to provide an optimal F_{MSY} proxy (defined as that level of fishing which produces the largest assured proportion of MSY), must necessarily be increased. Clark concluded that $F_{40\%}$ is the optimal rate for fish stocks exhibiting recruitment variability similar to Alaska groundfish stocks. Likewise, Mace (Mace 1994) recommended the use of $F_{40\%}$ as the target mortality rate when the stock-recruitment relationship is unknown. Lastly, Ianelli and Heifitz (Ianelli and Heifetz 1995) determined that $F_{44\%}$ was a good F_{MSY} proxy for Gulf of Alaska Pacific ocean perch, although they subsequently indicated that a recent recruitment to that stock was larger than expected and that $F_{44\%}$ may be too conservative in that case.

Based on this information and advice by its GMT, in 1997 the Council concluded that $F_{40\%}$ should be used as the proxy for F_{MSY} for rockfish in the absence of specific knowledge of recruitment or life history characteristics which would allow a more accurate determination of F_{MSY}. This proxy was later revised based on further Scientific and Statistical Committee (SSC) investigation into the appropriate F_{MSY} proxies in 2000.

In the spring of 2000, the Council's SSC sponsored a workshop to review the Council's groundfish exploitation rate policy. The workshop explored the historic use of different fishing mortality (F) rates and found that the Council's past practices have generally changed in response to new information from the scientific community. Starting in the early 1990s, the Council used a standard harvest rate of $F_{35\%}$. The SSC's workshop participants reported that new scientific studies in 1998 and 1999 had shown that the $F_{35\%}$ and $F_{40\%}$ rates used by the Council had been too aggressive for some Pacific Coast groundfish stocks, such that some groundfish stocks could not maintain a viable population over time. A 1999 study, The Meta-Analysis of the Maximum Reproductive Rate for Fish Populations to Estimate Harvest Policy; a Review (Myers, *et al.* 2000) showed that some Pacific Coast groundfish stocks, particularly rockfish, have very low productivity compared to other, similar species worldwide. One prominent theory about the reason for this low productivity is the large-scale North Pacific climate shifts that are thought to cycle Pacific Coast waters through warm and cool phases of 20-30 years duration. Pacific Coast waters shifted to a warm phase around 1977-1978, with ocean conditions less favorable for Pacific Coast groundfish and other fish stocks. Lower harvest rates are necessary to guard against steep declines in abundance during these periods of low productivity (low recruitment). After an intensive review of historic harvest rates, and current scientific literature on harvest rates and stock productivity, the SSC workshop concluded that $F_{40\%}$ is too aggressive for many Pacific Coast groundfish stocks, particularly for rockfish. For 2001 and beyond, the Council adopted the SSC's new recommendations for harvest policies of: $F_{40\%}$ for flatfish and whiting, $F_{50\%}$ for rockfish (including thornyheads) and $F_{45\%}$ for other groundfish such as sablefish and lingcod. In 2009, based on an SSC meta-analysis of flatfish productivity and the relationship between stock-recruitment steepness and fishing mortality rate, the SSC recommended and the Council adopted a new proxy F_{MSY} harvest rate for assessed flatfish species of $F_{30\%}$.

In the past, F_{MSY} fishing rates were treated by the Council (as intended) as targets. Under the Magnuson-Stevens Act as amended in 1996, these fishing rates are more appropriately considered to be thresholds that should not be exceeded (see Section 4.4).

The Council will consider any new scientific information relating to calculation of MSY or MSY proxies and may adopt new values based on improved understanding of the population dynamics and harvest of any species or group of species.

While B_{MSY} may be set based on the averaged unfished abundance ($B_{unfished}$) there are many possible approximations and estimates of mean $B_{unfished}$. The option currently preferred by the SSC is to set $B_{unfished}$ to the equilibrium point of the stock-recruitment relationship in the absence of exploitation.

[Amended: 5, 11, 16-1, 23]

4.4 Determination of OFL and ABC

In establishing OYs and ACLs for west coast groundfish, this FMP utilizes the interim step of calculating OFLs and ABCs for major stocks or management units (groups of species). OFL is the MSY harvest level associated with the current stock abundance. Over the long term, if OFLs are fully harvested, the average of the OFLs would be MSY. The SSC recommends the OFL based on application of a proxy or deterministic F_{MSY} harvest rate to the estimated exploitable biomass of the stock or, for unassessed stocks, an historical catch-based approach (e.g., average catch, depletion-corrected average catch, or depletion-based stock reduction analysis).

The ABC is a harvest specification set below the OFL and is a threshold that incorporates a scientific uncertainty buffer against overfishing (i.e., exceeding the OFL). The ABC is adopted by the Council based on its preferred level of risk aversion in combination with the recommendations of the SSC regarding scientific uncertainty. The ABC is based on a percentage reduction of the OFL. In cases where scientific uncertainty associated with estimating an OFL (σ) is quantified by the SSC, the percentage reduction that defines the scientific uncertainty buffer and the ABC can be determined by translating the estimated σ to a range of probability of overfishing (P*) values. Each P* value is then mapped to its corresponding buffer fraction[1]. The Council then determines the preferred level of risk aversion by selecting an appropriate P* value, accordingly. In cases where the P* approach is used, the upper limit of P* values considered will be 0.45.

4.4.1 Stocks with OFL and ABC Set by Relatively Data-Rich Quantitative Assessments, Category 1

The stocks with relatively data-rich quantitative assessments are those that have recently been assessed by a catch-at-age or catch-at-length analysis and judged to be informative for deciding stock-specific harvest specifications by the SSC. Annual evaluation of the appropriate MSY proxy (e.g., $F_{45\%}$) for species in this category will require some specific information in the SAFE document. Estimated age- or length-specific maturity, growth, and availability to the fishery (with evaluation of changes over time in these characteristics) are sufficient to determine the relationship between fishing mortality and yield-per-recruit and spawning biomass-per-recruit. The estimated time series of recruitment, spawning biomass, and fishing mortality are also required to determine whether recent trends indicate a point of concern. In general, OFL will be calculated by applying $F_{45\%}$ (or $F_{40\%}$, $F_{50\%}$, or other established MSY proxy) to the best estimate of current biomass. This current biomass estimate may be for a single year or the average of the present and several future years. Thus, OFL may be intended to remain constant over a period of three or more years.

The ABC, which incorporates a scientific uncertainty buffer against overfishing, can be calculated for category 1 species using the probability of overfishing (P*) approach. The SSC quantifies the variability in biomass estimates (σ) for category 1 species from stock assessments and the Council chooses the P* as described above to determine the size of the scientific uncertainty buffer.

Approaches to quantifying the variability on biomass estimates include using the standard error about the estimated biomass of a stock in the most recently approved assessment and estimating the between-assessment variance in biomass estimates for a stock with multiple assessments or for all category 1 stocks with multiple assessments in the meta-analysis. A proxy variance (sigma) can be calculated using this latter approach for all or some category 1 species. These approaches are not exclusive and the SSC

[1] Since estimated OFLs are median estimates, there is a 50% probability that the OFL is overestimated. Therefore, a P* of 0.5 equates to no scientific uncertainty or, in other words, the ABC is set equal to the OFL.

may recommend additional approaches to quantifying scientific uncertainty for category 1 species, including approaches that are specific to individual stocks. Once scientific uncertainty is quantified, it is mapped to an estimated P*. The Council chooses the ABC from the SSC recommended range based on its choice of P*, which is a risk-assessment policy decision. The P*-Sigma approach for quantifying scientific uncertainty will be the default approach for category 1 species unless an SSC-recommended method is adopted by the Council during the biennial specification process.

4.4.2 Stocks with OFL and ABC Set by Relatively Data-Poor Quantitative or Nonquantitative Assessment, Category 2

These stocks with OFL set by relatively data-poor quantitative or nonquantitative assessments typically do not have a recent, quantitative assessment, but there may be a previous assessment or some indicators of the status of the stock. Category 2 stocks may also have a recent assessment that was judged to be relatively data-poor by the SSC. Detailed biological information is not routinely available for these stocks, and OFL levels have typically been established on the basis of an historical catch-based approach (e.g., average catch, depletion-corrected average catch, or depletion-based stock reduction analysis), trends in a fishery independent survey or some other index of current biomass. Typically, the spawning biomass, level of recruitment, or the current fishing mortality rate for Category 2 stocks are unknown. The Council places high priority on improving the information for managing these stocks so that they may be moved to Category 1 status.

Since there is greater scientific uncertainty for category 2 stocks relative to category 1 stocks, the scientific uncertainty buffer is generally greater than that recommended for category 1 stocks. A P* approach can be used to determine the ABC. In such cases, the SSC recommends a value for σ, which is typically larger than an associated σ for category 1 stocks, and the Council chooses the P* value to determine the size of the scientific uncertainty buffer.

The following approaches can be considered for setting the ABC for category 2 stocks:

- Continue to apply a buffer of .25 for category 2 stocks for consistency with current practice until the SSC has developed and applied an appropriate analytical framework; or
- Set the value of sigma for category 2 stocks to two times the coefficient of variation (CV) for category 1 stocks. These specific values are not based on a formal analysis of assessment outcomes and could change substantially when the SSC reviews additional analyses.

These approaches for quantifying scientific uncertainty will be the default approaches for category 2 species unless an SSC-recommended method is adopted by the Council during the biennial specification process.

4.4.3 Stocks with OFL and ABC Values Set by Less Quantitative or Nonquantitative Assessment, Category 3

Of the 90-plus groundfish species managed under the FMP, OFL values have been established for only about 32. The remaining species are incidentally landed and usually are not listed separately on fish landing receipts. Information from fishery independent surveys is often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Until sufficient quantities of at-sea observer program data are available or surveys of other fish habitats are conducted, it is unlikely that there will be sufficient data to upgrade the assessment capabilities or to evaluate the overfishing potential of these stocks. Interim OFL values are established for these stocks based on an historical catch-based approach (e.g., average catch, depletion-corrected average catch, or depletion-based stock reduction analysis) or qualitative information, including advice from the Council's advisory entities.

Since there is greater scientific uncertainty for category 3 stocks relative to category 1 or 2 stocks, the scientific uncertainty buffer for such stocks is generally greater than that recommended for category 1 and 2 stocks. A P* approach can be used to determine the ABC. In such cases, the SSC recommends a value for σ, which is typically larger than an associated σ for category 1 or 2 stocks, and the Council chooses the P* value to determine the size of the scientific uncertainty buffer.

The following approaches can be considered for setting the ABC for category 3 stocks:

- Continue to apply a buffer of 0.5 for category 3 stocks for consistency with current practice until the SSC has developed and applied an appropriate analytical framework; or
- Set the value of sigma for category 3 stocks to four times the CV for category 1 stocks. These specific values are not based on a formal analysis of assessment outcomes and could change substantially when the SSC reviews additional analyses.

These approaches for quantifying scientific uncertainty will be the default approaches for category 3 species unless an SSC-recommended method is adopted by the Council during the biennial specification process.

4.4.4 Ecosystem Component Stocks Without OFL Values

Ecosystem Component species do not require specification of reference points (i.e., OFLs, ABCs, and ACLs) but are monitored to the extent that any new pertinent scientific information becomes available (e.g., catch trends, vulnerability, etc.) to determine changes in their status or their vulnerability to the fishery. For this classification, such species should:

1) be a non-target species or stock;
2) not be determined to be subject to overfishing, approaching overfished, or overfished;
3) not be likely to become subject to overfishing or overfished, according to the best available information, in the absence of conservation and management measures; and
4) not generally be retained for sale or personal use.

Categorizing FMP species as Category 1, 2 or 3 species may be done biennially in the specifications decision process; however, recategorizing species as in the fishery or as Ecosystem Component species requires an FMP amendment. A productivity and susceptibility assessment (Patrick, *et al.* 2009) can be done for FMP species in the biennial specifications process to guide a decision on whether stocks are actively managed with harvest specifications (i.e., category 1, 2, or 3 stocks) or are monitored as Ecosystem Component species.

[Amended: 11, 12, 16-1, 23]

4.5 Precautionary Thresholds and Overfishing Status Determination Criteria

The National Standard Guidelines define two thresholds that are necessary to maintain a stock at levels capable of producing MSY: the MFMT and a MSST. These two limits are intended for use as benchmarks to decide if a stock or stock complex is being overfished or is in an overfished state. The MFMT and MSST are intrinsically linked through the MSY control rule, which specifies how fishing mortality or catches could vary as a function of stock biomass in order to achieve yields close to MSY.

4.5.1 Determination of Precautionary Thresholds

The precautionary threshold is the biomass level at which point the harvest rate will be reduced to help the stock return to the MSY level (see Section 4.6.1- Default Precautionary and Interim Rebuilding ACL

Calculation). The precautionary biomass threshold is in addition to the overfishing and overfished/rebuilding thresholds required under the Magnuson-Stevens Act (MFMT and MSST). The precautionary biomass threshold is higher than the overfished biomass MSST. Because B_{MSY} is a long-term average, biomass will by definition be below B_{MSY} in some years and above B_{MSY} in other years. Thus, even in the absence of overfishing, biomass may decline to levels below B_{MSY} due to natural fluctuation. By decreasing harvest rates when biomass is below B_{MSY} but maintaining MSY control rule (or proxy control rule) harvest rates for biomass levels above MSY, the precautionary threshold and accompanying response effectively constitute a control rule that manages for harvests lower than MSY and an average biomass above MSY.

The precautionary threshold is established only for category 1 species. The precautionary threshold will be the B_{MSY} level, if known. The default precautionary threshold will be 40 percent of the estimated unfished biomass level. The Council may recommend different precautionary thresholds for any species or species group based on the best scientific information about that species or group. It is expected the threshold will be between 25 percent and 50 percent of the estimated unfished biomass level.

4.5.2 Determination of Overfishing Threshold

In this FMP, for Category 1 species, the term "overfishing" is used to denote situations where catch exceeds or is expected to exceed the established OFL. The term "overfished" describes a stock whose abundance is below its overfished/rebuilding threshold, or MSST. Overfished/rebuilding thresholds, in general, are linked to the same productivity assumptions that determine the OFL levels. The default value of this threshold is 25 percent of the estimated unfished biomass level or 50 percent of B_{MSY}, if known. The MFMT is simply the value(s) of fishing mortality in the MSY control rule, which is used to calculate the OFL. Technically, exceeding F_{MSY} constitutes overfishing; therefore, exceeding the OFL is used in this FMP to constitute overfishing since all stocks classified as "in the fishery" have specified OFLs.

For Category 2 species, the following may be evaluated as potential indicators of overfishing:

- catch that exceeds the OFL or an effective harvest rate higher than F_{MSY}
- catch per effort from logbooks
- catch area from logbooks
- index of stock abundance from surveys
- stock distribution from surveys
- mean size of landed fish

If declining trends persist for more than three years, then a focused evaluation of the status of the stock, its OFL, and overfishing threshold will be quantified. If data are available, such an evaluation should be conducted at approximately five-year intervals even when negative trends are not apparent. In fact, many stocks are in need of re-evaluation to establish a baseline for monitoring of future trends. Whenever an evaluation indicates the stock may be declining and approaching an overfished state, the Council should:

1. Improve data collection for this species so it can be moved to Category 1.

2. Determine the rebuilding rate that would allow the stock to return to MSY in no longer than ten years or as prescribed in an adopted rebuilding plan.

Information from fishery independent surveys is often lacking for Category 3 species because of their low abundance or because they are not vulnerable to survey sampling gear. Until sufficient data become available from the at-sea observer program, the risk of overfishing these species cannot be fully evaluated.

4.5.3 Determination of Overfished/Rebuilding Thresholds

The MSST (overfished/rebuilding threshold) is the default value of 25 percent of the estimated unfished biomass level or 50 percent of B_{MSY}, if known. The overfished/rebuilding threshold (also referred to as $B_{rebuild}$), is generally in the range of 25 percent to 40 percent of $B_{unfished}$.

The default overfished/rebuilding threshold for category 1 groundfish is $0.25B_{unfished}$. The Council may establish different thresholds for any species based on information provided in stock assessments, the SAFE document, or other scientific or groundfish management-related report. For example, if B_{MSY} is known, the overfished threshold may be set equal to 50 percent of that amount. The Council may also specify a lower level of abundance where catch or fishing effort is reduced to zero. This minimum abundance threshold (B_{MIN}) would correspond to an abundance that severely jeopardizes the stock's ability to recover to B_{MSY} in a reasonable length of time.

[Amended: 11, 12, 16-1, 23]

4.6 Ending Overfishing and Rebuilding

4.6.1 Default Precautionary and Interim Rebuilding ACL Calculation

The precautionary threshold, defined in Section 4.6.1, is used to trigger a precautionary management approach. If biomass declines to a level that requires rebuilding (below the MSST), the precautionary management approach also provides an interim rebuilding harvest control policy to guide the setting ACL until the Council sets a new rebuilding policy specific to the conditions of the stock and fishery. The default ACL/rebuilding policy can be described as an "ICES-type catch-based approach" that consists of a modification of the catch policy, where catch (C) declines from $C(F_{MSY})$ at the precautionary threshold in a straight line to F=0 at the minimum abundance threshold of ten percent of the estimated mean unfished biomass (sometimes called pristine or virgin biomass or reproductive potential). This approach could also be described as an ACL based on a variable F_{SPR} that is progressively more conservative at low biomass levels. The abbreviated name for this is the "40-10" default adjustment for species managed to a $B_{40\%}$ B_{MSY} target and, in the case of flatfish species that are managed to a $B_{25\%}$ target, the "25-5" adjustment. In most cases, there is inadequate information to estimate F_{MSY}; in such cases, the best proxy for F_{MSY} will be used. The default proxy values will be $F_{30\%}$ for flatfish, $F_{40\%}$ for whiting, $F_{50\%}$ for rockfish, and $F_{45\%}$ for other species such as sablefish and lingcod. The Council anticipates scientific information about the population dynamics of the various stocks will improve over time and that this information will result in improved estimates of appropriate harvest rates and MSY proxies. Thus, these initial default proxy values will be replaced from time to time. Such changes will not require an amendment to the FMP, but the scientific basis for new values must be documented.

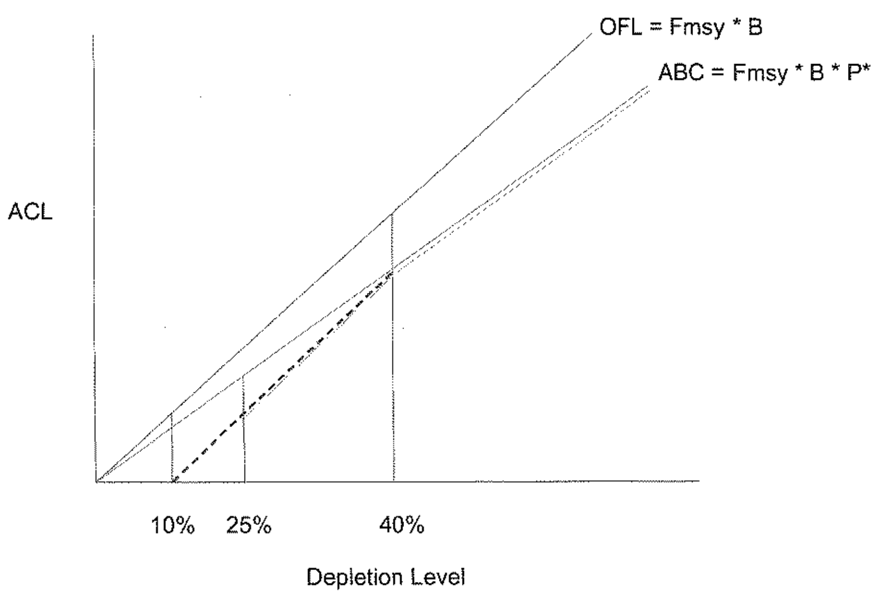

Figure 4-1. Illustration of the default "40-10" ACL rule compared to OFL and ABC as adopted under Amendment 23. This rule applies to all assessed non-flatfish species.

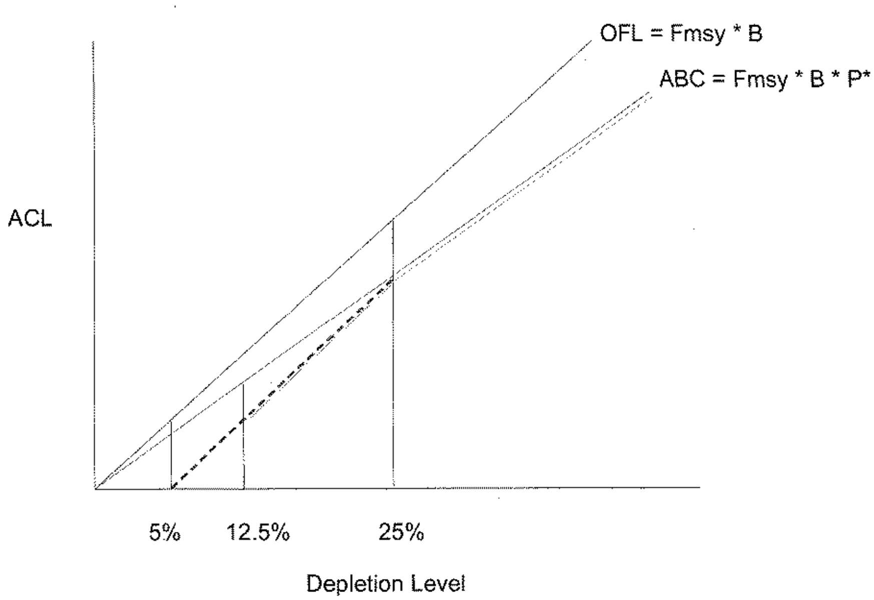

Figure 4-2. Illustration of the default "25-5" ACL rule compared to OFL and ABC as adopted under Secretarial Amendment 1. This rule only applies to assessed flatfish species.

The greater amount of catch reduction applied below the precautionary threshold will foster quicker return to the MSY level. If a stock falls below its overfished/rebuilding threshold, this line would be used as the interim rebuilding plan during the year until the Council develops a formal rebuilding plan. The point at which the line intersects the horizontal axis does not necessarily imply zero catch would be allowed, but rather is for determining the slope of the line.

In order to apply this default approach, a minimal amount of information is necessary; only stocks in Category 1 and those Category 2 stocks with a quantitative assessment of estimated biomass can be managed in this way. For stocks with inadequate information to apply this approach, the Council will strive to develop the information necessary to estimate biomass and employ this harvest control mechanism if needed.

4.6.2 Procedures for Calculating Rebuilding Parameters

The Magnuson-Stevens Act and National Standard Guidelines provide a descriptive framework for developing strategies to rebuild overfished stocks. This framework identifies three parameters: a minimum time in which an overfished stock can rebuild to its target biomass (denoted T_{MIN}), a maximum permissible time period for rebuilding the stock to its target biomass (T_{MAX}), and a target year, falling within the time period between T_{MIN} and T_{MAX} and representing the year by which the stock can be rebuilt, as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem (T_{TARGET}).

T_{MIN}, the lower limit of the specified time period for rebuilding, will be determined by the status and biology of the stock or stock complex and its interactions with other components of the marine ecosystem or environmental conditions, and is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely.

If T_{MIN} is less than ten years, then the specified time period for rebuilding may be adjusted upward so that the rebuilding period is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem, except that no such upward adjustment may result in the specified time period exceeding ten years (which would then constitute T_{MAX}), unless management measures under an international agreement in which the United States participates dictate otherwise.

If T_{MIN} is ten years or greater, then the specified time period for rebuilding may be adjusted upward so that the rebuilding period is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem, except that no such upward adjustment can exceed the rebuilding period calculated in the absence of fishing mortality, plus one mean generation time or equivalent period based on the species' life history characteristics. For example, if a stock could be rebuilt within 12 years in the absence of any fishing mortality, and has a mean generation time of eight years, the maximum allowable time to rebuild would be 20 years, which is T_{MAX}.

The Council may consider a number of factors in determining the time period for rebuilding, including:

1. The status and biology of the stock or stock complex.

2. Interactions between the stock or stock complex and other components of the marine ecosystem or environmental conditions.

3. The needs of fishing communities.

4. Recommendations by international organizations in which the United States participates.

5. Management measures under an international agreement in which the United States participates.

4.6.2.1 Calculating Rebuilding Probabilities

Stock assessment results form the basis of a rebuilding analysis, which in turn is used to develop rebuilding policies and choose the rebuilding parameters identified in each rebuilding plan. The elements of rebuilding analyses are described in the SSC Terms of Reference for Rebuilding Analyses (SSC 2001). This guidance has been incorporated into a computer program (Punt 2002). In the analysis, the probability that the overfished stock will reach its target biomass is determined with respect to T_{MIN}, T_{MAX}, and T_{TARGET}. The methods for calculating the values of these parameters are described below. This is a simplified explanation of the current methodology; for example, equations and technical specifications are omitted. The SSC may revise their terms of reference in the future as the computer program undergoes continued refinement and elaboration.

The rebuilding analysis program uses "Monte Carlo simulation" to derive a probability estimate for a given rebuilding strategy. This method projects population growth many times in separate simulations. It accounts for possible variability by randomly choosing the value of a key variable, in this case total recruitment or recruits per spawner from a range of values. These values can be specified empirically, by listing some set of historical values, or by a relationship based on a model. The SSC recommends that the rebuilding analyses use historical values. Because of this variability in a key input value, each simulation will show a different pattern of population growth. As a result, a modeled population may reach the target biomass that defines a rebuilt stock (B_{MSY}) in a different year in each of the simulations.

This technique is first used to calculate T_{MIN} in probabilistic terms, which is defined as the time needed to reach the target biomass in the absence of fishing with a 50 percent probability. In other words, in half the simulations the target biomass was reached in some year up to and including the computed T_{MIN}. Given T_{MIN}, T_{MAX} is computed as 10 years or by adding the value of one mean generation time to T_{MIN}, if T_{MIN} is greater than or equal to 10 years.

A target year, T_{TARGET}, is set as a year at T_{MIN} or greater, which does not exceed T_{MAX} ,and which is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem. Prior to Amendment 16-4, the Council set T_{TARGET} in part by considering the probability of rebuilding the stock by T_{MAX}. The Council may continue to review the probability of rebuilding the stock by T_{MAX} given differing F rates, a reference parameter known as "P_{MAX}." The Magnuson-Stevens Act, however, simply requires that rebuilding periods be as short as possible, taking into account:

- the status and biology of any overfished stocks of fish;
- the needs of fishing communities;
- recommendations by international organizations in which the United States participates; and
- the interaction of the overfished stock of fish within the marine ecosystem (§304(e)(4)(A)(i)).

It is important to recognize that some of the terms introduced and described above represent policy decisions at the national level and the Council **does not have a choice** in setting their values. The dates for T_{MIN} and T_{MAX} are determined based on guidelines established at the national level. Mean generation time is a biological characteristic that cannot be chosen by policymakers. Thus, the Council cannot choose these values and then use them as a basis for management. Defined in national guidelines, T_{MIN} is a consequence of the productivity of the fish stock and is calculated by fishery biologists based on information they get from a particular stock. Similarly, T_{MAX}, which is calculated from T_{MIN}, does not represent a Council choice.

Policy flexibility comes into play in determining T_{TARGET}, or the time by which the stock is projected to rebuild. As explained earlier, the time to rebuild must be as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem. When developing a management strategy the Council can choose a fishing mortality rate and corresponding annual level of fishing. However, when rebuilding overfished species, the choice of F is based on the value of T_{TARGET}, keeping in mind that these values cannot be chosen independently of one another. In other words, the Council may choose one value and derive the other from it, but they cannot choose these values independently of the other.

4.6.3 Stock Rebuilding Plans

As required by the Magnuson-Stevens Act, within one year of being notified by the Secretary that a stock is overfished or approaching a condition of being overfished, the Council will prepare a recommendation to end the overfished condition and rebuild the stock(s) or to prevent the overfished condition from occurring. For a stock that is overfished, the rebuilding plan will specify a time period for ending the overfished condition and rebuilding the stock. Overfishing restrictions and recovery benefits should be fairly and equitably allocated among sectors of the fishery.

Certain elements of a rebuilding plan developed by the Council, as specified in Section 4.6.3.2 (Contents of Rebuilding Plans), will be submitted to the Secretary as an FMP amendment and implementing regulations. Changes to key rebuilding plan elements will be accomplished through full (notice and comment) rulemaking. Once approved by the Secretary, a rebuilding plan will remain in effect for the specified duration of the rebuilding program, or until modified. The Council will make all approved rebuilding plans available in the annual SAFE document or by other means. The Council may recommend that the Secretary implement interim measures to reduce overfishing until the Council's program has been developed and implemented.

The Council intends its stock rebuilding plans to provide targets, checkpoints, and guidance for rebuilding overfished stocks to healthy and productive levels. They should provide a clear vision of the intended results and the means to achieve those results. They will provide the strategies and objectives that regulations are intended to achieve, and proposed regulations and results will be measured against the rebuilding plans. It is likely that rebuilding plans will be revised over time to respond to new information, changing conditions, and success or lack of success in achieving the rebuilding schedule and other goals. If, in response to these revisions, the Council recommends changes to the management target for a particular stock, such changes will be published through full (notice and comment) rulemaking as described in Section 6.2 of this FMP. As with all Council activities, public participation is critical to the development, implementation and success of management programs.

4.6.3.1 Goals and Objectives of Rebuilding Plans

The overall goals of rebuilding programs are to (1) achieve the population size and structure that will support the MSY within a specified time period that is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem; (2) minimize, to the extent practicable, the adverse social and economic impacts associated with rebuilding, including adverse impacts on fishing communities; (3) fairly and equitably distribute both the conservation burdens (overfishing restrictions) and recovery benefits among commercial, recreational, and charter fishing sectors; (4) protect the quantity and quality of habitat necessary to support the stock at healthy levels in the future; and (5) promote widespread public awareness, understanding and support for the rebuilding program. More specific goals and objectives may be developed in the rebuilding plan for each overfished species.

To achieve the rebuilding goals, the Council will strive to (1) explain the status of the overfished stock, pointing out where lack of information and uncertainty may require that conservative assumptions be made in order to maintain a risk-averse management approach; (2) identify present and historical harvesters of the stock; (3) where adequate harvest sharing plans are not already in place, develop harvest sharing plans for the rebuilding period and for when rebuilding is completed; (4) set harvest levels that will achieve the specified rebuilding schedule; (5) implement any necessary measures to allocate the resource in accordance with harvest sharing plans; (6) promote innovative methods to reduce bycatch and bycatch mortality of the overfished stock; (7) monitor fishing mortality and use available stock assessment information to evaluate the condition of the stock; (8) identify any critical or important habitat areas and implement measures to ensure their protection; and (9) promote public education regarding these goals, objectives, and the measures intended to achieve them.

4.6.3.2 Contents of Rebuilding Plans

Generally, rebuilding plans will contain:

1. A description of the biology and status of the overfished stock and fisheries affected by stock rebuilding measures.

2. A description of how rebuilding parameters for the overfished stock were determined (including any calculations that demonstrate the scientific validity of parameters).

3. Estimates of rebuilding parameters ($B_{unfished}$, B_{MSY}, T_{MIN}, T_{MAX}, and the probability of reaching target biomass by this date, and T_{TARGET}) at the time of rebuilding plan adoption.

4. A description of the fishing communities' needs that were considered at the time of adoption of the plan.

5. The process, and any applicable standards, that will be used during periodic review to evaluate progress in rebuilding the stock to the target biomass (see Section 4.6.3.5).

6. Any management measures the Council may wish to specifically describe in the FMP, which facilitate stock rebuilding in the specified period. (These measures would be in addition to any existing measures typically implemented through annual or biennial management. See Section 4.6.3.4 for more information.)

7. Any goals and objectives in addition to or different from those listed in the preceding section.

8. Potential or likely allocations among sectors.

9. For fisheries managed under international agreement, a discussion of how the rebuilding plan will reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.

10. Any other information that may be useful to achieve the rebuilding plan's goals and objectives.

The following questions also serve as a guide in developing rebuilding plans:

1. What is the apparent cause of the current condition (historical fishing patterns, a declining abundance or recruitment trend, a change in assessment methodology, or other factors)?

2. Is there a downward trend in recruitment that may indicate insufficient compensation in the spawner-recruitment relationship?

3. Based on a comparison of historical harvest levels (including discards) relative to recommended ACLs, has there been chronic over-harvest?

4. Is human-induced environmental degradation implicated in the current stock condition? Have natural environmental changes been observed that may be affecting growth, reproduction, and/or survival?

5. Would reduction in fishing mortality be likely to improve the condition of the stock?

6. What types of fishing communities rely on catch of this particular stock, or on catch of stocks that co-occur with this stock?

7. Is the particular species caught incidentally with other species? Is it a major or minor component in a mixed-stock complex?

8. What types of management measures are anticipated and/or appropriate to achieve the biological, social, economic, and community goals and objectives of the rebuilding plan?

Rebuilding plan documents are distinct from the analytical documents required by the National Environmental Policy Act (NEPA) and other legal mandates, although they will reflect the contents of those analyses in a much briefer form. Rebuilding plan elements incorporated into the FMP (in Section **Error! Reference source not found.**) summarize the contents enumerated in this section. Rebuilding plans as a whole will be published in the next annual SAFE document after their approval.

Any new rebuilding program will commence as soon as the first measures to rebuild the stock or stock complex are implemented.

Fishing communities need a sustainable fishery that: is safe, well-managed, and profitable; provides jobs and incomes; contributes to the local social fabric, culture, and image of the community; and helps market the community and its services and products.

4.6.3.3 Process for Development and Approval of Rebuilding Plans

Upon receiving notification that a stock is overfished, the Council will identify one or more individuals to draft the rebuilding plan. A draft of the plan will be reviewed and preliminary action taken (tentative adoption or identification of preferred alternatives), followed by final adoption at a subsequent meeting. The tentative plan or alternatives will be made available to the public and considered by the Council at a minimum of two meetings, unless stock conditions suggest more immediate action is warranted. Upon completing its final recommendations, the Council will submit the proposed rebuilding plan or revision to an existing plan to NMFS for concurrence. A rebuilding plan will be developed following the standard procedures for considering and implementing an FMP amendment (if necessary) under the Magnuson-Stevens Act and other applicable law.

The following elements in each rebuilding plan will be incorporated into the FMP in Appendix F and will constitute the rebuilding plans for all overfished species. Appendix F will be modified as appropriate to reflect the most recent rebuilding plan for each overfished species. :

1. A brief description of the status of the stock and fisheries affected by stock rebuilding measures at the time the rebuilding plan was prepared.

2. The methods used to calculate stock rebuilding parameters, if substantially different from those described in Section 4.6.2.

3. An estimate at the time the rebuilding plan was prepared of:
   - unfished biomass ($B_{unfished}$ or B_0) and target biomass (B_{MSY});
   - the year the stock would be rebuilt in the absence of fishing (T_{MIN});
   - T_{MIN} plus one mean generation time (T_{MAX}); and
   - the year in which the stock would be rebuilt based on the application of stock rebuilding measures that achieve rebuilding as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the overfished stock within the marine ecosystem (T_{TARGET}).

4. A description of the harvest control rule (e.g., constant catch or harvest rate) and the specification of this parameter. The types of management measures that will be used to constrain harvests to the level implied by the control rule will also be described (see also Section 4.5.3.4). These two elements, the harvest control rule and a description of management measures, represents the rebuilding strategy intended to rebuild the stock by the target year.

It is likely that over time the parameters listed above will change. It must be emphasized that the values enumerated in the FMP represent estimates at the time the rebuilding plan is prepared. Therefore, the FMP need not be amended if new estimates of these values are calculated. The values for these parameters found in the FMP are for reference, so that managers and the public may track changes in the strategy used to rebuild an overfished stock. However, any new estimates of the parameters listed above will be published in the SAFE documents as they become available.

4.6.3.4 Updating Key Rebuilding Parameters

In addition to an initial specification in the FMP in Appendix F, the target year (T_{TARGET}) and the harvest control rule (type and numerical value) will also be specified in regulations. If new information indicates a need to change the value of either of these two parameters, such a change will be accomplished through full (notice and comment) rulemaking as described in Section 6.2 of this FMP and reflected in Appendix F. The target year is the year by which the stock would be rebuilt to its target biomass. Therefore, if a subsequent analysis identifies an earlier target year for the current fishing mortality rate (based on the harvest control rule), there is no obligation to change in regulations either the target year (to the computed earlier year) or the harvest control rule (to delay rebuilding to the original target year). Stock assessments for overfished species are typically conducted every two years. Stock assessments and rebuilding analyses use mathematical models to predict a stock's current abundance, as well as project future abundance and recruitment. In any mathematical model that uses a variety of data sources, as the stock assessments do, model results tend to vary from one assessment to the next within some range of values. This expected variation means that, when the Council and SSC review a new overfished species stock assessment and rebuilding model, they must also consider whether the result of that model or models show a rebuilding trajectory that varies from the previously-predicted trajectory to a significant degree. If the variation between the stock assessments and rebuilding analyses for a particular species do not show significant differences in the rebuilding trajectory for that species, they are mathematically considered to be essentially the same. In that circumstance, the Council will likely not need to revise the T_{TARGET} or harvest control rule for that species. Since the target year is the key rebuilding parameter, it should only be changed after careful deliberation. For example, the Council might recommend that the target year be changed if, based on new information about the status and/or biology of the stock, they determine that the existing target year is later than the recomputed maximum rebuilding time (T_{MAX}) or if a recomputed harvest control rule would result in such a low optimum yield as to cause substantial socioeconomic impacts. These examples are not definitive: the Council may elect to change the target year because of other circumstances. However, any change to the target year or harvest control rule must be supported by commensurate analysis that demonstrates that the new target year is a target to rebuild the stock as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem.

4.6.3.5 Implementation of Actions Required Under the Rebuilding Plan

NMFS will implement or adjust, with the adoption of the rebuilding plan, any management measures not already in effect that are necessary to implement the rebuilding plan. Many necessary measures may already be in place through the standard management process. Because of the complex nature of the fishery and the interaction of various stocks, regulations will need to be adjusted over the periods of the rebuilding plans. Management measures will be adjusted, or new measures will be developed and implemented in the future, in order to best implement each rebuilding plan throughout the life of that plan.

Once a rebuilding plan is adopted, certain measures required in the rebuilding plan may need to be implemented through authorities and processes already described in the FMP. Management actions to achieve OY harvest, and objectives related to rebuilding requirements of the Magnuson-Stevens Act and goals and objectives of the FMP (each of which may require a slightly different process) include: automatic actions, notices, abbreviated rulemaking actions, and full rulemaking actions. (These actions are detailed in Section 4.7, Chapter 5, and Section 6.2.) Allocation proposals require consideration as specified in the allocation framework (see Section 6.3.1). Any proposed regulations to implement the rebuilding plan will be developed in accordance with the framework procedures of this FMP.

Any rebuilding management measures that are not already authorized under the framework of the existing FMP, or specified in the FMP consequent of rebuilding plan adoption, will be implemented by further FMP amendments. These plan amendments may establish the needed measures or expand the framework to allow the implementation of the needed measures under framework procedures.

The Council may designate a state or states to take the lead in working with its citizens to develop management proposals to achieve stock rebuilding.

4.6.3.6 Periodic Review of Rebuilding Plans

Rebuilding plans will be reviewed periodically, but at least every two years, although the Council may propose revisions to an adopted rebuilding plan at any time. These reviews will take into account the goals and objectives listed in Section 4.6.3.1, recognizing that progress towards the first goal, to achieve the population size and structure that will support MSY within the specified time period, will only be evaluated on receipt of new information from the most recent stock assessment.

The Council, in consultation with the SSC and GMT, will determine on a case-by-case basis whether there has been a significant change in a parameter such that the chosen management target must be revised. If, based on this review, the Council decides that the harvest control rule or target year must be changed, the procedures outlined in Section 4.6.3.3 will be followed. Regardless of the Council's schedule for reviewing overfished species rebuilding plans, the Secretary of Commerce, through NMFS, is required to review the progress of overfished species rebuilding plans toward rebuilding goals every two years, per Magnuson-Stevens Act at 16 U.S.C. ' 304(e)(7).

4.6.3.7 Precedence of a Recovery Plan or "No Jeopardy" Standard Issued Pursuant to the Endangered Species Act

Like rebuilding plans pursuant to National Standard 1 in the Magnuson-Stevens Act, a recovery plan pursuant to the Endangered Species Act (ESA) outlines measures for the conservation and survival of the designated species. Under Section 7 of the Endangered Species Act an agency must consult NMFS when any activity permitted, funded, or conducted by that agency may affect a listed marine species or its designated critical habitat. (In the case of fishery management actions, NMFS is both the action and consulting agency.) As part of these consultations, a biological opinion is produced describing standards that must be met when permitting or implementing the action to ensure that the action is not likely to jeopardize the continued existence of the listed species; these are referred to as no jeopardy standards.

Measures under a recovery plan or "no jeopardy" standards in a biological opinion will supersede rebuilding plan measures and targets if they will result in the stock rebuilding to its target biomass by an earlier date than the target year identified in the current rebuilding plan. (If expressed probabilistically, any ESA standard expressed as a combination of date and probability that constitutes a higher standard will take precedence over the equivalent target and probability in the rebuilding plan. For example, an ESA standard requiring recovery by the rebuilding plan target year, but with a higher probability, would take precedence over the rebuilding plan.) If a stock is de-listed before reaching its target biomass, the rebuilding plan will come back into effect until such time as the stock is fully rebuilt.

4.7 Determination of OY, ACL and ACT

Optimum yield (OY) is defined in the Magnuson-Stevens Act as the amount of fish which 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; that is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, that provides for rebuilding to a level consistent with producing the MSY in such fishery. OY may be established at the stock or stock complex level, or at the fishery level. Achieving, on a continuing basis, the "optimum yield from each fishery" means producing, from each stock, stock complex, or fishery: a long-term series of catches such that the average catch is equal to the OY, overfishing is prevented, the long-term average biomass is near or above B_{MSY}, and overfished stocks and stock complexes are rebuilt consistent with timing and other requirements of section 304(e)(4) of the Magnuson-Stevens Act. OYs are considered long-term harvest objectives and are not necessarily set every year or during every biennial management cycle. The Magnuson-Stevens Act also specifies that OY is based on MSY, and may be equal to or less than MSY. The FMP authorizes establishment of a numerical or non-numerical OY for any groundfish species or species group and lays out the procedures the Council will follow in determining appropriate numerical OY values. An OY may be specified for the fishery management area as a whole or for specific subareas.

The ACL is a level of annual catch, which counts all sources of annual fishing-related mortality, including discard mortalities, and is the harvest threshold used to manage west coast fisheries. The ACL is decided in a manner to achieve OY without exceeding a specified OFL or ABC. ACLs are specified for each stock or stock complex actively managed in the fishery and serves as the basis for invoking AMs. The ACL may not exceed the ABC and may be set equal to the ABC if the Council and NMFS judge there are no reasons to buffer the ABC to account for management uncertainty, socioeconomic concerns, ecological concern, rebuilding concerns, etc. If ACLs are exceeded more often than one in four years, then AMs, such as catch monitoring and inseason adjustments to fisheries, need to improve or additional AMs may need to be implemented. Such additional AMs may include setting an annual catch target (ACT), which is a level of harvest below the ACL, may need to be specified. The ACT may be especially important for a stock subject to highly uncertain inseason catch monitoring. Unlike an ACL, the ACT can be exceeded annually. ACLs and ACTs, if needed, are annual specifications that are determined every other year in the biennial specifications process described in Section **Error! Reference source not found.**.

ACLs and ACTs can be specified for sectors of a fishery as well as for the entire fishery. In such cases, the sector-specific ACLs and/or ACTs would sum to the ACL or ACT specified for the stock for the entire fishery. Sector-specific ACLs may be decided for sectors with a formal, long-term allocation of the harvestable surplus of a stock (see Section 6.3.2). A sector-specific ACT may serve as a harvest guideline for a sector or used strategically in a rebuilding plan to attempt to reduce mortality of an overfished stock more than the rebuilding plan limits prescribe.

Total fishing mortality must be accounted in the stock or stock complex ACL, including mortality resulting from tribal fisheries, incidental open access fisheries (e.g., non-groundfish fisheries that impact groundfish stocks), scientific research, and removals under EFPs. These types of mortality can be deducted from either the ACL or ACT; this decision and the corresponding impacts are analyzed during the biennial specifications process. In some instances, the Council may treat the ACT like the ACL and subtract the off-the-top deductions from the ACT prior to determining sector allocations. In other cases, for example, if sector-specific ACTs are used, then the off-the-top deductions may be taken from the ACL prior to calculating the ACT.

Most of the 90-plus species managed by the FMP have never been assessed in either a quantitative or qualitative manner. In some cases even basic catch statistics are unavailable, because many species (rockfish, for example) are not sorted unless specifically required by regulation. Species of this type have generally not been subject to numerical harvest limits, but rather harvest is limited by gear restrictions and market demand. Other management measures which determine the total amount of harvest each year include trip landing and frequency limits. Those species without a specified OY and not included in a multi-species OY will be included in a non-numerical OY, which is defined as all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the U.S. Secretary of Commerce. This non-numerical OY is not a predetermined numerical value, but rather the harvest that results from regulations, specifications, and management measures as they are changed in response to changes in the resource and the fishery. In many cases, the absence of a numerical specification reflects the absence of basic management information, such as abundance estimates and catch statistics. The non-numerical OY concept allows for a variable amount of groundfish to be harvested annually, limited by such constraints as gear restrictions, management measures for other species, and/or absence of consumer acceptance or demand.

The close spatial relationship of many groundfish species throughout the management area results in commercial and recreational catches often consisting of mixtures of several species. This is especially the case in the trawl fishery where fishermen may target one species, but unavoidably harvest several other species. In such cases, the optimum harvest strategy often is to target a group (complex or assemblage) of groundfish species.

The Council will avoid allowing overfishing of individual stocks and control harvest mortality to allow overfished stocks to rebuild to the MSY level. In the event the Council determines that greater long-term benefits will be gained from the groundfish fishery by overfishing individual stocks or by preventing a stock from recovering to its MSY level, it will justify the action in writing in accordance with the procedures and standards identified in this section and the National Standard Guidelines (50 CFR 600.310(d)). Conversely, the Council may determine that greater benefits will accrue from protecting an individual stock by constraining the multiple species complex or specific components of that complex.

Reduction in catches or fishing rates for either precautionary or rebuilding purposes is an important component of converting values of OFL to values of ACL. This relationship is specified by the ABC harvest control rule, which accounts for scientific uncertainty in the determination of the OFL, and the ACL harvest control rule. All ACLs will remain in effect until revised, and, whether revised or not, will be announced at the beginning of the fishing period along with other specifications (see Chapter 5).

Groundfish stock assessments generally provide the following information to aid in determination of OFL and ACL.

1. Current biomass (and reproductive potential) estimate.

2. F_{MSY} or proxy, translated into exploitation rate.

3. Estimate of MSY biomass (B_{MSY}), or proxy, unfished biomass (based on average recruitment), precautionary threshold, and/or overfished/rebuilding threshold.

4. Precision estimate (e.g., confidence interval) for current biomass estimate.

4.7.1 Determination of Numerical ACLs If Stock Assessment Information Is Available from a Relatively Data-Rich Assessment (Category 1)

The Council will follow these steps in determining numerical ACLs. The recommended numerical ACL values will include any necessary adjustments to harvest mortality needed to rebuild any stock determined to be below its overfished/rebuilding threshold and may include adjustments to address uncertainty in the status of the stock.

1. OFL: Multiply the current fishable biomass estimate times the F_{MSY} exploitation rate or its proxy to get OFL.

2. ABC: Determine an appropriate scientific uncertainty buffer to set the ABC below the OFL.

3. Precautionary adjustment: If the abundance is above the specified precautionary threshold, the ACL will be equal to or less than ABC. If current biomass estimate is less than the precautionary threshold (Section 4.5.1), the harvest rate will be reduced according to the harvest control rule specified in Section 4.6.1 in order to accelerate a return of abundance to optimal levels. If the abundance falls below the overfished/rebuilding threshold (Section 4.5.2), the harvest control rule will generally specify a greater reduction in exploitation as an interim management response toward rebuilding the stock while a formal rebuilding plan is being developed. The rebuilding plan will include a specific harvest control rule designed to rebuild the stock, and that control rule will be used in this stage of the determination of the ACL.

4. Other adjustments to the ACL: Adjustments to an ACL for other social, economic, or ecological considerations may be made. The ACL will be reduced for anticipated bycatch mortality (i.e. mortality of discarded fish). Amounts of fish harvested as compensation for private vessels participating in NMFS resource survey activities will also be deducted from ABC prior to setting the ACL.

5. ACL recommendations will be consistent with established rebuilding plans and achievement of their goals and objectives.
   (a) In cases where overfishing is occurring, Council action will be sufficient to end overfishing.
   (b) In cases where a stock or stock complex is overfished, Council action will specify the ACL in a manner that complies with rebuilding plans developed in accordance with Section 4.6.2.
   (c) For fisheries managed under an international agreement, Council action must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States. This will allow the Council and Secretary of Commerce to consider domestic regulations that will help address international overfishing in cases where that is occurring.
   (d) For any stock that has been declared overfished, the open access/LE allocation shares may be temporarily revised for the duration of the rebuilding period by amendment to the regulations in accordance with the normal allocation process described in this FMP. However, the Council may at any time recommend the shares specified in Chapter 12 of this FMP be reinstated without requiring further analysis. Once reinstated, any change may be made only through the allocation process.
   (e) For any stock that has been declared overfished, any vessel with a LE permit may be prohibited from operating in the open access fishery when the LE fishery has been closed.

6. Adjustments to an ACL could include increasing the ACL above the default value up to the overfishing level as long as the management still allows achievement of established rebuilding goals and objectives. In limited circumstances, these adjustments could include increasing the ACL above the overfishing level as long as the harvest meets the standards of the mixed stock exception in the National Standard Guidelines:
   1. The Council demonstrates by analysis that such action will result in long-term net benefits to the Nation.
   2. The Council demonstrates by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/ configuration, or other technical characteristic in a manner such that no overfishing would occur.
   3. The resulting rate or level of fishing mortality will not cause any species or evolutionarily significant unit thereof to require protection under the Endangered Species Act.

7. Exceptions to the requirement to prevent overfishing could apply under certain limited circumstances. Harvesting one stock at its optimum level may result in overfishing of another stock when the two stocks tend to be caught together (this can occur when the two stocks are part of the same fishery or if one is bycatch in the other's fishery). Before the Council and NMFS may decide to allow this type of overfishing, an analysis must be performed and the analysis must contain a justification in terms of overall benefits, including a comparison of benefits under alternative management measures, and an analysis of the risk of any stock or stock complex falling below its MSST. The Council may decide to allow this type of overfishing if the fishery is not overfished and the analysis demonstrates that all of the following conditions are satisfied:
   (a) Such action will result in long-term net benefits to the Nation.
   (b) Mitigating measures have been considered and it has been demonstrated that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur; and
   (c) The resulting rate of fishing mortality will not cause any stock or stock complex to fall below its MSST more than 50 percent of the time in the long term, although it is recognized that persistent overfishing is expected to cause the affected stock to fall below its B_{MSY} more than 50 percent of the time in the long term.

8. For species complexes (such as the minor rockfish complexes), the ACL will generally be set equal to the sum of the individual component ACLs, as appropriate.

4.7.2 Determination of a Numerical ACL If OFL Is Based on a Relatively Data-Poor Quantitative or Non-quantitative Assessment (Category 2)

1. OFL may be based on an historical catch-based approach (e.g., average catch, depletion-corrected average catch, or depletion-based stock reduction analysis), a previous relatively data-poor assessment, a non-quantitative assessment, or other qualitative information.

2. ABC: Determine an appropriate scientific uncertainty buffer to set the ABC below the OFL.

3. Precautionary adjustments, if any, would be based on relevant information. In general, the Council will follow a risk-averse approach and may recommend an ACL below ABC if there is a perception the stock is below its MSY biomass level or to accommodate management uncertainty, socioeconomic concerns, or other considerations. If a declining trend persists for more than three years, then a focused evaluation of the status of the stock, its OFL, and the overfishing parameters will be quantified. If data are available, such an evaluation should be conducted at approximately

five-year intervals even when negative trends are not apparent. In fact, many stocks are in need of re-evaluation to establish a baseline for monitoring of future trends. Whenever an evaluation indicates the stock may be declining and approaching an overfished state, then the Council should:
(a) Recommend improved data collection for this species.
(b) Determine the rebuilding rate that would increase the multispecies value of the fishery.

4. Uncertainty adjustment: In cases where there is a high degree of uncertainty about the condition of the stock or stocks, ACL may be reduced accordingly.

5. Amounts of fish harvested as compensation for industry research activities will also be deducted.

6. These adjustments could include increasing ACL above the default value as indicated for Category 1 stocks, items 5 and 6 above.

4.7.3 Non-numerical OY for Stocks with No ABC Values (Category 3)

Fish of these species are incidentally landed and usually are not listed separately in fish landing receipts. Information from fishery-independent surveys are often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Until sufficient quantities of at-sea observer program data are available or surveys of other fish habitats are conducted and/or requirements that landings of all species be recorded separately, it is unlikely that there will be sufficient data to upgrade the assessment capabilities or to evaluate the overfishing potential of these stocks.

These species typically have OFL values based on an historical catch-based approach (e.g., average catch, depletion-corrected average catch, or depletion-based stock reduction analysis), often from a species composition estimate of landings from port sampling, and a precautionary reduction of the ABC and ACL generally greater than that specified for category 2 species. Another approach typically used for deciding the OFL value for a category 3 species is based on a fishing mortality rate (F) associated with the species estimated or assumed natural mortality rate (M); such as F = .75M.

Most category 3 species are managed in a stock complex, where harvest specifications are set for the complex in its entirety. "Stock complex" means a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar. At the time a stock complex is established, the FMP should provide a full and explicit description of the proportional composition of each stock in the stock complex, to the extent possible. Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another and MSY cannot be defined on a stock-by-stock basis (see paragraph (e)(1)(iii) of this section); where there is insufficient data to measure their status relative to SDC; or when it is not feasible for fishermen to distinguish individual stocks among their catch. The vulnerability of stocks to the fishery should be evaluated when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex. Stock complexes may be comprised of: one or more indicator stocks, each of which has SDC and ACLs, and several other stocks; several stocks without an indicator stock, with SDC and an ACL for the complex as a whole; or one of more indicator stocks, each of which has SDC and management objectives, with an ACL for the complex as a whole.

Current stock complexes will be used until the Council advisory bodies can complete their analysis and provide recommendations regarding reconfiguration of those complexes according to the factors discussed in the National Standard guidelines.

An indicator stock is a stock with measurable SDC that can be used to help manage and evaluate more poorly-known stocks that are in a stock complex. If an indicator stock is used to evaluate the status of a complex, it should be representative of the typical status of each stock within the complex, due to similarity in vulnerability. If the stocks within a stock complex have a wide range of vulnerability, they should be reorganized into different stock complexes that have similar vulnerabilities; otherwise the indicator stock should be chosen to represent the more vulnerable stocks within the complex. In instances where an indicator stock is less vulnerable than other members of the complex, management measures need to be more conservative so that the more vulnerable members of the complex are not at risk from the fishery. More than one indicator stock can be selected to provide more information about the status of the complex. When indicator stock(s) are used, periodic re-evaluation of available quantitative or qualitative information (e.g., catch trends, changes in vulnerability, fish health indices, etc.) is needed to determine whether a stock is subject to overfishing, or is approaching (or in) an overfished condition.

[Amended: 11, 16-1, 17, 23]

CHAPTER 5 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 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 OFL for major stocks will be developed, as well as an ABC that accounts for the scientific uncertainty of the stock's estimated biomass. The Council will identify those species or species groups which it proposes to be managed by the establishment of numerical harvest levels (OYs, ACLs, ACTs, harvest guidelines [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 OFL, an ABC specification set below the OFL to account for scientific uncertainty, the establishment of OYs and ACLs for various stocks (may be set equal to the ABC), and the calculation of specified allocations between harvest sectors. 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 LE 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 would be imposed through one of the management measures processes at either 6.2 C or D in Chapter 6.

The NMFS Regional Administrator will review the Council's recommendations, supporting rationale, public comments, and other relevant information, and, if it is approved, will undertake the appropriate method of implementation. Rejection of a recommendation will be explained in writing.

The procedures specified in this chapter do not affect the authority of the U.S. Secretary of Commerce (Secretary) to take emergency regulatory action as provided for in Section 305(c) of the Magnuson-Stevens Act 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 Magnuson-Stevens Act.

This chapter describes the steps in this process.

[Amended: 5, 12, 16-1, 17, 18]

5.1 General Overview of the Harvest Specifications and Management Process

The specifications and management process, in general terms, occurs as follows:

1. The Council will determine the MSY or MSY proxy and OFL for each major stock. Typically, the MSY proxy will be in terms of a fishing mortality rate ($F_{x\%}$,) and OFL will be the $F_{x\%}$ applied to the current biomass estimate. The MSY is the maximum long-term average yield expected from annual application of the MSY (or proxy) harvest policy under prevailing ecological and environmental conditions.

2. The Council and SSC will determine an appropriate scientific uncertainty buffer to set the ABC below the OFL. The ABC accommodates the uncertainty in estimating the OFL and may be determined using either a straight percentage reduction of the OFL as recommended by the SSC or by the P* approach.

3. Every species will either have its own designated ACL or be included in a multispecies ACL. Species which are included in a multispecies ACL may also have individual ACLs, have individual HGs, or be included in a HG for a subgroup of the multispecies ACL.

4. To determine the ACL for each stock, the Council will determine the best estimate of current abundance and its relation to its precautionary and overfished thresholds. If the abundance is above the precautionary threshold, the ACL will be equal to or less than the ABC. If abundance falls below the precautionary threshold, the ACL will be reduced according to the harvest control rule for that stock. If abundance falls below the overfished/rebuilding threshold, the ACL will be set according to the interim rebuilding rule until the Council develops a formal rebuilding plan for that species.

5. For any stock or stock complex where the Secretary identifies that overfishing is occurring, the Council will take remedial action to end overfishing and prevent the stock or stock complex from falling below the minimum stock size threshold. For any stock the Secretary has declared overfished or approaching the overfished condition, or for any stock the Council determines is in need of rebuilding, the Council will implement such periodic management measures as are necessary to rebuild the stock by controlling harvest mortality, habitat impacts, or other effects of fishing activities that are subject to regulation under this biennial process. These management measures will be consistent with any approved rebuilding plan.

6. The Council may reserve and deduct a portion of the ACL of any stock to provide for compensation for vessels conducting scientific research authorized by NMFS. Prior to the research activities, the Council will authorize amounts to be made available to a research reserve. However, the deduction from the ACL will be made in the year after the "compensation fishing"; the amounts deducted from the ACL will reflect the actual catch during compensation fishing activities.

7. The Council will identify stocks which are likely to be fully harvested (i.e., the ACL or ACT/HG achieved) in the absence of specific management measures and for which allocation between LE and open access sectors of the fishery is appropriate.

8. The groundfish resource is fully utilized by U.S. fishing vessels and seafood processors. The Council may entertain applications for foreign or joint venture fishing or processing at any time, but fishing opportunities may be established only through amendment to this FMP. This section supersedes other provisions of this FMP relating to foreign and joint venture fishing.

[Amended: 5, 12, 16-1, 17, 23]

5.2 SAFE Document

For the purpose of providing the best available scientific information to the Council for evaluating the status of the fisheries relative to the MSY and overfishing definition, developing OFLs, determining the need for individual species or species group management, setting and adjusting numerical harvest levels, assessing social and economic conditions in the fishery, and updating the appendices of this FMP; a SAFE document is prepared annually. Not all species and species groups can be reevaluated every year due to limited state and Federal resources. However, the SAFE or the biennial specifications and management measures NEPA document will in general contain the following information:

1. A report on the current status of Washington, Oregon, and California groundfish resources by major species or species group.

2. Specify and update estimates of harvest control rule parameters for those species or species groups for which information is available. (The Council anticipates scientific information about the population dynamics of the various stocks will improve over time and that this information will result in improved estimates of appropriate harvest rates and MSY proxies. Thus, initial default proxy values will be replaced from time to time. Such changes will not require amendment to the FMP, but the scientific basis for new values must be documented.)

3. Estimates of MSY and OFL for major species or species groups.

4. Catch statistics (landings and value) for commercial, recreational, and charter sectors.

5. Recommendations of species or species groups for individual management by ACLs.

6. A brief history of the harvesting sector of the fishery, including recreational sectors.

7. A brief history of regional groundfish management.

8. A summary of the most recent economic information available, including number of vessels and economic characteristics by gear type.

9. Other relevant biological, social, economic, ecological, and essential fish habitat information which may be useful to the Council.

10. A description of the MFMT and the MSST for each stock or stock complex, along with other information the Council may use to determine whether overfishing is occurring or a stock or stock complex is overfished. (The default overfished/rebuilding threshold for most category 1 groundfish is $0.25B_{unfished}$ or 0.125 $B_{unfished}$ for assessed flatfish species. The Council may establish different thresholds for any species based on information provided in stock assessments, the SAFE document, or other scientific or groundfish management-related reports.)

11. A description of any rebuilding plans currently in effect, a summary of the information relevant to the rebuilding plans, and any management measures proposed or currently in effect to achieve the rebuilding plan goals and objectives.

12. A list of annual specifications and management measures that have been designated as routine under processes described in the FMP at Section 6.2.

Under a biennial specifications and management measures process, elements 2, 5, 6, 7, and 11 would not need to be included in a SAFE document in years when the Council is not setting specifications and management measures for an upcoming biennial fishing period. The stock assessment section of the SAFE document is normally completed when the most current stock assessment and fisheries performance information is available and prior to the meeting at which the Council approves its final management recommendations for the upcoming biennial fishing period. The Council will announce the availability of the stock assessment section of the SAFE document to the public by such means as mailing lists or newsletters, and will provide copies upon request. The fishery evaluation section of the SAFE may be prepared after the Council has made its final recommendations for the upcoming biennial fishing period and will include the final recommendations, including summaries of rebuilding plans and an estimate of the previous year's catch. Availability will be similarly announced and copies made available upon request.

[Amended: 5, 12, 13, 16-1, 17, 23]

5.3 Authorization and Accounting for Fish Taken as Compensation for Authorized Scientific Research Activities.

At a Council meeting, NMFS will advise the Council of upcoming resource surveys that would be conducted using private vessels with groundfish as whole or partial compensation. For each proposal, NMFS will identify the maximum number of vessels expected or needed to conduct the survey, an estimate of the species and amounts of compensation fish likely to be needed to compensate vessels for conducting the survey, when the fish would be taken, and when the fish would be deducted from the ABC in determining the ACL/harvest guideline. NMFS will initiate a competitive solicitation to select vessels to conduct resource surveys. NMFS will consult with the Council regarding the amounts and types of groundfish species to be used to support the surveys. If the Council approves NMFS' proposal, NMFS may proceed with awarding the contracts, taking into account any modifications requested by the Council. If the Council does not approve the proposal to use fish as compensation to pay for resource surveys, NMFS will not use fish as compensation.

Because the species and amounts of fish used as compensation will not be determined until the contract is awarded, it may not be possible to deduct the amount of compensation fish from the ABC or harvest guideline in the year that the fish are caught. Therefore, the compensation fish will be deducted from the ABC the year or biennial fishing period after the fish are harvested. During the specification and management measures process, NMFS will announce the total amount of fish caught during the year or biennial fishing period as compensation for conducting a resource survey, which then will be deducted from the following year's ABCs in setting the ACLs.

[Amended: 11, 17, 23]

5.4 Biennial Implementation Procedures for Specifications and Management Measures

Biennially, the Council will develop recommendations for the specification of OFLs, ABCs, ACLs, and any ACTs or quotas over the span of three Council meetings. In addition, during this process the Council may recommend establishment of ACTs, HGs and/or quotas for species or species groups within an ACL. Depending on stock assessment availability and fishery management interactions with Canada, the Council may also develop recommendations for the specification of the Pacific whiting ABC/OY and quotas in a separate, annual process governed by the Pacific whiting treaty.

The Council will develop preliminary recommendations at the first of three meetings (usually in November) based upon the best stock assessment information available to the Council at the time and consideration of public comment. After the first meeting, the Council will provide a summary of its preliminary recommendations and their basis to the public through its mailing list, as well as providing copies of the information at the Council office and to the public upon request. The Council will notify the public of its intent to develop final recommendations at its third meeting (usually in June) and solicit public comment both before and at its second meeting.

At its second and/or third meeting, the Council will again consider the best available stock assessment information which should be contained in the recently completed SAFE report or preliminary NEPA documents and consider public testimony before adopting final recommendations to the Secretary. Following the third meeting, the Council will submit its recommendations along with the rationale and supporting information to the Secretary for review and implementation.

Upon receipt of the Council's recommendations supporting rationale and information, the Secretary will review the submission, and, if it is sufficient for public review, publish a proposed rule in the *Federal Register*, making the Council's recommendations available for public comment and agency review. Following the public comment period on the proposed rule, the Secretary will review the proposed rule, taking into account any comments or additional information received, and will publish a final rule in the *Federal Register*, possibly modified from the proposed rule in accordance with the Secretary's consideration of the proposed rule. All OFLs, ABCs, ACLs, OYs, and any ACTs, HGs, or quotas will remain in effect until revised, and, whether revised or not, will be announced at the beginning of the biennial fishing period along with other specifications.

In the event that the Secretary disapproves one or more of the Council's recommendations, he may implement those portions approved and notify the Council in writing of the disapproved portions along with the reasons for disapproval. The Council may either provide additional rationale or information to support its original recommendation, if required, or may submit alternative recommendations with supporting rationale. In the absence of an approved recommendation at the beginning of the biennial fishing period, the current specifications in effect at the end of the previous biennial fishing period will remain in effect until modified, superseded, or rescinded.

[Amended: 5, 11, 17, 23]

5.5 Inseason Procedures for Establishing or Adjusting Specifications

5.5.1 Inseason Adjustments to OFLs, ABCs, and ACLs

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 OFLs, ABCs ACLs, 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, OFLs ABCs, ACLs, OYs, ACTs, HGs, and quotas may only be modified in cases where a harvest specification announced at the beginning of the biennial 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 ACLs, OYs, HGs, and Quotas

ACLs, OYs ACTs, and HGs or quotas 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 OFL 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 OFL. These constraints on establishing and adjusting ACLs, OYs, ACTs, 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.

[Amended: 11, 17, 18, 23]

CHAPTER 6 MANAGEMENT MEASURES

6.1 Introduction

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 used 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 three 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, especially bycatch mortality. Bycatch is defined in the Magnuson-Stevens Act 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 and/or report on fishery 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.

These procedures, measures, and requirements must be consistent with the goals and objectives of the FMP, the Magnuson-Stevens Act, 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

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 biological, 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.

[Amendment 18]

6.2 General Procedures for Establishing and Adjusting Management Measures

This FMP establishes three 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 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act.

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. Notice actions may be nondiscretionary; they may be actions 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 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 lengthen 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 Magnuson-Stevens Act 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).

6.2.1.1 Routine Management Measures through Amendment 18:

Commercial limited entry and open access fisheries:

> 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; Pacific cod; spiny dogfish; 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.

Recreational fisheries all gear types:

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.

Bag limits 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; extend the fishing season; for the commercial fisheries, to minimize disruption of traditional fishing and marketing patterns; to reduce discards; for the recreational fisheries, to spread the available catch over a large number of anglers; to discourage target fishing while allowing small incidental catches to be landed; and to allow small fisheries to operate outside the normal season.

The current list of routine management measures is published in Federal regulations at 50 CFR 660.370.

Routine management measures have been developed to deal with management uncertainty in the groundfish fishery. The process allows timely adjustment of measures inseason to respond to the most current scientific and management information. These routine management measures are AMs under the Magnuson-Stevens Act as amended.

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 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 ACL, OY, HG or quota is not specified.
2. Catch for the calendar year is projected to exceed the current ACL, 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 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 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, codend specifications, marking requirements, and other gear specifications as necessary
- Observer or other monitoring coverage
- Reporting requirements
- Permits

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 detract from the authority of the Secretary to take emergency action under Section 305(c) of the Magnuson-Stevens Act.

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. Reduce fishing capacity.
13. Maintain data collection and means for verification.
14. Maintain or improve the recreational 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act.

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 its recommendation to the Council, the committee may also include in its recommendations proposed changes in the designation of HAPCs 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 a HAPC, is recommended for elimination, the committee may recommend whether or not to retain the HAPC designation. Any such recommendation with respect to a HAPC would trigger the process for the modification of HAPCs (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

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 & A) in common with other citizens of the United States. NMFS has determined that the tribes that have groundfish U & 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.

[Amendment 18]

6.3 Allocation

6.3.1 Allocation Framework

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 Magnuson-Stevens Act 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.

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 Magnuson-Stevens Act 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.

6.3.2 Formal Allocations

6.3.2.1 Sector Allocations of Sablefish North of 36° N. latitude

Fixed allocations of sablefish are based on the ACL specified for the area north of 36° N. latitude (to the U.S.-Canada border). Sablefish allocations north of 36° N. latitude are determined by first deducting the tribal share from the ACL specified for north of 36° N. latitude, then deducting the estimated total mortality of sablefish in research and non-groundfish fisheries (these deductions are decided in the biennial process for specifying harvest specifications and management measures based on the best available information at the time of the decision), then dividing the remaining yield (non-tribal share) between open access and LE fisheries, with the LE share divided between the trawl and fixed gear (longline and fishpot) sectors. The proportions of each of these divisions are indicated in **Error! Reference source not found.**. The LE fixed gear share is then generally divided 85 percent to the primary fishery for LE fixed gear vessels with sablefish endorsements and 15 percent for the daily-trip-limit fishery, for such vessels with and without sablefish endorsements.

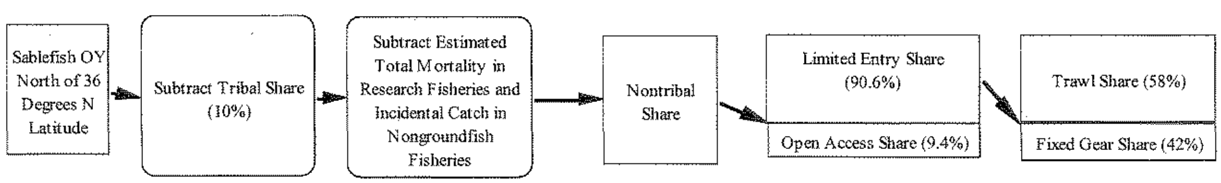

Figure 6-1. Fixed intersector allocations of sablefish north of 36° N. latitude.

6.3.2.2 Sector allocations of Pacific Whiting

Projected total mortalities of Pacific whiting in recreational, research, and non-whiting fisheries are first set aside (these deductions are decided in the annual process for specifying Pacific whiting harvest specifications and management measures based on the best available information at the time of the decision), then a yield amount is set-aside to accommodate tribal whiting fisheries. In some years the whiting set-aside may be increased to accommodate other programs, such as EFPs. The nontribal commercial share of whiting is allocated to LE whiting trawl sectors as follows: 42 percent for the shoreside whiting sector, 24 percent for the at-sea mothership whiting sector, and 34 percent for the at-sea catcher-processor whiting sector. No more than five percent of the shoreside whiting sector's allocation may be taken and retained south of 42° N. latitude prior to the start of the shore-based whiting season north of 42° N. latitude (in waters off Oregon and Washington).

6.3.2.3 Limited Entry Trawl Allocations for Amendment 21 Species

Formal allocations of species covered under Amendment 21 support Amendment 20 trawl rationalization measures. Annual OYs/ACLs are established for these species the same as for other groundfish species. The OYs/ACLs are then reduced by deducting the estimated total mortality of these species in research, tribal, and non-groundfish fisheries, and the estimated exempted fishing permits set-asides. The remainder of the OYs/ACLs are then allocated according to the percentages in **Error! Reference source not found.**. The trawl percentage is for the non-treaty trawl fishery managed under Amendment 21. The non-treaty, non-trawl percentage is for the LE fixed gear fishery, the open access fishery, and the recreational fishery. Allocations to the directed non-trawl sectors (i.e., LE fixed gear, directed open access, and recreational) for the species allocated in **Error! Reference source not found.** are decided, if needed, in the biennial harvest specifications and management measures process.

Trawl/Nontrawl Allocations

Table 6-1. Allocation percentages for limited entry trawl and non-trawl sectors specified for FMP groundfish stocks and stock complexes under Amendment 21 (most percentages based on 2003-2005).

Stock or Complex	All Non-Treaty LE Trawl Sectors	All Non-Treaty Non-Trawl Sectors
Lingcod	45.0%	55.0%
Pacific Cod	95.0%	5.0%
Sablefish S. of 36° N. latitude	42.0%	58.0%
PACIFIC OCEAN PERCH	**95.0%**	**5.0%**
WIDOW	**91.0%**	**9.0%**
Chilipepper S. of 40°10' N. latitude	75.0%	25.0%
Splitnose S. of 40°10' N. latitude	95.0%	5.0%
Yellowtail N. of 40°10' N. latitude	88.0%	12.0%
Shortspine N. of 34°27' N. latitude	95.0%	5.0%
Shortspine S. of 34°27' N. latitude	50 mt	Remaining Yield
Longspine N. of 34°27' N. latitude	95.0%	5.0%
DARKBLOTCHED	**95.0%**	**5.0%**
Minor Slope RF North of 40°10' N. latitude	81.0%	19.0%
Minor Slope RF South of 40°10' N. latitude	63.0%	37.0%
Dover Sole	95.0%	5.0%
English Sole	95.0%	5.0%
Petrale Sole	95.0%	5.0%
Arrowtooth Flounder	95.0%	5.0%
Starry Flounder	50.0%	50.0%
Other Flatfish	90.0%	10.0%

Shoreside Trawl Allocations for Initial Issuance

Under Amendment 20 trawl rationalization, the two existing LE trawl sectors delivering groundfish to shoreside processing plants (i.e., shoreside whiting and shoreside non-whiting) are managed as one sector under a system of IFQs. However, before quota shares can be allocated to eligible LE trawl permit holders, an initial one-time allocation was made to the two shoreside sectors. All species subject to formal allocation, including sablefish north of 36° N. latitude and excluding the three trawl-dominant overfished species (i.e., darkblotched rockfish, Pacific ocean perch, and widow rockfish) and yellowtail rockfish are allocated to the shoreside whiting and shoreside non-whiting sectors based on 1995-2005 sector catch percentages (**Error! Reference source not found.**). An initial allocation of 300 mt of yellowtail rockfish was made to the shoreside whiting sector prior to allocation of Amendment 20 quota shares. The estimated fishing mortality of Amendment 21 species in the at-sea whiting fishery (i.e., total catch by catcher-processors and vessels delivering whiting to motherships) other than the three trawl-dominant overfished species is set-aside from the LE trawl allocations specified in **Error! Reference source not found.** prior to making the initial shoreside trawl sector allocations. While set-aside amounts for the at-sea whiting fishery (Mothership and Catcher/Processor sectors) were preliminarily decided under Amendment 21, the actual set-aside amounts will be based on the best available information on bycatch by these sectors in the biennial harvest specifications and management measures decision process.

Table 6-2. Shoreside trawl sector catch percentages during 1995-2005 used to apportion the initial allocation of Amendment 21 species to LE trawl sectors delivering groundfish to shoreside processing plants (i.e., shoreside whiting and shoreside non-whiting).

Stock or Complex	1995-2005 Sector Catch Percentage	
	Non-whiting	Whiting
Lingcod	99.70%	0.30%
Pacific Cod	99.90%	0.10%
Pacific Whiting	0.10%	99.90%
Sablefish N. of 36° N. latitude	98.20%	1.80%
Sablefish S. of 36° N. latitude	100.00%	0.00%
Chilipepper S. of 40°10' N. latitude	100.00%	0.00%
Splitnose S. of 40°10' N. latitude	100.00%	0.00%
Shortspine N. of 34°27' N. latitude	99.90%	0.10%
Shortspine S. of 34°27' N. latitude	100.00%	0.00%
Longspine N. of 34°27' N. latitude	100.00%	0.00%
Minor Slope RF North of 40°10' N. latitude	98.60%	1.40%
Dover Sole	100.00%	0.00%
English Sole	99.90%	0.10%
Petrale Sole	100.00%	0.00%
Arrowtooth Flounder	100.00%	0.00%
Starry Flounder	100.00%	0.00%
Other Flatfish	99.90%	0.10%

Allocation of Trawl Dominant Overfished Species

Under Amendment 20, the at-sea whiting sectors (i.e., catcher-processors and motherships) are managed in a system of sector-specific harvest cooperatives. Each at-sea whiting sector will manage their bycatch of canary rockfish, darkblotched rockfish, Pacific ocean perch, and widow rockfish using sector-specific total catch limits. An initial allocation of these four species needs to be made to the four existing LE trawl sectors before initial allocation of quota shares under Amendment 20. Initial sector allocation of canary rockfish would be decided in the biennial harvest specification and management measures process immediately preceding implementation of Amendments 20 and 21. The initial sector allocation of the trawl-dominant overfished species under Amendment 21 is as follows:

Darkblotched Rockfish

Allocate 9 percent or 25 mt, whichever is greater, of the total LE trawl allocation of darkblotched rockfish to the whiting fisheries (at-sea and shoreside combined). The distribution of the whiting trawl allocation of darkblotched to individual whiting sectors will be done pro rata relative to the sectors' whiting allocation.

Pacific Ocean Perch

Allocate 17 percent or 30 mt, whichever is greater, of the total LE trawl allocation of Pacific ocean perch to the whiting fisheries (at-sea and shoreside combined). The distribution of the whiting trawl allocation of POP to individual whiting sectors will be done pro rata relative to the sectors' whiting allocation.

Widow Rockfish

Initially allocate 52 percent of the total LE trawl allocation of widow rockfish to the whiting sectors if the stock is under rebuilding or 10 percent of the total LE trawl allocation or 500 mt of the trawl allocation to the whiting sectors, whichever is greater, if the stock is rebuilt. If the stock is overfished when the initial allocation is implemented, the latter allocation scheme automatically kicks in when it is declared rebuilt. The distribution of the whiting trawl allocation of widow to individual whiting sectors will be done pro rata relative to the sectors' whiting allocation.

Allocation of Pacific Halibut

Pacific halibut is a prohibited species in the west coast LE trawl fishery. Under Amendment 20, Pacific halibut bycatch in the shoreside trawl fishery north of $40^{0}10'$ N. latitude is managed using a system of individual bycatch quotas (IBQs). Under Amendment 21, an allocation of Pacific halibut was decided as follows:

The trawl mortality limit for legal and sublegal Pacific halibut be set at 15 percent of the Area 2A (i.e., waters off California, Oregon, and Washington) constant exploitation yield for legal size halibut, not to exceed 130,000 pounds for the first four years of trawl rationalization and not to exceed 100,000 pounds starting in the fifth year. This total bycatch limit may be adjusted downward or upward through the biennial specifications and management measures process. Part of the overall total catch limit is a set-aside of 10 mt of Pacific halibut to accommodate bycatch in the at-sea whiting fishery and bottom trawl bycatch south of 40°10' N. latitude. The set-aside amount of Pacific halibut to accommodate the incidental catch in the trawl fishery south of $40^{0}10'$ N. latitude and in the at-sea whiting fishery may be adjusted in the biennial specifications and management measures process in future years as better information becomes available.

Under Amendment 21, it was decided that any formal allocations be specified in the FMP. Future consideration for a re-allocation of FMP species subject to a formal allocation will require an FMP amendment. The provision to temporarily suspend formal allocation if a species is declared overfished (see Section 4.6.1(5) of the FMP) is maintained under Amendment 21.

All intersector allocations will be formally reviewed along with the formal review of the trawl rationalization program five years after implementation of Amendments 20 and 21.

[Amendment 18, 21]

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 ACLs/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] This discarded component is what the Magnuson-Stevens Act 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 ACL/OY. These measures 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, a fisher may discard fish of that stock 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 Magnuson-Stevens Act (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

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2 The Magnuson-Stevens Act 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 Magnuson-Stevens Act definition of bycatch is used, as distinct from incidentally-caught species.

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 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

The Magnuson-Stevens Act 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 Magnuson-Stevens Act 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 waters off Washington, Oregon, and California, may be required to accommodate an observer and/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 and/or electronic monitoring system for the purpose of estimating total catch inseason to implement a sector- or vessel-specific total catch limit program. 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 central processing unit 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 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 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. Combining bycatch information with information on landed catch 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 in time and an ACL/ annual OY. Management measures within a given year may be adjusted based on total catch information in order to prevent total catch from exceeding ACL/OY levels. Fishery managers also use historic total catch data in stock assessments and to develop future harvest specifications and management measures.

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 ACLs/OYs, including all overfished species. The states also require LE 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. Fish tickets are designed by the individual states, but there is an effort to coordinate record-keeping requirements with state and Federal managers through PSMFC. Catch weight by sorted species category, area of catch, vessel identification number, and other data elements are required on fish tickets. 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 PSMFC. The GMT and PSMFC manage the Quota Species Monitoring (QSM) data set 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 ACLs/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 in August 2001, placing observers aboard commercial groundfish vessels to monitor discards. By regulation (50 CFR 660.314), 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 percent and 20 percent 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 Magnuson-Stevens Act, 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 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 form 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 unit of 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 ODFW's 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 to port, 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 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 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 (California's sampling methodology for private recreational vessels) with 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 percent 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 percent 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 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

telephone survey for all effort.

- PC vessels are sampled using two surveys: a weekly telephone survey of all PC vessels for effort and onboard sampling for catch.
- Estimates of private access and night fishing effort and catch for PR, MM, and Beach and Bank sites by trip type are derived using the angler license database 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:

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.

[Amendment 18]

6.5 Bycatch Mitigation Program

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 Magnuson-Stevens Act 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 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 Magnuson-Stevens Act'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 the 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 **Error! Reference source not found.**. At Section 4.7, the FMP requires that landed catch ACLs/OYs be reduced from total catch ACLs/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

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 Magnuson-Stevens Act. 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 Magnuson-Stevens Act definition of fish and are therefore not defined as bycatch under the Magnuson-Stevens Act. 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 Section 6.8.4), and an at-sea observer program intended to track whiting and incidental species take inseason (See Section 6.4.1.1). Sea turtles are rare in areas where groundfish fisheries are prosecuted and no incidental take of sea turtles has 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 the *National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries*. This National Plan of Action contains guidelines that are applicable to the groundfish fisheries and would require seabird incidental catch mitigation if a significant problem is found to exist.

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 (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 LE fixed gear fleet and the vessel/permit buyback program for the LE trawl fleet.

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 and 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.

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 and 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.

Sector-specific Total Catch Limit Program

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 would have to 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 LE trawl vessels.
2. At-sea Pacific whiting catcher-processors.
3. LE trawl vessels delivering to at-sea Pacific whiting motherships.
4. LE trawl vessels delivering Pacific whiting to shore-based processing plants.
5. LE longline vessels.
6. LE pot vessels.
7. Directed open access vessels. These are vessels without a groundfish LE 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 LE 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 LE trawl vessel may make landings attributable to the shore-based whiting sector or the non-whiting LE trawl sector, and 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 non-groundfish 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 ACL/OY or total catch limit prevents attainment of target species' ACLs/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 ACLs/OYs 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.

6.5.3.4 Recreational Catch and Release Management

The Council may develop recreational catch-and-release programs for any groundfish stock through either the harvest specifications and management measures rulemaking (Section 6.2, C.) or the full rulemaking (Section 6.2, D) processes. 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.

[Amendment 18]

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

This 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). Trawl footrope diameter restrictions originated as a rockfish bycatch reducing measure, as discussed in Section 6.6.1.2. Footropes of diameters larger than 8 inches have been prohibited for use in the nearshore area in order to minimize bycatch, but the FMP had not set a formal boundary line for their use prior to 2006. Amendment 19 to the FMP requires permanent closure of the area shoreward of the 100 fm depth contour, a mandatory EFH protection measure.

The use of bottom trawl footrope gear with a footrope diameter larger than 19 inches is prohibited in the fishery management area.

The use of dredge gear is prohibited in the fishery management area.

The use of beam trawl gear is prohibited in the fishery management area.

States may implement parallel measures within their state waters (0-3 nm).

6.6.1.2 Trawl Gear

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 or modifications 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, without 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

Nontrawl gear includes all legal commercial gear other than trawl gear. Fixed gear (anchored non-trawl 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

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 are designed or modified to make contact with the sea floor during normal use. 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, or knives) are also considered bottom-contact gear for the purpose of regulation. Other gear, midwater trawl gear for example, although it may occasionally make contact with the sea floor during deployment, is not considered a bottom contact gear because the gear is not designed for bottom contact, is not normally 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

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 Magnuson-Stevens Act), 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.

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.

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.

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. 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

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).

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.

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 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

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.

[Amendment 18, 19]

6.8 Time/Area Closures

The Council uses a variety of time/area closures 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 (Section 6.8.6) are established in order to mitigate the adverse effects of fishing on EFH. 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 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.

6.8.1 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 LE 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 LE, 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 Section 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 allowable 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 perch 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

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.)

6.8.2 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. longitude, 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. Yelloweye Rockfish Conservation Area (YRCA): 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.

6.8.3 Ecologically Important Habitat Closed Areas

The Council has identified discrete areas that are closed 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) and bottom contact closed areas (BCCAs). 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 (see 50 CFR 660.306(h)), there are 50 such closures:

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. Astoria Canyon
2. Nehalem Bank/Shale Pile
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 North
7. Point Arena South Biogenic Area
8. Cordell Bank/Biogenic Area
9. Farallon Islands/Fanny Shoal
10. Half Moon Bay
11. Monterey Bay/Canyon
12. Point Sur Deep
13. Big Sur Coast/Port San Luis
14. East San Lucia Bank
15. Point Conception
16. Hidden Reef/Kidney Bank
17. Catalina Island
18. Potato Bank
19. Cherry Bank
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.

Bottom Contact Closed Areas

Off of Oregon:
1. Thompson Seamount
2. President Jackson Seamount

Off of California:
1. Cordell Bank (within 50 fm isobath)
2. Harris Point

3. Richardson Rock
4. Scorpion
5. Painted Cove
6. Davidson Seamount (fishing below 500 fm prohibited, see below)
7. Anacapa Island
8. Carrington Point
9. Judith Rock
10. Skunk Point
11. Footprint
12. Gull Island
13. South Point
14. Santa Barbara

All of the BCCAs off of California occur within the Cordell Bank, Monterey, or Channel Islands National Marine Sanctuaries. Mitigation measures implemented under Magnuson-Stevens Act authority are also intended to support the goals and objectives of these sanctuaries. In the case of Davidson Seamount, it is unlawful for any person to fish with bottom contact gear, or any other gear that is deployed deeper than 500 fathoms, within the area defined in Federal regulations. Closing the water column below 500 fathoms to fishing in addition to prohibiting fishing that contacts the bottom addresses Sanctuary goals and objectives while practicably mitigating the adverse effects of fishing on groundfish EFH.

Maps showing the locations of these closures and coordinates defining their boundaries, as published in Federal regulations, appear in FMP Appendix C.

6.8.4 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 to the outer extent of groundfish EFH (3,500 m, see Section 7.2, or the seaward boundary of the EEZ). 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 historically been adversely affected by bottom trawling. Because this closure applies to an area where bottom trawling effort has been limited or nonexistent, the socioeconomic impacts of this closure are modest.

6.8.5 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 so 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.)

[Amendment 18, 19]

6.9 Measures to Control Fishing Capacity, Including Permits and Licenses

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 LE program in detail.) In December 2003, NMFS reduced participation in the LE trawl fleet by buying the fishing rights to 91 LE 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.

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. Effort restrictions related to gear may also be useful in reducing bycatch.

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

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 Magnuson-Stevens Act.

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

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 LE permits authorize fishing within limits and restrictions specified for those permits. Vessels without such permits are also subject to the specified limits and restrictions for the open access fishery. 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

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.

6.9.1.3 Processor Permits

Federal permits also may be required for groundfish processors. Under the trawl rationalization program (see Section 6.9.3) mothership processors in the Pacific whiting fishery must possess a mothership (MS) permit. Like groundfish LE permits (see Chapter 11) Pacific whiting mothership (MS) permits are transferrable once initially distributed to qualifying vessels at the beginning of the trawl rationalization program. To qualify for initial issuance of an MS permit at the beginning of the program, a processing vessel must have processed at least 1,000 mt of Pacific whiting in each of any two years from 1997 through 2003.

6.9.2 Sector Endorsements

The Council may establish sector endorsements, such as with the LE 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 LE permits or to those in the open access or recreational fisheries, is a license limitation program.

6.9.3 Fishery Rationalization

6.9.3.1 The Trawl Rationalization Programs

The trawl rationalization program applies to vessels holding trawl-endorsed groundfish LE permits (and mothership processors registered to mothership permits). The program is intended to reduce fishery capacity, minimize bycatch, and meet other goals of the FMP. The program replaces most cumulative landing limits (in both whiting and nonwhiting shoreside LE trawl sectors) with individual fishing quotas. Under the Magnuson-Stevens Act, "an 'individual fishing quota' 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." The Council may establish IFQ programs for any commercial fishery sector.

The Pacific whiting mothership sector is managed through a system of cooperatives (co-ops) under which catcher vessels choosing to fish in a co-op would be obligated to deliver their catch to an associated mothership processor. Each year motherships and catcher vessels must identify which co-op they plan to participate in. If they do not plan to join a co-op for that year they participate in a non-co-op fishery. The Pacific whiting catcher-processor sector operates as a single, voluntary co-op. If the voluntary catcher-processor co-op dissolves, any allocation to the sector will be divided equally among the catcher-processor endorsed permits.

Appendix E describes the details of the trawl rationalization program that will be implemented in Federal regulations.

The trawl rationalization program described in Appendix E may be modified through regulatory amendments proposed by the Council per §303(c) of the MSA and reviewed by the Secretary per §304(b). Appendix E may be revised from time to time to reflect changes to the program, but changes can be made without submitting such changes for review by the Secretary as described in §304(a) of the MSA. The Council will establish a process for considering recommended changes to the regulations.

6.9.3.2 Rationalization of Other Fishery Sectors

IFQ programs could be established in other fishery sectors 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 that Mitigate EFH Impacts and May Reduce Capacity

If consistent with the goals and objectives of this FMP, the Council may facilitate and encourage private purchases of groundfish LE permits and corresponding vessels in order to mitigate EFH impacts by reducing fleet capacity. Private purchases intended solely to reduce fishing capacity would permanently foreclose the future use of subject permits and vessels in west coast groundfish fisheries, if like the federally-sponsored west coast groundfish trawl buyout program. Aside from any socioeconomic benefits, reducing fleet fishing capacity can mitigate adverse impacts of fishing on groundfish EFH to the degree that fishing activity with adverse consequences is reduced. In such cases where multiple objectives are being addressed, arrangements other than the immediate or permanent retirement of the permit and/or vessel may be a feature of the agreement. Contracts for the purchase of groundfish LE 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 12, 14, 15, and 16 (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*

The current condition of the groundfish fisheries of the Washington, Oregon, and California region is such that further reduction of the LE 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.

[Amendment 18, 19, 20]

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? Do the Enforcement Consultants 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

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

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

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).

Federal regulations at 50 CFR 600.735 state "Any person committing, or fishing vessel used in the commission of a violation of the Magnuson-Stevens Act or any other statute administered by NOAA and/or any regulation issued under the Magnuson-Stevens Act, is subject to the civil and criminal penalty provisions and civil forfeiture provisions of the Magnuson-Stevens Act, to this section, to 15 CFR part 904 (Civil Procedures), and to other applicable law."

[Amendment 18]

CHAPTER 7 ESSENTIAL FISH HABITAT

7.1 How This FMP Addresses Provisions in the Magnuson-Stevens Act Relating to Essential Fish Habitat

The Magnuson-Stevens Act (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 Magnuson-Stevens Act 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 HAPC in this FMP (Section 7.3); notwithstanding other criteria, HAPCs 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 provide further guidance on these required FMP contents. These guidelines recommend that FMPs identify HAPCs, 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 on EFH, the Magnuson-Stevens Act 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/life stages.

- Section 7.3 describes the groundfish HAPCs that have been identified by the Council, including the criteria used to identify those areas.

- 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 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

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 geographic information system (GIS).

- Areas designated as HAPCs 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 percent 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.

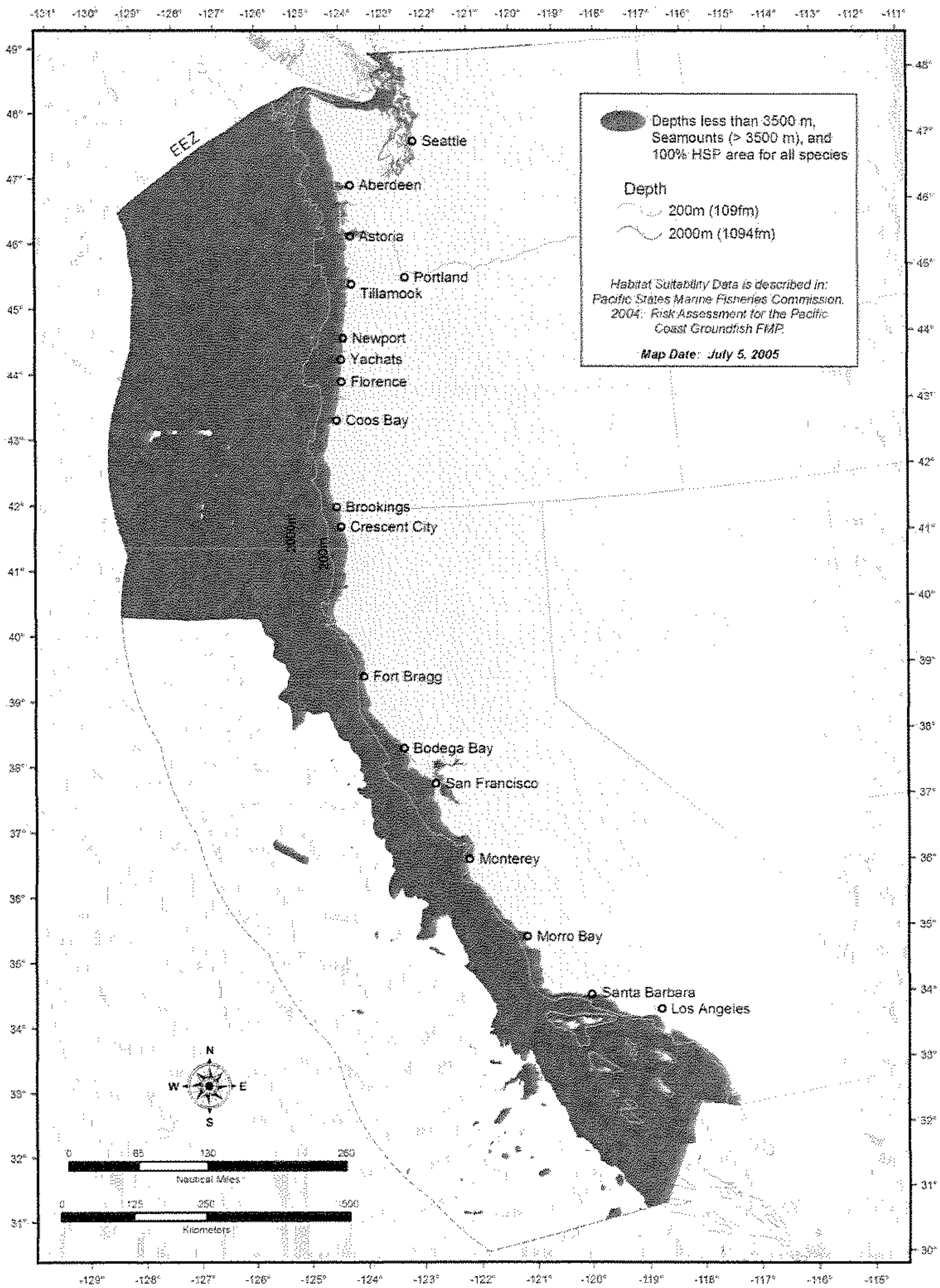

Figure 7-1. Groundfish EFH

7.2.1.1 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 the 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 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 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 percent. 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 percent 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 HAPCs 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 HAPCs. In some cases, HAPCs 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 HAPCs 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.

HAPCs 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 HAPCs are described below, which may be applied in specific circumstances to determine whether a given area is designated as a groundfish HAPC. HAPCs 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 HAPCs. For HAPCs 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 HAPCs 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 HAPCs, which can be used in conjunction with the map to determine if a specific location is within one of these HAPCs. The areas of interest HAPCs 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.

Defining characteristics: 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.* (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 10 feet, a mid-water 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 (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 (Wyllie-Echeverria and Ackerman 2003) published a 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.).[1]

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 HAPCs:

- Off of Washington: All waters and sea bottom in state waters 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 Channel Islands National Marine Sanctuary; specific areas of the Cowcod Conservation Area.

The Washington State waters HAPC encompasses a variety of habitats important to groundfish, including other HAPCs 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).

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[1] 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).

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, 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 (Mullineaux and Mills 1997;Dower and Perry 2001) and zooplankton, a principal food source for rockfish (Genin, *et al.* 1988; Haury, *et al.* 2000). Several species observed on seamounts, such as deep sea 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 HAPCs 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.

Defining characteristics: 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 HAPCs 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.

7.3.2 Process for Modifying Existing or Designating New HAPCs

Recognizing that new scientific information could reveal other important habitat areas that should be designated HAPCs or call into question the criteria for existing HAPCs, the Council may designate a new HAPC or modify or eliminate an existing HAPC through the process described below. This process allows organizations and individuals to petition the Council at any time to consider a new designation, or modify or eliminate an existing 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 a new HAPC, the location of the HAPC, defined by specified geographic

characteristics such as coordinates, depth contours, or distinct biogeographic characteristics; (b) for a new HAPC, how the HAPC meets the criteria specified in regulations at 50 CFR 600.815 (a)(8), or for changes to an 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 to 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.

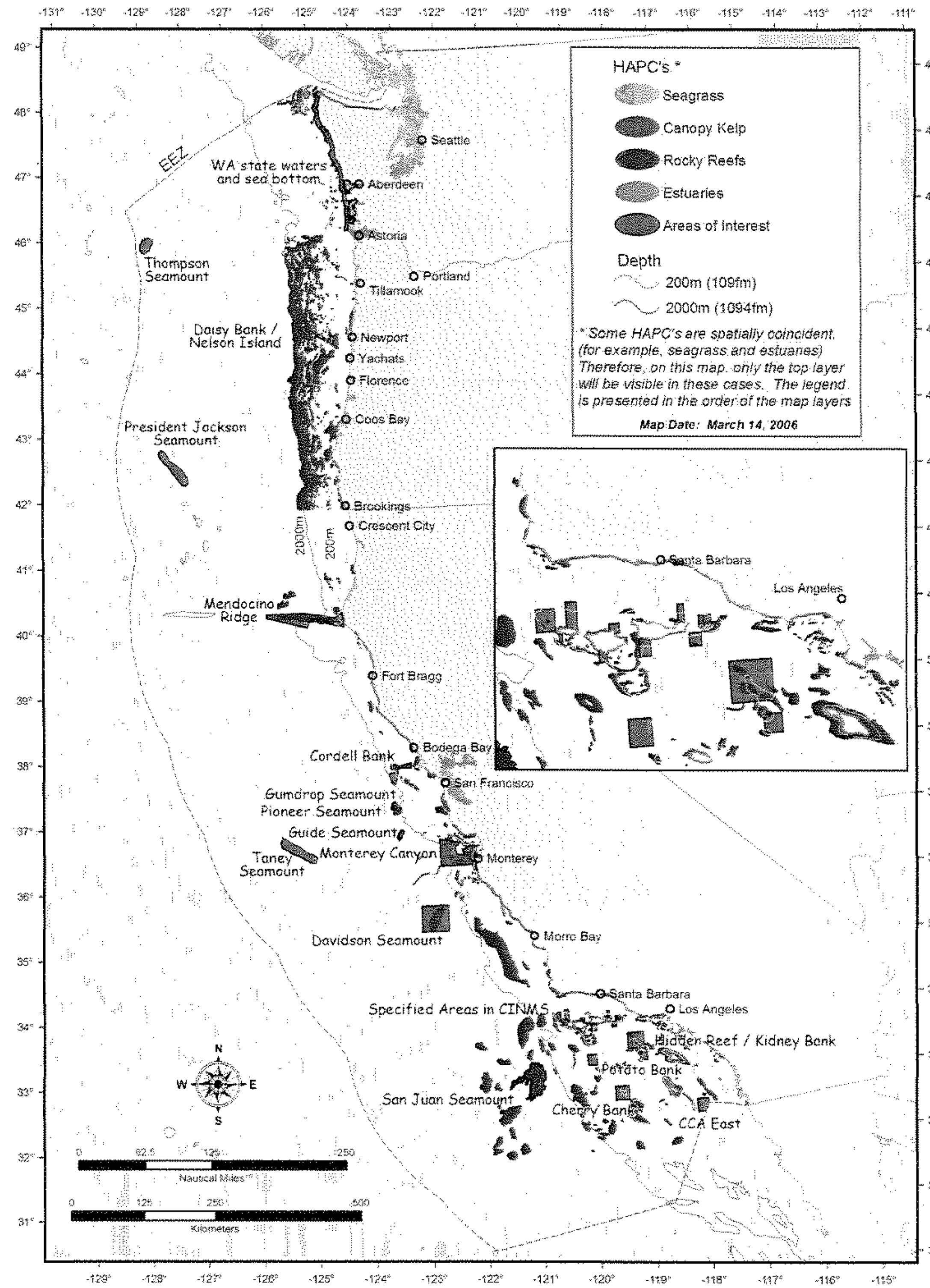

Figure 7-2. Groundfish HAPCs.

7.4 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 to the outer extent of groundfish EFH (3,500 m) or the seaward extent of the EEZ, preventing the expansion of the use of this gear type into area 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 aerial 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 & A grounds of the Makah, Hoh, and Quileute Tribes, and the Quinault 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 & 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 & A grounds will be subject to these procedures.

7.5 EFH Coordination, Consultation, and Recommendations

The Magnuson-Stevens Act (§305(b)) also provides a mechanism for NMFS and the 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' 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 ESA, Clean Water Act, NEPA, 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 Descriptions and Identification

The Council will review the EFH description and identification, HAPC designations, and information on fishing impacts and nonfishing impacts included in this FMP at least every five years. New information may be included in the annual SAFE document or similar document and, if necessary, the FMP may be amended. 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 LE 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 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 LE 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 LE 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 LE 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.

[Amended: 11, 19 (all Chapter 7)]

CHAPTER 8 EXPERIMENTAL FISHERIES

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 goal and objectives. Experimental fishing will be conducted under Federal EFPs issued under Section 303(b)(1) of the Magnuson-Stevens Act.

The Regional Administrator may authorize, for limited experimental purposes, the direct or incidental harvest of groundfish managed under this FMP that would otherwise be prohibited. No experimental fishing may be conducted unless authorized by an EFP issued by the Regional 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 Administrator consider issuance of EFPs for a particular experiment in advance of the Regional 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 to 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 apply nationwide and are found in Federal regulations at 50 CFR 600.745:

1. Applicants must submit a completed application in writing to the Regional 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 exempted fishery for which an EFP is needed, including justification for issuance of the EFP;
    d For each vessel to be covered by the EFP:
        (1) A copy of the USCG documentation, state license, or registration of each vessel, or the information contained on the appropriate document; and
        (2) The current name, address, and telephone number of owner and master;
    e. The species (target and incidental) expected to be harvested under the EFP, the amount(s) of such harvest necessary to conduct the exempted fishing, the arrangements for disposition of all regulations species harvested under the EFP, and any anticipated impacts on marine mammals and endangered species;
    f. 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
    g. The signature of the applicant.

The Regional Administrator may request from an applicant additional information necessary to make the determinations required under this section.

2. The Regional Administrator will review each application and will make a preliminary determination whether or not the application contains all of the required information and constitutes an activity appropriate for further consideration. If the Regional Administrator finds any application does not warrant further consideration, both the applicant and the Council will be notified in writing of the reasons for the decision. If the Regional Administrator determines that any application warrants further consideration, notification receipt of the application will be published in the *Federal Register* with a brief description of the proposal, and the intent of NMFS to issue an EFP. Interested persons 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 notification may establish a cutoff date for receipt of additional applications to participate in the same or a similar exempted fishing activity.

    The Regional Administrator also will forward copies of the application to the Council, the United States Coast Guard, and the fishery management agencies of Oregon, Washington, California, and Idaho, accompanied by the following information:

    a. The effect of the proposed EFP on the target and incidental species, including the effect on any ACL/OY;
    b. A citation of the regulation or regulations that, 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 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 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 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;
   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;
   c. Issuance of the EFP would have economic allocation as its sole purpose;
   d. Activities to be conducted under the EFP would be inconsistent with the intent of national goals for Magnuson-Stevens Act implementation or the management objectives of this FMP;
   e. The applicant has failed to demonstrate a valid justification for the permit; or
   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, as granted, is significantly different from the original application, or is denied, NMFS may publish notification in the *Federal Register* describing the exempted fishing to be conducted under the EFP or the reasons for denial.

6. The Regional Administrator may attach terms and conditions to the EFP consistent with the purpose of the exempted fishing, including, but not limited to:

   a. The maximum amount of each regulated species that can be harvested and landed during the term of the EFP, including trip limitations, where appropriate;
   b. The number, size(s), name(s), and identification number(s) of the vessel(s) authorized to conduct fishing activities under the EFP;
   c. The time(s) and place(s) where exempted fishing may be conducted;
   d. The type, size, and amount of gear 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 carried on board vessels operated under an EFP, and any necessary conditions, such as predeployment notification requirements;
   f. Reasonable data reporting requirements;
   g. 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 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.

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 Federal regulations.

[Amendment 18]

CHAPTER 9 SCIENTIFIC RESEARCH

Nothing in this FMP is intended to inhibit or prevent any scientific research involving groundfish which is acknowledged by the Secretary or his delegee, and is to be conducted in the fishery management area by a scientific research vessel or a commercial vessel contracted to carry out scientific research.

Activity should not be acknowledged as scientific research unless it is submitted in writing to the Secretary of Commerce or his delegee in the form of a research proposal which addresses all of the factors below. An activity may be acknowledged as scientific research if its primary objective, purpose, or product is the acquisition of data, information, or knowledge as determined by consideration of all of the following factors:

1. Clearly researchable subject matter exists which will result in information useful for scientific or management purposes;

2. The application of existing knowledge alone is insufficient to solve the scientific or management subject presented by the scientific research proposal;

3. Facts/data/samples will be collected or observed and analyzed in a scientifically acceptable manner and the results will be formally prepared and available to the public; and

4. Recognized scientific experts, organizations, or institutions with expertise in the field or subject matter area are sponsoring or are otherwise affiliated with the activity.

Secretarial Acknowledgment of Scientific Research

1. If the Secretary of Commerce or his delegee agrees that an activity constitutes scientific research involving groundfish, a letter of acknowledgment should be issued to the operator or master of the vessel conducting the scientific research.

2. The letter will include information on the purpose, scope, location, and schedule of the acknowledged activities.

3. Any activities not in accordance with the letter of acknowledgment should be subject to all provisions of the Magnuson-Stevens Act and its implementing regulations.

4. The Secretary or his delegee should transmit copies of letters of acknowledgment to the Council and to state and Federal administrative and enforcement agencies to ensure they are aware of the research activities.

Groundfish taken under the scientific research exclusion may be sold to offset all or part of the cost of carrying out the research plan including costs associated with operating the research vessel.

CHAPTER 10 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. 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 national standards to ensure that the state regulations are enforceable. If appropriate, the Council may also recommend to 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 Magnuson-Stevens Act, 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; and,

5. Any impacts in terms of achievement of quotas or harvest guidelines, 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.

[Amendment 18]

CHAPTER 11 GROUNDFISH LIMITED ENTRY

All references to fishing activities in these proposals are references to catching activities occurring off the Washington, Oregon, and California coasts unless otherwise noted.

11.1 Introduction

11.1.1 Problem to be Addressed by this Groundfish Limited Entry System

The Council adopted the following problem statement in April 1990:

Nearly all groundfish stocks are now fully harvested by domestic fishermen in the Pacific Coast groundfish fishery. While fleet harvesting capacity has increased, harvests are declining as stocks are fished down to MSY levels. Further, there is a general level of excess harvest capacity existing in most West Coast and North Pacific fishing fleets (e.g., shrimp, crab, halibut, salmon, etc). As these other fisheries grow increasingly overcrowded relative to available harvest, it becomes more likely that capacity will be redirected to the west coast groundfish fishery when downturns occur elsewhere. In addition, the implementation of more restrictive management regulations in other fisheries, including individual trawl quota (ITQ) LE systems, may result in increased effort during season openings in the west coast groundfish fishery.

In the Pacific Coast groundfish fishery, declining stocks and the presence of harvest capacity in excess of that necessary to catch the resource result in increasing number and complexity of regulations. Accordingly, the Council faces increased pressure to balance the conflicting need to adopt more restrictive regulations for protecting the resource with the need to provide sufficient allowable catch to sustain the fleet.

Increased number and complexity of regulations have many adverse impacts in such areas as fleet costs, resource utilization, safety, and enforcement costs and effectiveness. Additionally, there is a point beyond which added regulations which interfere with day-to-day vessel operations (e.g., trip limits or mesh size regulations) will not improve the Council's ability to accomplish its goals. Pressures on industry arise not only from management measures which restrict operations, but also the division of the allowable catch among larger numbers of vessels.

Two components comprise fleet harvest capacity: vessel fishing power and number of vessels. As harvesting capacity in the fisheries continues to increase, problems arising from the need for more restrictive management measures and resolution of allocation issues become more acute. It is apparent that no relief from these problems will occur if management actions continue to allow increased harvest capacity.

11.1.2 Goals and Objectives for Groundfish Limited Entry

The following are the goals and objectives for LE adopted by the Council in April 1990. The primary objective directly addresses the overcapacity problem, and the secondary objectives address the ways the Council hopes LE will promote achievement of the Council's goals and objectives for the groundfish fishery.

Goals. The goals for the west coast groundfish fishery LE program are to improve stability and economic viability of the industry while recognizing historic participation, meet groundfish management objectives, and provide for enforceable laws.

Primary Objective. The primary objective of the LE program will be to limit or reduce harvest capacity in the west coast groundfish fishery.

Secondary Objectives. In pursuit of the primary objective, the following secondary objectives will be addressed:

Economic

- Promote long-term economic stability.
- Increase net returns from the fishery.
- Allow flexibility for combination vessels.

Management

- Stabilize management regimes by reducing need for frequent inseason changes.
- Reduce the cost of management.
- Reduce bycatch and waste.
- Encourage effort in underutilized species fisheries.

Enforcement

- Promote cost-effective enforcement by reducing need for frequent changes and tight trip limits.
- Promote logistically viable enforcement by minimizing need to use regulations such as trip limits or subarea closures which are more difficult to enforce.

Social

- Recognize and accommodate historical participation of those investing their life and resources in the fishery.
- Maintain a mechanism for fishery entrance/exit and flexibility for change in the fleet.
- Reduce conflicts between user groups by limiting or reducing effort competition for the same resource.
- Provide a stable supply of groundfish to the public at a reasonable price.

11.1.3 Achievement of Goal and Objectives and Need for Additional Measures to Reduce Capacity

The license limitation system adopted under this amendment to the groundfish FMP will not in itself immediately accomplish in a readily apparent manner the goals and objectives the Council has set out for LE. It is a first step that may slow or prevent the worsening of conditions which impede the Council from achieving the overall goals and objectives for the fishery. The Council believes it is reasonable to expect that the primary objective will be accomplished through this license limitation system; i.e., there will be an effective limit which reduces growth in the active fleet and results in less capacity in the fishery under the adopted license limitation program than would have been present in its absence. However, movement toward the goals and objectives as compared to the existing fishery will become apparent only when a way is found to substantially reduce the capacity already present.

Establishment of this license limitation system will provide a starting point for any future programs which may be necessary to further reduce harvest capacity. To further reduce harvest capacity, a voluntary buy-back program should be implemented and the appropriate enabling legislation for funding sought. Incremental implementation of a groundfish ITQ program may also be considered as a means of further reducing harvest capacity.

11.1.4 Nature of the Interest Created

Groundfish LE permits and endorsements confer a right to participate in the west coast groundfish fishery with LE gear in accordance with the LE system established under the groundfish FMP as modified by this chapter of the FMP (created under Amendment 6) or any future amendment which may modify or even abolish the LE system. The permits and endorsements are also subject to sanctions, including revocation, as provided by the Magnuson Fishery Conservation and Management Act, 16 USC at 1858(g) and 15 CFR Part 904, Subpart D.[1]

11.1.5 Fisheries Within the Scope of the Limited Entry Program

The provisions of this chapter apply only to the commercial groundfish fisheries. Regulations and allocations for the treaty Indian and recreational fisheries are not affected by the provisions of this chapter unless specifically mentioned. All harvest guidelines, quotas and catches referenced are those specific to the non-treaty commercial fisheries.

11.2 Management, Allocation and General Rules on the Issuance and Use of Groundfish LE Permits, Gear Endorsements, Size Endorsements, and Fixed Gear Sablefish Endorsements

11.2.1 Federal LE Permits Required Only for Gears Fishing on the Limited Access Quota

1. Federal groundfish LE permits will be required and issued only for those vessels catching Council-managed groundfish species[2] with groundfish LE gears (trawl, longline or fishpot gear) under the limited access fishery regulations.[3]

2. Vessels using exempted gears (all gears other than trawl, longline and fishpot) or using longline

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[1] It is intended that a statement of the nature of the interest created be included on the groundfish LE permit.

[2] All references to "Council-managed groundfish" refer only to groundfish species specified in the Council groundfish FMP which are caught in the exclusive economic zone or adjacent state waters off Washington, Oregon and California.

[3] References to longline, pot, and trawl gear are references to legal groundfish gears as defined by the groundfish FMP.

or fishpot gear[4] without a permit endorsed for one of those gears may continue to catch groundfish under an open access system. However, catch by vessels with trawl-endorsed LE permits that use such gears may instead be managed with IFQs, as specified in the regulations for the IFQ program (see Appendix E). (Exempted, longline and fishpot gears used by vessels without endorsements for those gears are termed open access gears.)

11.2.2 Allocations Between the Limited Entry and Open Access Fisheries and Management of the Open Access Fishery

1. The division of the fleet into LE and open access participants will require that separate allocations be established for each group.

2. Allocations for the open access fishery will be based on historical catch levels for the period July 11, 1984 to August 1, 1988 by exempted, longline, and fishpot gears used by vessels which did not receive an endorsement for the gear where management measures are required to prevent harvest in excess of ACLs.

    a. On the basis of landings over this period, a percentage of catch[5] for these gears will be determined and applied to harvest guidelines and quotas in order to establish the allocation for the open access portion of the fishery. The open access portion of harvest guideline or quota will be set aside before other allocations are made.

    b. LE/open access allocation percentages for specific species and species groups will be determined after this LE program is implemented, and permitted and non-permitted vessels are identified.

    c. An open access allocation based on catch history will be determined for each separate species, species group, and area for which the Council determines an allocation is necessary.

    d. Initial determination and any subsequent revision of the species or species groups and areas for which an open access allocation will be made will occur through a rulemaking under the appropriate framework in Chapter 6 of this plan.

    e. Open access allocations for species, species groups and areas identified for such allocation by the Council will be specified during the biennial process for setting specifications described in Section 5.7 of this plan.

    f. A change in the catch history allocation method for determining the allocation for the open access fishery will require a plan amendment.

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4 Trawl gear may not be used without a permit because the open access fishery for limited entry gears is aimed at accommodating small producers and will likely be managed under restrictive trip limits. The fishing power of trawl gear would result in excessive discards under these trip limits. Additionally, while longline and fishpot vessels catching small quantities of groundfish will be prevented from qualifying by the structure of the minimum landing requirements (MLRs) (a day's landings must be greater than 500 pounds in order for the day to count toward meeting the MLR; Section 11.3.1.3), this structure will provide little barrier for most trawl vessels. Thus, there is no strong reason to provide the open access opportunity to compensate for the 500 pound per landing day threshold.

5 Percentage of catch as determined through the Pacific Coast Fisheries Information Network database or some comparable database.

g. If a group of vessels that initially is to participate in the open access fishery later receives permits in the limited access fishery, the historical catch levels of those vessels shall be deducted from the historical catch levels used to calculate the open access allocation, and the percentages used in setting the open access allocation recalculated. For example, if a vessel whose gear is prohibited by a state or the Secretary of Commerce qualifies for a LE permit under Section 11.3.2.3(9), or if a small LE fleet is incorporated under Section 11.3.1.3(9) and its vessels are issued LE permits, their catch history with the banned gear or the LE gear for which they are now going to receive permits shall be deducted from the open access fishery's historical catch levels, and open access percentages will be recalculated.

h. Prior to expiration of "B" endorsements, vessels' catch history using gears for which they receive "B" endorsements is not included in the catch history used to calculate the percentage of catch for open access vessels. When "B" endorsements expire, the historic catch levels of vessels which received "B" endorsements for longline or fishpot gear when using that gear will then count toward determining the proportion allocated to the open access quota. The historic catch levels of vessels which received "B" endorsements for trawl gear will continue to count toward determining the limited access quota and will not be transferred to the catch history used to determine the open access quota, even after trawl "B" endorsements expire.

3. For International North Pacific Fisheries Commission areas where quotas or harvest guidelines for a stock are not fully utilized, no limited/open access allocation will be established until it is anticipated the allowable catch for a species or group of species will be reached.

4. Groundfish catch will be counted against the allocation to the fishery or sector into which the vessel has declared or is otherwise participating.

5. Allocations among gear types for species other than sablefish north of 36° N. latitude may be established in the future. If this occurs, portions of the new allocations may, in turn, be allocated to the open access fishery under the principles set forth in this section.

6. Management of the open access fishery.

a. The open access portion of the fishery will be managed to provide year-round fishing opportunity.

b. The purpose of providing an open access alternative for vessels using longline or fishpot gear is to allow a group of vessels which has historically fished at low levels, with minimal impacts on the resource (fewer than 5 or 6 landings greater than 500 pounds per vessel during the qualifying window period, July 1, 1984 through August 1, 1988), to remain in the fishery without creating permits which may be used at higher effort levels.

c. The open access fishery will be managed with the intent of maintaining the historic fishing opportunities for the participant groups and to keep the overall catch in line with historic harvests. For example, trip limits for non-permitted longline and fishpot gears operating in the open access fishery will likely be fairly low because the historic fishing levels of this group are low. Trip limits, when necessary, for some exempted gears will probably be higher because their historic fishing levels are higher.

11.2.3 Initial Issuance of Limited Entry Permits

1. Each qualifying vessel will entitle only the current owner[6] to one LE permit.

2. A vessel qualifies for an LE permit by meeting the initial issuance criteria for one or more gear endorsements (see Sections 11.2.5 and 11.3).

3. A given vessel will not result in the issuance of more than one LE permit.

11.2.4 Ownership Restriction and Changes in Ownership

1. Only entities (human beings, corporations, etc.) qualified to own a U.S. fishing vessel may be issued or may hold (by ownership or otherwise) an LE permit. (Foreign ownership of LE permits should be limited to the maximum degree possible given what is allowed under the law.)

2. Ownership of a permit will be considered to change when there is an ownership change on U.S. Coast Guard documents, however, an owner can submit documents to demonstrate that the controlling interest has not changed and therefore the change in documentation is not a change in ownership.

3. An entity qualified to hold an LE permit may hold more than one LE permit. If the Council authorizes an LE permit stacking program, in which a vessel could use multiple permits simultaneously, each LE fishery participant would be required to hold at least one LE "base" permit. An LE base permit is the initial permit necessary to participate in the LE fishery, and subject to all of the requirements described herein for LE permit ownership qualifications, and gear and length endorsements. Requirements and additional privileges for permits "stacked" on to base permits may be authorized by Federal rulemaking.

4. For the purpose of provisions specifically identified by the Council, NMFS may promulgate regulations which define a change in ownership of a permit as a change in the identity or ownership interest of a corporation or partnership owning a permit.

11.2.5 Gear Endorsements

1. An LE permit confers no rights without a valid gear endorsement attached.

2. As of Amendment 13 to the FMP, there is only one functioning type of endorsement, the "A" endorsement. With Amendment 13, the provisional "A" endorsement, the "B" endorsement, and the designated species "B" endorsements were removed as expired or defunct.

3. Gear endorsements will be affixed to the LE permit and specify the type of LE gear which may be used to catch Council-managed groundfish.

4. A gear endorsement for a particular gear authorizes the catch of all Council-managed groundfish species with that gear, except in the case of fishing for which a fixed gear sablefish endorsement

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[6] An exception to this would occur in the case of a lost vessel (Section 11.2.9.1 paragraph 2), or if a contract transferring vessel ownership specified that the seller would retain the rights to the LE permit. In this case, a past owner (the seller) may ultimately receive the LE permit.

is required (see Section 11.2.6). LE vessels using longline and fishpot gear to catch sablefish against the LE quota north of 36° N. latitude are required to hold fixed gear sablefish endorsements during periods specified in the regulations, in addition to the required gear endorsement.

5. More than one gear endorsement may be affixed to a single LE permit.

6. Gear endorsements are required for LE-permitted vessels to use LE gear types (see Section 11.2.1, paragraph 1) to catch groundfish under the regulations governing the LE fishery.

   a. Longline and Fishpot Usage for Vessels with a Permit Endorsed for the Gear. If a vessel has longline or fishpot gear on board, and the vessel is registered to an LE permit that is endorsed for the longline or fishpot gear on board, regulations for the limited access fishery will apply to the vessel. If the vessel also has a trawl endorsement and has opted to participate for a period in the trawl rationalization program using the fixed gear (longline or fishpot) for which it holds an endorsement, then the trawl rationalization portion of the LE fishery regulations will apply to the vessel for that period.

   b. Exception for Longline and Fishpot Gear Usage for Vessels With a LE Permit not Endorsed for the Gear Being Used:

      i. As specified in Section 11.2.1, paragraph 2, LE vessels may use longline and pot gear without an endorsement, in which case the use of the gear is governed by the open access fishery regulations unless the vessel's LE permit is endorsed for trawl gear.
      ii. As specified in Section 11.2.2, if a vessel registered to a LE permit is fishing with longline or fishpot gear, but without an endorsement for that gear, the catch still counts against the LE fishery allocation (See Section 11.2.2).
      iii. As specified in the trawl rationalization program (Section 6.9.3.1 and Appendix E) vessels registered to a trawl-endorsed LE permit and using longline or fishpot gear without a LE endorsement for those gears must cover their landings with trawl IFQ and comply with the provisions of the trawl IFQ program. Open access sector regulations will not apply to vessels participating under the IFQ program.

   c. Trawl Gear Usage. Trawl gear and Council-managed groundfish may not be on board a vessel at the same time, nor may the gear be deployed, without an LE permit registered for the vessel and endorsed for trawl gear.

7. Depending on the type of gear endorsement (see Section 11.3 on the specific type of gear endorsements):

   a. the period for which the gear endorsement is valid may be limited, and
   b. the gear endorsement may or may not remain valid when the LE permit is transferred.[7]

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[7] Unless otherwise noted:

a. Transferable means separable from the vessel owner and vessel.

b. LE permit transferability, with respect to an owner, means the LE permit may be transferred, inherited, sold, bartered, traded, given or otherwise alienated from the LE permit owner.

c. LE permit transferability, with respect to a vessel, means the LE permit may be registered for use with a different vessel.

8. Gear endorsements are not separable from the LE permit and therefore may not be transferred separately from the LE permit.[8]

9. Limitations which apply to a given gear endorsement shall not restrict the use of any other gear endorsement on the same LE permit.

10. Rules on the issuance of gear endorsements and other characteristics of the gear endorsements are specified under sections on each type of gear endorsement (see Section 11.3).

11.2.6 Sector Endorsements

11.2.6.1 1Fixed Gear Sablefish Endorsements

1. The permit and gear endorsement requirements of the license limitation program limit the number of vessels which may participate in the groundfish fishery, however, there is still substantial opportunity for vessels to shift between segments of the groundfish fishery. One of the segments of the LE fishery subject to an increase in the number of vessels participating is the LE fixed gear sablefish fishery. To prevent the movement of vessels from non-sablefish segments of the LE fixed gear groundfish fishery to the sablefish segment of the fishery, a fixed gear sablefish endorsement for LE permits is required for longline and fishpot gear LE vessels to take sablefish against the fixed gear LE allocation and as part of the primary fishery, the major LE fixed gear sablefish harvest opportunities north of 36^0 N. latitude. Such endorsements are not required to harvest under fixed gear LE daily-trip-limit or other regulations intended to allow low level or incidental harvest.

2. The fixed gear sablefish endorsement will be affixed to the permit.

3. The fixed gear sablefish endorsement will remain valid when the permit is transferred.

4. If permits are stacked such that a single permit has multiple sablefish endorsements, sablefish endorsements and associated cumulative limits may be transferred to other sablefish-endorsed permits so long as at least one sablefish endorsement and associated tier limit remains with the permit. Fixed gear sablefish endorsements may not be transferred from permits on which there is only one fixed gear sablefish endorsement.

5. Limitations which apply to the fixed gear sablefish endorsement and fishing there under shall not restrict the use of any trawl gear endorsement on the same LE permit, unless these restrictions are specific in their application to trawl gear.

6. Rules on the issuance of fixed gear sablefish endorsements and other characteristics of the endorsements are specified in Section 11.4.

The fixed gear sablefish endorsement is intended for operations participating in the fixed gear sablefish fishery which were significantly active and dependent on the fishery prior to the end of the qualifying period specified in paragraph 3. The following paragraphs describe qualifying criteria that were used for initial issuance of the fixed gear sablefish endorsement.

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[8] The intent of this provision is to not allow the fishing capacity to expand by separate transfer of endorsements which might otherwise go unused.

1. A fixed gear sablefish endorsement will be affixed to any LE permit which meets the fixed gear sablefish endorsement qualifying criteria.

2. The catch history used to determine whether a permit meets the fixed gear sablefish endorsement qualifying criteria is the permit catch history. Permit catch history includes the catch history of the vessel(s) that initially qualified for the permit and the catch of any other vessels with which the permit rights were associated during the time the rights were associated with the vessel (if the current permit is the result of the combination of multiple permits, then for the combined permit to qualify for an endorsement, at least one of the permits which were combined must have sufficient sablefish history to qualify for an endorsement on its own; or the permit must qualify based on catch occurring after it has combined but within the qualifying period). Permit catch history also includes the catch of any interim permit held by the current owner of the permit during the pendency of an appeal on a permit denied under the groundfish LE program, but only if (1) the appeal on which the interim permit was based was lost and (2) the owner's current permit was used by the owner in the 1995 LE sablefish fishery.

3. The fixed gear sablefish endorsement qualifying criteria are at least 16,000 pounds round weight of sablefish caught with longline or fishpot gear in one year from 1984 to 1994. All catch must be non-Indian harvest from Council-managed areas. Harvest taken in tribal set-aside fisheries does not qualify.

4. The NMFS issuing authority will have broad authority to examine information other than codes on landing tickets in determining whether the qualifying criteria is or is not met.

11.2.6.2 Pacific whiting Catcher-processor (CP) Endorsement

The class of CP endorsed permits (CP permits) is limited by an endorsement placed on an LE permit. LE permits registered to qualified catcher-processor vessels are endorsed as CP permits. A qualified permit is one that harvested and processed in the catcher-processor sector of the Pacific whiting fishery at any time from 1997 through 2003. A vessel that is 75 feet or less LOA that harvests whiting and, in addition to heading and gutting, cuts the tail off and freezes the whiting, is not considered to be a catcher-processor nor is it considered to be processing fish. Such a vessel is considered a participant in the shorebased whiting sector, and is subject to regulations and allocations for that sector (50 CFR 660.373(a)(3). Therefore, such vessels do not require a CP endorsement.

11.2.6.3 Pacific whiting Catcher Vessel (CV(MS)) Endorsement

Permits with a qualifying history are designated as CV(MS) permits through the addition of an endorsement to their LE groundfish permit. Only vessels registered to an LE permit with a CV(MS) endorsement may participate in the Pacific whiting mothership-processor fishery. A qualified permit is one that has a total of more than 500 mt of whiting deliveries to motherships from 1994 through 2003.

11.2.7 Size Endorsement Will Specify the Vessel Length

The LE base permit will be endorsed with the length overall (as defined for purposes of U.S. Coast Guard documentation) of the vessel for which the LE permit is initially issued. The length for which the LE permit is endorsed will be changed only when LE permits are combined, as per Section 11.2.11.[9] Vessels

[9] The FMP included an exception for when LE permits endorsed for trawl gear were transferred to a smaller vessel such that the LE permit will be reissued with a size endorsement for the length of the smaller vessel (from Amendment 6). This

which do not have documents stating their length overall will have to be measured by a marine surveyor or the U.S. Coast Guard and certified for that length.[10]

If the Council establishes a permit stacking program, that program may or may not require that permits stacked on top of the base LE permit be endorsed with the length overall of the vessel holding the permits.

11.2.8 An LE Permit and Necessary Gear Endorsements Will Be Held by the Owner of Record of the Vessel

1. The vessel owner is responsible for acquiring and holding an LE permit with the necessary gear endorsement(s) for each vessel that is required to have an LE permit to catch Council-managed groundfish under the LE system (vessels fishing LE gear under the limited access quota and regulations).

2. The vessel owner is responsible for acquiring and holding an LE permit with the longline or fishpot endorsement(s), and fixed gear sablefish endorsement(s), for each vessel that is required to have such endorsements to catch Council-managed sablefish under the LE system (vessels fishing longline and fishpot gear against the LE fixed gear sablefish allocation and under LE fixed gear sablefish regulations during fishing periods specified in the regulations and north of 36° N. latitude).

3. The vessel owner is responsible for maintaining NMFS-required documentation of the LE permit on board the vessel.

4. The LE permit will be used with one vessel only. That vessel must be declared and registered with the NMFS issuing authority. Registration is incomplete until acknowledged in writing by NMFS. (Transfer of an LE permit to a different vessel is allowed as per Section 11.2.8.)

5. A vessel owner may not use a vessel, or allow a vessel to be used, to catch any Council-managed groundfish with LE gear under the limited access quota and regulations unless the vessel owner holds an LE permit with gear endorsement(s) which explicitly allows such catch, and the LE permit has been registered with NMFS for use with that vessel.

6. A vessel owner may not use a vessel, or allow a vessel to be used, to catch any Council-managed sablefish with longline or fishpot gear against the LE fixed gear sablefish allocation as part of the primary fixed gear sablefish fishery specified in the regulations and north of 36° N. latitude, unless the vessel owner holds an LE permit with a longline or fishpot gear endorsement and a fixed gear sablefish endorsement, and the LE permit has been registered with NMFS for use with that vessel. Sablefish endorsements are not required to harvest under fixed gear LE daily-trip-limit or other regulations intended to allow low level or incidental harvest.

11.2.9 Transfer of an LE Permit to Different Owners or Vessels of the Same Owner

1. LE permits may be transferred to other owners for use with other vessels or used with other vessels under the same ownership, but will continue to be restricted by size and gear

exception was removed by Amendment 20.

10 While not an immediate cap on vessel capacity, the size endorsement places an upward limit on the amount by which the capacity used with an LE permit may increase.

endorsements unless otherwise designated through a permit stacking program.

2. Whenever an owner wishes to transfer an LE permit to a different owner or use an LE permit with a different vessel under the same ownership, the NMFS issuing authority must be notified of the change. Notification is not complete until acknowledged in writing by NMFS.

3. LE base permits may be used with vessels greater in length than the endorsed length provided the increase does not exceed five feet of the endorsed length. Original size endorsements will change only when LE permits are combined as per Section 11.2.11, or when an LE permit with a trawl endorsement is transferred to a vessel five feet less in length than the endorsed length. In the latter case, the LE permit will be reissued with a size endorsement for the length of the smaller vessel. Regulations may be promulgated to waive this downsizing requirement if the permit was transferred to a smaller vessel for the purpose of stacking (see Section 11.2.4, paragraph 3).

4. The transfer of LE permits between vessels or owners may not be used to circumvent vessel landing limits.

5. When an LE permit is transferred to a different owner or vessel, provisional "A," "B," and designated species "B" gear endorsements will become invalid, unless the transfer is caused by the total loss of a vessel (as per Section 11.2.9) and ownership of the LE permit is not transferred.

11.2.10 Loss of a Vessel

11.2.10.1 Loss of a Vessel Prior to Permit Issuance

1. A "B" or provisional "A" endorsement will be issued for a vessel which qualified for a "B" or provisional "A" endorsement but is lost before the LE permits are issued. The vessel must be replaced within two years of the loss unless otherwise determined by the NMFS regional director, and the requirements of the third paragraph of Section 11.2.8 apply. The validity of the "B" or provisional "A" gear endorsement on transfer of the LE permit to the new vessel will be subject to review by the NMFS review authority.

2. For a vessel that would qualify an owner for an "A" endorsement, in the case of a vessel's sinking or total loss, all rights to a permit from the fishing history of the vessel prior to the sinking or total loss remain with the owner at the time of sinking or total loss unless specifically transferred. The vessel must be replaced within two years of the loss, unless otherwise determined by the NMFS regional director, and the requirements of the third paragraph of Section 11.2.8 apply.

11.2.10.2 Loss of a Vessel after Permit Issuance

In the event that a vessel is totally lost, the provisional "A" or "B" gear endorsements on an LE permit will remain valid if the LE permit is transferred to a different vessel owned by the same LE permit owner, subject to the following: (1) the replacement vessel may not exceed the endorsed length by five feet of the official length overall and (2) the lost vessel is replaced within two years of the loss unless otherwise determined by the NMFS regional director, and the requirements of the third paragraph of Section 11.2.8 apply. The validity of the provisional "A" or "B" gear endorsements on transfer of the LE permit to the new vessel will be subject to review by the NMFS review authority.

11.2.11 Combining LE Permits

1. Two or more LE permits with "A" gear endorsements for the same type of LE gear (either trawl, longline or fishpot) may be combined (based on specific criteria) to "step-up" to a permit with a larger size endorsement. NMFS, with professional advice of marine architects and other qualified individuals, and after consultation with the Council and review board, will develop and implement a standardized measure of harvest capacity for the purpose of determining the appropriate endorsed length for LE permits created by combining two or more permits possessing smaller length endorsements. The capacity represented by the appropriate length endorsement for the combined permit should not exceed the sum of the capacities of the LE permits being combined.

2. LE permits may not be divided to "step-down" to more than one permit with smaller size endorsements.

3. Survival of gear endorsements. When LE permits are combined, "A" endorsements identical on both LE permits will remain valid. Provisional "A," "B," and designated species "B" gear endorsements will generally become invalid because they are not separable from the vessel for which they are initially issued. (See table below for examples.)

1st Permit Endorsement on 1st LE Permit	+	2nd Permit Endorsements on 2nd LE Permit	=	Combined Permit Endorsements on the Combined LE Permit
"A" - Trawl		"A" - Pot		None
"A" - Longline		"A" - Longline		"A" - Longline
"A" - Trawl		Provisional "A" - Trawl		None
"A" - Pot		"B" - Pot		None
"A" - Trawl		Designated Species "B" - Shortbelly - Trawl		None

4. Survival of Fixed Gear Sector Endorsements. Fixed gear sablefish endorsements will remain valid only if all the longline or fishpot permits being combined have fixed gear sablefish endorsements.

5. Survival of Trawl Sector Endorsements. When a CP-endorsed LE permit is combined with an LE trawl permit without a CP-endorsement a single CP-endorsed permit with a larger size endorsement will result. A CV(MS) endorsement on a permit being combined with a CP-endorsed permit will not be reissued on the resulting permit. If a CV(MS) endorsed permit is combined with a permit without a sector endorsement, the CV(MS) endorsement is retained on the resulting permit. The resulting size endorsement will be determined based on the permit combination formula authorized in paragraph 1 above.

11.2.12 Permit Renewal

1. Permits must be renewed each year between October 1 and November 30 in order to remain valid for the following calendar year.

2. Notice of upcoming renewal periods will be sent by September 15 each year to the most recent address as provided to the permit issuing authority by the permit holder. It shall be the permit holder's responsibility to provide the permit issuing authority with address changes in a timely manner.

3. An annual fee will be charged which reflects the administrative costs of maintaining the permit

system.

4. Failure to renew during this period will result in expiration of the permit at the end of the calendar year.

5. Once a permit has expired because of failure to renew during the renewal period, it may not subsequently be renewed or reissued, except through an appeals process.

6. If a permit expires because of failure to renew, the permit holder may appeal for reissuance, provided the appeal is received by the issuance review authority by March 31 of the following year. Conditions for reissuance of a permit are listed in Section 11.4.1 paragraph 1.h.

11.2.13 Owner-on-board Requirements

In order to preserve the social and historic characteristics and practices in the fishery or to encourage the flow of fishery benefits to fishing communities, on the Council's recommendation, as it deems appropriate and consistent with the goals of the groundfish FMP and National Standards, NMFS may require permit owners to be on-board a vessel during fishing operations.

[Amended: 9, 13, 14, 15, 20, 21]

11.3 Multilevel Gear Endorsement System

This section contains a description of the characteristics specific to each type of gear endorsement. Gear endorsements may not be transferred separate from the LE permit to which they are affixed. An LE permit confers no rights without a valid gear endorsement attached. These and other general characteristics of all gear endorsements are described in Section 11.2.5.

11.3.1 "A" Gear Endorsement

11.3.1.1 Overview of the "A" Endorsement

The "A" endorsement is intended for participants who were significantly active in the groundfish fishery with LE gear(s) during the qualifying window period (July 11, 1984 through August 1, 1988). The "A" endorsement allows the catch of all Council-managed groundfish species with the specified gear, remains valid when the LE permit is transferred, and is valid for an unlimited period of time (subject to Section 11.1.4) except as noted.

11.3.1.2 Description, Use and Transferability of the "A" Endorsement

1. Each "A" endorsement affixed to an LE permit will specify the type of gear with which the LE permit may be used (e.g., "A-Trawl").

2. The vessel for which the LE permit is registered will be allowed to catch all Council-managed groundfish with the gear specified in the "A" endorsement, except for fixed gear sablefish as specified in Section 11.2.6.

3. The "A" endorsement will remain valid when the LE permit is transferred to a different owner or vessel.

11.3.1.3 "A" Endorsement Initial Issuance Criteria

1. An "A" endorsement will be affixed to a vessel's LE permit for each gear the vessel qualifies with under these "A" endorsement initial issuance criteria.

2. Vessels must qualify separately for each gear that an "A" gear endorsement is requested.

3. A current owner of a vessel[11] that meets the minimum landing requirements (MLRs) (as per the following paragraph) within the window period (July 11, 1984 and August 1, 1988) may receive an "A" endorsement.[12]

4. MLRs are gear-specific amounts of landings or deliveries (joint-venture or domestic) of west coast groundfish.

   The MLRs for the LE gears which must be met during the window period would be as follows:

   Trawl: At least 9 days in which over 500 pounds of any groundfish species except Pacific whiting are landed or delivered, or 450 mt of landings or deliveries of any groundfish species except Pacific whiting, or 17 days in which over 500 pounds of Pacific whiting are landed or delivered, or 3,750 mt of landings or deliveries of Pacific whiting.

   Longline: At least 6 days in which over 500 pounds of any groundfish species are landed or delivered, or 37.5 mt of landings or deliveries of any groundfish species.

   Fishpot: At least 5 days in which over 500 pounds of any groundfish species are landed or delivered, or 150 mt of landings or deliveries of any groundfish species.

5. Landings coded as groundfish trawl, longline or fishpot gear may be credited toward meeting the MLRs for the gear except any landing with:

   a. salmon in it will not be counted toward meeting MLRs with longline gear;

   b. shrimp in it will not be counted toward meeting MLRs with trawl gear;[13]

   c. abnormal catches for the indicated gear may result in an issuing authority review of the validity of all tickets presented as evidence of meeting MLRs and a request by the issuing authority that additional evidence be presented that the gear was actually used.

6. In addition to the specifications of the above paragraph, the NMFS issuing authority will have broad authority to examine information other than codes on landing tickets in determining whether MLRs are or are not met by a particular vessel and gear.

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[11] Only the **current** owner of a qualifying vessel at the time the permit is initially issued will be issued an LE permit (except in the case of vessel loss as per Section 12.2.9.1 paragraph 2). Without this provision, a single vessel could qualify several owners for LE permits. If private contractual arrangements have been made between a vessel buyer and seller to reserve to the seller the right to the LE permit issued for the vessel, the LE permit may ultimately be issued to the vessel seller in place of the current owner.

[12] Notice of this qualification period was published in the *Federal Register* on August 4, 1998 (53 FR 29337).

[13] The Council notes that in Washington when shrimp and groundfish are landed together, tickets are sometimes filled out for the groundfish and shrimp separately. The issuing authority will have to be aware of such circumstances in evaluating whether a vessel meets MLRs with trawl gear.

7. Prior to permit issuance, all rights of a vessel owner to an "A" endorsement will be considered transferred with the sale of the qualifying vessel unless otherwise stipulated in a contract.[14]

8. Vessel owners who acquire a provisional "A" endorsement will receive an "A" endorsement after meeting the upgrade criteria (Section 11.3.2.4), provided all other requirements of the LE program are met.

9. Members of local LE programs which have been Council certified and incorporated by the issuing authority (as per Section 11.3.1.4) may be issued "A" endorsements subject to the following constraint. The "A" endorsements issued on the basis of a vessel's membership in a certified LE program will be valid only when the vessel for which it is registered is operating under and in conformance with the certified program.

10. The NMFS review authority will have discretionary powers to grant exceptions to the qualification criteria on specified grounds. The basis on which the NMFS review authority may grant exceptions are described in Section 11.3.5.

11.3.1.4 Incorporation of Small Limited Entry Fleets

1. Small LE programs which are operated by local governments, in existence as of July 11, 1991 and have negligible impacts on the resource may be certified as consistent with the goals and objectives of this LE program and incorporated into the Federal LE program.

2. The purpose of this provision is to recognize and provide for small fisheries with unique cultural and social importance that are dependent on the groundfish resource but have negligible impacts on the resource, as long as the size and number of vessels in the fishery are sufficiently controlled through a LE program under local jurisdiction.

3. A representative of a small LE fleet may apply to NMFS to be certified as consistent with the goals and objectives of this LE program and incorporated into the LE program. NMFS will refer the application to the permit issuance review board. The board will provide its recommendations to the Council, which in turn will provide its recommendation, together with the reasons therefore, to NMFS. If NMFS determines that a fleet meets the goals and objectives of this LE program and the standards of this section, it shall certify the fleet and incorporate it into the LE program.

4. If a fleet is certified and incorporated into the LE program, vessels in the fleet at the time of incorporation will be issued LE permits with "A" endorsements as provided in Section 11.3.1.3.

5. A permit issued to a vessel in a certified fleet under this section is only valid when the vessel for which it is registered is operating under and in conformance with the certified program. Such a permit and endorsement may be transferred to another vessel that will operate in the same certified fleet as long as the total number of vessels in the fleet does not increase.

6. If more vessels are added to a fleet in a certified LE program, these additional vessels will not

[14] If by contractual agreement permit rights are transferred separate from the vessel, the LE permit size and gear endorsements will continue to be restricted to those which would have been issued to the originally qualifying vessel as per *Federal Register* notice 55 FR 29337.

receive "A" endorsements unless the program is recertified for the greater number of vessels, and the larger fleet is incorporated into the LE program.

7. For each certified fleet, there may be an upper limit placed on the amount of groundfish that vessels operating in the certified fleet may land.

11.3.1.5 Expiration of the "A" Endorsement

The "A" endorsement is valid for an unlimited period of time, except as noted in Section 11.1.4 and Section 11.2.11.

11.3.2 Provisional "A" Gear Endorsement—Overview

The provisional "A" endorsement was intended for: (1) the vessel owner who, during the window period, was preparing through construction, conversion or purchase to use a vessel with LE gear in the west coast groundfish fisheries; (2) the owner of a replacement vessel who would have otherwise received an "A" endorsement on an LE permit endorsed for a smaller-sized replaced vessel when the replacement has occurred prior to September 30, 1990; and (3) owners of a vessel that landed sufficient groundfish during the window but using a gear type that had been prohibited by a state (Washington, Oregon or California) or the Secretary of Commerce subsequent to the window period. The purpose of the provisional "A" endorsement was to require the owner demonstrate, by actual catching activity, intent to participate in the west coast groundfish fisheries with the vessel and LE gear. When intent had been demonstrated (as per Section 11.3.2.4), the provisional "A" endorsement could have been upgraded to an "A" endorsement. The provisional "A" endorsement allowed the catch of all Council-managed groundfish species with the specified gearCbecame invalid when the LE permit was transferred, except in the case of a lost vesselCand was valid for a maximum of three years.

11.3.3 "B" Gear Endorsement—Overview

The "B" endorsement was intended for the vessel owner who was active in the west coast groundfish fishery prior to the cut-off date (August 1, 1988) with a LE gear, but did not land sufficient groundfish with the gear during the window period to qualify for an "A" endorsement. The "B" endorsement provided for an adjustment period during which a vessel owner could seek to acquire a permit with an "A" endorsement or find an alternative fishery. The "B" endorsement, which allowed the catch of all Council-managed groundfish species with the gear and vessel specified in the endorsement, became invalid when the LE permit was transferred or after December 31, 1986, which was three years after implementation of the LE program. To qualify for a "B" endorsement, an owner must have owned a vessel which met the initial issuance requirements and must have owned it during and continually since the time the qualifying activities occurred.

In accordance with the FMP, the "B" endorsement program expired on December 31, 1996. Amendment 13 to the FMP removed expired "B" endorsement language from the FMP.

11.3.4 Designated Species "B" Gear Endorsements—Overview

The designated species "B" gear endorsement was intended to allow for expansion of domestic processing of underutilized species in the event the LE fleet (those holding LE permits other than the designated species "B" endorsement holders) was unwilling to harvest the full amount of the underutilized species desired by domestic processors or ABC, whichever was less. In this event, designated species "B" endorsements would have been issued to harvesters willing to deliver to domestic processors. In addition, the endorsement may have been issued when the possibility existed that an apportionment to total allowable level of foreign fishing would occur. In that event, designated species "B" endorsements would have been issued to harvesters willing to deliver to JV processors. A separate endorsement was required for each combination of gear type and species. The designated species "B" endorsement allowed the catch of the specified species with the gear and vessel specified in the endorsement. The endorsement became invalid when the LE permit was transferred and would have expired at the end of the fishing year.

Amendment 12 to the FMP declared all species managed under the FMP to be fully utilized. Amendment 13 removed the designated species "B" endorsement option from the FMP.

11.3.5 Exceptions to the Issuance Criteria and Grounds for Appeal

1. Exceptions may be granted for the time limit on replacing lost vessels, and requirements for timeliness with respect to applications for permits and permit renewal, for good cause. With respect to permit renewal, only illness, injury or death of one of the vessel owners will be considered good cause. Additionally, in the following hardship situations, where appropriate, the NMFS issuing authority may grant exceptions to permit issuance and upgrade criteria, the time limit on replacing lost vessels, and requirements for timeliness with respect to applications for permits and permit renewal.[15]

    a. Insufficient documented landings with legal groundfish gear in the qualifying period due to disputes over records of landings (evidence other than landing records may be considered).

    b. Construction or conversion criteria are not met due to documentation disputes or delays in construction or conversion.

    c. A qualified vessel was totally lost before permits were issued (the vessel should be replaced within two years of the loss and the requirements of the third paragraph of Section 11.2.8 apply).

    d. Illness or injury.

    e. Litigation involving the vessel preventing the vessel owner from making sufficient landings in the qualifying period.

    f. Death of a vessel owner preventing the surviving vessel owner(s) from making sufficient landings in the qualifying period because the vessel could not be fished.

    g. Death of a vessel owner preventing fulfillment of upgrade criteria for converting a provisional "B" endorsement to an "A" endorsement.

2. Implementation of the license limitation program will require exercise of judgment in the application of particular provisions. Any dispute over how the issuing authority has applied provisions of the program may be appealed.

[15] Economic hardship, loss or inactivity of a vessel due to a violation (involving the vessel) of domestic laws which prevent the use of the vessel during the window period will not entitle the owner to a LE permit or endorsement granted through the review process.

[Amendment: 9, 13]

11.4 LE Permit Issuance Review Board

11.4.1 Functions

A permit issuance review board will be created by the Council with three functions.

1. Review appeals related to issuance of permits and gear endorsements.

2. Make recommendations to the Council on whether a non-federal/non-state LE system in place as of July 12, 1991 should be certified as being consistent with the goals and objectives of this LE program, as described in Section 11.3.1.4.

3. Make reports to the Council on the progress of the program and need for adjustments.

11.4.2 Expenses

The intent of the Council is that the issuance review board be an integral part of the permit issuance process. As such:

1. the board expenses will be included in determining permit fees, and
2. the board members will be reimbursed for expenses.

11.4.3 Advisory Role of Group

Issuance, administration of permits and review of appeals will be through the issuing and reviewing authorities (NMFS regional offices). The issuance review board shall function in an advisory capacity only.

11.4.4 Nominations

Nominations for the board may be made by anyone. Selection will be made by the Council or its designee.

11.4.5 Membership

The board should consist of:

1. "Knowledgeable" fishing industry members.
2. 7 to 10 voting members.[16]
3. Two-thirds of the members must be present for a quorum.

11.4.6 Majority Vote

A simple majority of those present and voting shall be necessary to take action on a review.

16 The Council should look at the composition of the fishery in each state and determine the appropriate representation from each gear group so that a broad range of expertise is available to the Council.

11.4.7 Terms of Members

The term for a board member shall be three years. Terms will be staggered.

11.4.8 Review of Sablefish Endorsement Appeals

The Council and Council's LE permit review board will not take part in the review of appeals of denied sablefish endorsements.

[Amendment 9]

11.5 Implementation, Application and Appeals Process

1. When NMFS announces it is ready to receive applications, individuals must make application to the issuing entity for LE permits and "A," provisional "A," and "B" endorsements within six months, except as follows: (1) Owners of vessels qualifying for provisional "A" endorsements under the prohibited gear provisions must make application within six months of the prohibition date, or six months of the NMFS announcement that it is ready to receive applications, whichever comes last, and (2) owners of vessels applying for a "B" endorsement after the vessel has failed to meet the provisional "A" endorsement upgrade criteria, must make application within six months of failure to meet upgrade criteria or six months of the NMFS announcement that it is ready to receive applications for permits, whichever comes last.

2. Vessel owners are responsible for submitting evidence that qualification requirements have been met.

3. Applications to the issuing authority involving the hardship situations and other special circumstances described in paragraphs 4 and 5 of Section 11.2.3, shall be submitted within six months of the NMFS announcement that it is ready to receive applications, or six months of the event which would potentially qualify the applicant for a hardship exemption or under a special circumstance, whichever comes last.

4. Untimely applications will be rejected and no permit will be issued thereon. To be timely, an application must provide all of the information required in the NMFS application announcement or in the application form, by the deadline specified in paragraph 1 of this section. If the application is complete and valid, NMFS may request any supplementary information it needs to act on the permit application.

5. If an application is denied, the applicant may appeal to the NMFS regional director. In making such an appeal, the applicant may request that in deciding the issue, the NMFS regional director consult with the Council and its review board. Such a consultation would require the applicant to waive any rights to confidentiality of information.

6. At the time of implementation, NMFS, in consultation with the Council, will set and publish in the *Federal Register* a date after which all vessels using LE gear to catch Council-managed groundfish under the LE quota and management regulations will be required to have an LE permit with endorsements allowing such activity.

7. NMFS will establish a reasonable application period for the fixed gear sablefish endorsement.

Untimely applications will be rejected and no sablefish endorsement will be issued thereon. If an application is denied, the applicant may appeal to the NMFS regional director. NMFS will set and publish in the *Federal Register* a date after which requirements for fixed gear sablefish endorsements will be in effect.

[Amendment 9]

11.6 Council Review and Monitoring

On an annual basis, either the NMFS issuing authority or the issuance review board will review the economic status of the fishery and the fishing fleet, and issue a status report to the Council evaluating achievement of the goals and objectives established for the LE system.

[Amendment 6 added chapter]

REFERENCES

Allen, M. J. 1982. Functional structure of soft-bottom fish communities of the southern California shelf. Ph.D Dissertation. University of California.

Alverson, D. L., A. T. Pruter, and L. L. Ronholt. 1964. *A Study of Demersal Fishes and Fisheries of the Northeastern Pacific Ocean.* Vancouver, British Columbia: Institute of Fisheries, University of British Columbia.

Bence, J. R. and J. E. Hightower. 1990. Status of bocaccio in the Conception/Monterey/Eureka INPFC areas in 1990. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 1990 and Recommended Acceptable Biological Catches for 1991 (SAFE Report)* Portland: Pacific Fishery Management Council.

Bence, J. R. and J. B. Rogers. 1992. Status of bocaccio in the Conception/Monterey/Eureka INPFC areas in 1992. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 1992 and Recommended Acceptable Biological Catches for 1993 (SAFE Report)* Portland, OR: Pacific Fishery Management Council.

Bond, A. B., Jr J S.Stephens, D. Pondella, M. J. Allen, and M. Helvey. 1998. A method for estimating marine habitat values based on fish guilds, with comparisons between sites in the Southern California Bight. 1 1998. Asilomar, California.

Brodeur, R. D. 2001. Habitat-specific distribution of Pacific ocean perch (*Sebastes alutus*) in Pribilof Canyon, Bering Sea. *Continental Shelf Research* 21(3):207-224.

Browning, R. J. 1980. *Fisheries of the North Pacific: History, Species, Gear, & Processes*. Anchorage, Alaska: Alaska Northwest Publishing Company.

Butler, J. L. and Barnes, T. 2000. Cowcod rebuilding. Portland, OR: Pacific Fishery Management Council. Unpublished report.

Butler, J. L., T. Barnes, P. Crone, and R. Conser. 2003. Cowcod rebuilding review. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Butler, J. L., L. D. Jacobson, J. T. Barnes, H. G. Moser, and R. Collins. 1999. Stock assessment of cowcod. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 1998 and Recommended Acceptable Biological Catches for 1999 (SAFE Report)* Portland, OR: Pacific Fishery Management Council.

Clark, W. G. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. Pages 233-246 in Kruse, G., R. J. Marasco, C. Pautzke, and T.J.Quinn II, eds.Alaska Sea Grant College Program Report No.93-02, University of Alaska Fairbanks.

Conser, R. J., J. J. Maguire, R. Methot, P. Spencer, R. Moore, and M. Saelens. 2003. Widow rockfish STAR Panel meeting report. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Cowardin, L. M., Carter, V., Golet, F., and LaRoe, E. 1979. Classification of wetlands and deepwater habitats of the United States
2.: U.S. Fish and Wildlife Service.

Crone, P. R., R. D. Methot, R. J. Conser, and T. L. Builder. 1999. Status of the canary rockfish resource off Oregon and Washington in 1999. In *Status of the Pacific Coast Groundfish Fishery Through 1998 and Recommended Acceptable Biological Catches for 1999 (SAFE Report)* Portland, OR: Pacific Fishery Management Council.

de Forges, B. R., J. A. Koslow, and G. C. B. Poore. 2000. Diversity and endemism of the benthic seamount fauna in the southwest Pacific
6. *Nature* 405(6789):944-947.

Dower, J. F. and R. I. Perry. 2001. High abundance in larval rockfish over Cobb Seamount, an isolated seamount in the Northeast Pacific
7. *Fisheries Oceanography* 10(3):268-274.

Ebeling, A. W., R. J. Larson, and W. S. Alevizon. 1980. Annual variability of reef-fish assemblages in kelp forest off Santa Barbara, California. *U. S. Natl. Mar. Fish. Serv. Fish. Bull.* 78:361-377.

Eschmeyer, W. N., E. S. Herald, and H. Hammon. 1983. *A Field Guide to Pacific Coast Fishes of North America*. Boston: Houghton Mifflin.

Feder, H. M., C. H. Turner, and C. Limbaugh. 1974. Observations on fishes associated with kelp beds in southern California. *California Department of Fish and Game, Fish Bull.* 160:1-144.

Foster, M. S. and Schiel, D. R. 1985. The ecology of giant kelp forests in California: A community profile. U. S. Fish Wildl. Serv. Biol. Rep. 85(7.2).

Genin, A., L. Haury, and P. Greenblatt. 1988. Interactions of migrating zooplankton with shallow topography: Predation by rockfishes and intensification of patchiness. *Deep-Sea Research* 35(2):151-175.

Haertel, L. and C. Osterberg. 1967. Ecology of Zooplankton, Benthos and Fishers in the Columbia River Estuary. *Ecology* 48(3):459-472.

Hamel, O. S. 2006. Rebuilding Update for Pacific Ocean Perch. In *Volume 3: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

Haury, L., C. Fey, C. Newland, and January 2000 A.Genin....() pp. 2000. Zooplankton Distribution around four eastern North Pacific seamounts. *Progress in Oceanography* 45(1):69-105.

He, X., A. Punt, A. D. MacCall, and S. Ralston. 2006. Rebuilding Analysis for Widow Rockfish in 2005. In *Volume 3: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

He, X., A. Punt, A. D. MacCall, and S. V. Ralston. 2003a. Rebuilding analysis for widow rockfish in 2003. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

He, X., S. V. Ralston, A. D. MacCall, D. E. Pearson, and E. J. Dick. 2003b. Status of the widow rockfish resource in 2003. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Herke, W. H. and B. D. Rogers. 1993. Maintenance of the estuarine environment. In *Inland Fisheries Management in North America.*, edited by Kohler, C. C. and W. A. Hubert. Pages 263-286. Bethesda, Maryland: American Fisheries Society.

Hoss, D. E. and G. W. Thayer. 1993. The importance of habitat to the early life history of estuarine dependent fishes. *American Fisheries Society Symposium* 14:147-158.

Ianelli, J. N. and J. Heifetz. 1995. Decision analysis of alternative harvest policies for the Gulf of Alaska Pacific ocean perch fishery. *Fisheries Research* 24:35-63.

Ianelli, J. N., M. Wilkins, and S. Harley. 2000. Status and future prospects for the Pacific ocean perch resource in waters off Washington and Oregon as assessed in 2000. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 2000 and Recommended Acceptable Biological Catches for 2001 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Ianelli, J. N. and Zimmerman, M. 1998. Status and future prospects for the Pacific ocean perch resource in waters off Washington and Oregon as assessed in 1998. Portland, OR: Pacific Fishery Management Council.

Lavelle, J. W., E. T. Baker, and G. A. Cannon. 2003. Ocean currents at Axial Volcano, a northeastern Pacific seamount
3. *Journal of Geophysical Research* 108(C2):3020.

Lenarz, W. H. 1993. An initial examination of the status of the darkblotched rockfish fishery off the coasts of California, Oregon, and Washington. In *Appendix C in Appendices to the Status of the Pacific Coast Groundfish Through 1993 and Recommended Acceptable Biological Catches for 1994.*

Love, M. S. 1991. *Probably More Than You Want to Know About the Fishes of the Pacific Coast.* Santa Barbara, California: Really Big Press.

Love, M. S., Morris, P., McCrae, M., and Collins, R. 1990. Life history aspects of 19 rockfish species (Scorpaenidae: *Sebastes*) from the southern California bight. NOAA, NMFS Tech. Rep. 87.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. *The Rockfishes of the Northeast Pacific.* Berkeley, California: University of California Press.

MacCall, A. D. 2006. Bocaccio Rebuilding Analysis for 2005. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

MacCall, A. D. 2002. Status of bocaccio off California in 2002. In *Volume 1 Status of the Pacific Coast Groundfish Fishery Through 2002 and Recommended Acceptable Biological Catches for 2003 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

MacCall, A. D. 2003a. Bocaccio rebuilding analysis for 2003. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004*

(Stock Assessment and Fishery Evaluation) Portland, OR: Pacific Fishery Management Council.

MacCall, A. D. 2003b. Status of bocaccio off California in 2003. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

MacCall, A. D. and X. He. 2002. Bocaccio rebuilding analysis for 2002. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2002 and Recommended Acceptable Biological Catches for 2003 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

MacCall, A. D., S. Ralston, D. Pearson, and E. Williams. 1999. Status of bocaccio off California in 1999 and outlook for the next millennium. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 1999 and Recommended Acceptable Biological Catches for 2000 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Mace, P. M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. *Canadian Journal of Fisheries and Aquatic Sciences* 51:110-122.

Methot, R. D. 2000a. Rebuilding analysis for canary rockfish. Portland, OR: Unpublished report prepared for the Pacific Fishery Management Council.

Methot, R. D. 2000b. Technical description of the stock synthesis assessment program. NOAA Technical Memorandum NMFS-NWFSC-43.

Methot, R. D. and K. Piner. 2002a. Rebuilding analysis for canary rockfish update to incorporate results of coastwide assessment in 2002. In *In Volume 1 Status of the Pacific Coast Groundfish Fishery Through 2002 and Recommended Acceptable Biological Catches for 2003 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Methot, R. D. and K. Piner. 2002b. Rebuilding analysis for yelloweye rockfish: update to incorporate results of coastwide assessment in 2002. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Methot, R. D. and K. Piner. 2002c. Status of the canary rockfish resource off California, Oregon and Washington in 2001. In *Volume 1 Status of the Pacific Coast Groundfish Fishery Through 2002 and Recommended Acceptable Biological Catches for 2003 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Methot, R. D. and Rogers, J. 2001. Rebuilding analysis for darkblotched rockfish. Portland, OR: Unpublished report prepared for the Pacific Fishery Management Council.

Methot, R. D. and I. J. Stewart. 2006. Status of the U.S. canary rockfish resource in 2005. In *Volume 6: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

Methot, R. D., F. Wallace, and K. Piner. 2003. Status of yelloweye rockfish off the U.S. West Coast in 2002. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2003 and Recommended Acceptable Biological Catches for 2004 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Miller, D. J. and R. N. Lea. 1972. Guide to the coastal marine fishes of California. *Calif. Dept. Fish and Game, Fish. Bull.* 157:249.

Monterey Bay National Marine Sanctuary. 2005. SIMoN: Sanctuary Integrated Monitoring Network [WWW]. Accessed: May 25, 1907 at <http://www.mbnms-simon.org>.

MRAG Americas Inc., TerraLogic GIS Inc., NMFS Northwest Fisheries Science Center FRAM Division, and NMFS Northwest Region. 2004. Identification of Essential Fish Habitatfor the Pacific Groundfish FMP. Portland, OR: Pacific States Marine Fisheries Commission. Apr. 2004. Exhibit C.6.b, Attachment 1, April 2004 Council Meeting.

Mullineaux, L. S. and S. W. Mills. 1997. A test of the larval retention hypothesis in seamount-generated flows

5. *Deep Sea Research* 44(5):745-770.

Myers, R. A., Barrowman, N. J., and Hilborn, R. 2000. The Meta-analysis of the maximum reproductive rate for fish populations to estimate harvest policy; a review.: Unpublished report distributed at the March 20-23, 2000, West Coast Groundfish Harvest Rate Policy Workshop sponsored by the Scientific and Statistical Committee of the Pacific Fishery Management Council.

National Research Council. 2002. *Effects of Trawling and Dredging on Seafloor Habitat*. Washington, D.C.: National Academy Press.

O'Connell, V. M. and D. W. Carlile. 1993. Habitat-specific density of adult yelloweye rockfish *Sebastes ruberrimus* in the eastern Gulf of Alaska. *Fish. Bull.* 91:304-309.

O'Connell, V. M. and F. C. Funk. 1986. Age and growth of yelloweye rockfish (*Sebastes ruberrimus*) landed in southeastern Alaska. Pages 171-185 in Anchorage, Alaska: Alaska Sea Grant College Program.

PFMC. 2002. Status of the Pacific coast groundfish fishery through 2001 and recommended acceptable biological catches for 2002. Stock Assessment and fishery evaluation. Portland, OR: Pacific Fishery Management Council.

PFMC. 2006. Proposed Groundfish Acceptable Biological Catch and Optimum Yield Specifications and Management Measures: 2007-2008 Pacific Coast Groundfish Fishery; Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Portland, OR: Pacific Fishery Management Council. Oct. 2006.

Piner, K. 2006. Cowcod Rebuilding Analysis 2005 Analysis of the Progress towards Rebuilding in the Southern California Bight. In *Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

Punt, A. E. 2002. SSC default rebuilding analysis: Technical specifications and user manual. Portland, OR: Pacific Fishery Management Council.

Punt, A. E. and Ianelli, J. N. 2001. Revised rebuilding analysis for Pacific ocean perch. Portland, OR: Unpublished report to the Pacific Fishery Management Council.

Punt, Andre E. and MacCall, Alec D. 2002. Revised rebuilding analysis for widow rockfish for 2002. Portland, OR: Unpublished report to the Pacific Fishery management Council.

Ralston, S., J. N. Ianelli, D. E. Pearson, M. E. Wilkins, R. A. Miller, and D. Thomas. 1996. Status of bocaccio in the Conception/Monterey/Eureka INPFC areas in 1996 and recommendations for management in 1997. In *Appendix Vol. 1: Status of the Pacific Coast Groundfish Fishery Through 1996 and Recommended Acceptable Biological Catches for 1997 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Rogers, J. B. 2006. Update of Darkbotched Rockfish (*Sebastes crameri*) Rebuilding Analyses. In *Volume 3: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

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. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 2000 and Recommended Acceptable Biological Catches for 2001 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Rosenthal, R. J., Haldorson, L., Field, L. J., Moran-O'Connell, V., LaRiviere, M. G., Underwood, J., and Murphy, M. C. 1982. Inshore and shallow offshore bottomfish resources in the southeastern Gulf of Alaska (1981-1982). Juneau, Alaska: Alaska Dept. Fish and Game.

Sampson, D. B. 1996. Appendix C: Stock status of canary rockfish off Oregon and Washington in 1996. In *Status of the Pacific Coast Groundfish Fishery Through 1996 and Recommended Acceptable Biological Catches for 1997: Stock Assessment and Fishery Evaluation*, edited by Pacific Fishery Management Council. Portland, OR: Pacific Fishery Management Council.

Sampson, D. B. and E. M. Stewart. 1994. Appendix G: Status of the canary rockfish resource off Oregon and Washington in 1994. In *Status of the Pacific Coast Groundfish Fishery Through 1994 and Recommended Acceptable Biological Catches for 1995: Stock Assessment and Fishery Evaluation* Portland, OR: Pacific Fishery Management Council.

SSC. 2001. SSC terms of reference for groundfish rebuilding analyses. Portland: Pacific Fishery Management Council. Apr. 2001. Briefing Book Exhibit F.7.

Tsou, T. and F. R. Wallace. 2006. Updated Rebuilding Analysis for Yelloweye Rockfish Based on Stock Assessment in 2006. In *Volume 6: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses* Portland, OR: Pacific Fishery Management Council.

Wallace, F. R. 2002. Status of the yelloweye rockfish resource in 2001 for northern California and Oregon waters. In *Appendix to the Status of the Pacific Coast Groundfish Fishery Through 2001 and Acceptable Biological Catches for 2002 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Williams, E. H., A. D. MacCall, S. Ralston, and D. E. Pearson. 2000. Status of the widow rockfish resource in Y2K. In *Appendix to Status of the Pacific Coast Groundfish Fishery Through 2000 and Recommended Acceptable Biological Catches for 2001 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery Management Council.

Williams, E. H., S. Ralston, A. D. MacCall, D. Woodbury, and D. E. Pearson. 1999. Stock assessment of the canary rockfish resource in the waters off southern Oregon and California in 1999. In *Status of the Pacific Coast Groundfish Fishery Through 1999 and Recommended Acceptable Biological Catches for 2000 (Stock Assessment and Fishery Evaluation)* Portland, OR: Pacific Fishery

Management Council.

Wyllie-Echeverria, S. W. and J. D. Ackerman. 2003. The seagrasses of the Pacific Coast of North America. In *World Atlas of Seagrasses*, edited by Green, E. P. and F. T. Short. Page 199 – 206. Berkeley: University of California Press.

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. These appendices are reproduced under separate cover.

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
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- Relationship of this FMP to Existing Laws and Policies
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APPENDIX B: Pacific Coast Groundfish Essential Fish Habitat

1. Assessment Methodology for Groundfish Essential Fish Habitat
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3. Essential Fish Habitat Text Descriptions (Habitat Use Database Output of Species/Life Stage Distribution/Associations
4. Habitat Suitability Probability Maps for Individual Groundfish Species and Life History Stages
5. Research Needs and Data Gaps Analysis for Groundfish Essential Fish Habitat

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. Map of EFH Conservation Areas
4. Coordinates for EFH Conservation 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.

APPENDIX E: Description of Trawl Rationalization (Catch Shares) Program

APPENDIX F: Overfished Species Rebuilding Plans

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA, SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON, Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **PLAINTIFFS' OPPOSITION TO MOTION OF MIDWATER TRAWLERS COOPERATIVE AND ENVIRONMENTAL DEFENSE FUND FOR LEAVE TO FILE *AMICI CURIAE* BRIEF ON REMEDY**

Midwater Trawlers Cooperative ("MTC") and Environmental Defense Fund ("EDF") (collectively, ("Movants") have come late to the game and now seek leave to file a brief as *amici curiae* regarding the remedy in this case. On the eve of the Court's order on a remedy as to defendants National Oceanic and Atmospheric Administration's and National Marine Fisheries Service's (collectively, "defendants'") violation of the Magnuson-Stevens Fishery Conservation and Management Act ("MSA"), MTC and EDF are attempting to undermine this Court's Order Granting in Part and Denying in Part Plaintiffs' and Defendants' Motions for Summary Judgment (Docket No. 49, filed December 22, 2011, "MSJ Order"). Movants, who are politically motivated and failed to show any interest in this case until after summary judgment was decided, do not and cannot offer any "unique information or perspective" and their motion should be denied.

I. ARGUMENT

Movants seek to complicate this lawsuit, which is at the final stages of resolution. They failed to participate in the case earlier and would now have this Court revisit its decision without going through an appeal. They claim defendants should be given an opportunity to provide a rational basis for their exclusion of certain fishing history in the IFQ allocations – a basis which defendants already failed to convince this Court they had. Movants provide no new information or position distinct from that of defendants and their motion for permission to file an *amici curiae* brief on their view of the remedy should be denied. *See generally, Uelian de Abadia-Peixoto v. U.S. Dept. of Homeland Security*, 2011 U.S. Dist. LEXIS 148029 at *10(N.D. Cal. 2011) (motion to file amicus brief denied where information of proposed amici was "not especially pertinent" as to underlying motion and party-counsel adequately addressed the issues).

A. **Movants' Motion, Which Fails to Show a "Unique Perspective," is Untimely and Should be Denied.**

Movants purport to offer a unique perspective on the remedy in this case; however, their brief is untimely and is nothing more than an attempt to get another bite at the Court's decision in the MSJ Order. Movants claim to have a substantial interest in the IFQ Program, yet they waited until *after* the Court ruled on the summary judgment motions and asked for supplemental briefing on remedies to cast their line and offer their views on the case.[1]

Movants' position is the same one that the government defendants took at the summary judgment stage. Defendants failed to convince the Court that they had a basis for excluding fishing history years beyond 2003 and 2004. Movants' brief contains nothing but a reiteration of the same position as defendants and a request for the defendants to be given another chance to substantiate their decision to exclude the later years. The Court already considered and rejected this position in the MSJ Order. The Court has concluded that defendants violated the MSA when they failed to consider any fishing history years beyond 2003 and 2004. The question now before the Court is solely about the appropriate remedy and not whether defendants could state a rational basis for leaving existing years in place in the regulations and excluding the most recent years.

[1] Assuming *arguendo* that MTC or the other "major stakeholders" (Movants' Br. at 4) have an interest, they should have sought to participate earlier, if at all, if they were concerned about protecting their interests in the IFQ Program. They should not now be allowed to try to effectively appeal this Court's decision at the remedy stage only after the parties have submitted supplemental briefs on the remedy as ordered by the Court.

B. Permission to File Movants' Proposed Brief Should be Denied because they are Motivated by Their Own Self-Interest in Gaming the IFQ Program.

MTC is an association of fishermen, many of whom participated in the Pacific whiting fishery early on prior to 2003. Declaration of Burton Parker (February 6, 2012) "Parker Decl.") at ¶3. Thus, they have a greater interest in using the earlier years for quota shares because they are better off in their allocation if they exclude the more recent fishing history years. Many of the MTC members are now going to Alaska to try to build recent history there in anticipation of a proposed ITQ program. *Id.* They want to have the best of both worlds – old fishing history years in the Pacific whiting fishery and new, recent history in Alaska. Therefore, MTC desires to avoid any reallocation that would include recent fishing history years because they benefited from the incorrect application of the Magnuson-Stevens Act ("MSA") in the initial 2011 allocation of IFQs.

In spite of MTC's so-called "concerns" about the IFQ Program, they were not so concerned as to seek to participate in this proceeding until the remedy stage and after the Court concluded that defendants violated the MSA when they failed to include fishing history beyond 2003 and 2004 (the optimal years that benefit MTC's members). Further, the involvement of MTC members in supporting the IFQ Program illustrates their conflict of interest in urging the Court to reconsider its position in the MSJ Order. Nevertheless, they insist that the IFQ Program continue to be based on and use only outdated, ancient history years, which this Court has found to be inconsistent with the MSA, to the benefit of a group of largely Oregon-based fishermen.

EDF is siding with one group of fishermen over another in an allocation dispute and acting out of its own political motivation. Parker Decl. at ¶4. EDF claims to be "a leading national not-for-profit organization" and an advocate for catch share programs "that align conservative and economic goals in commercial and recreational fisheries." (Movants' Br. at 2:24-3:3). Yet here, EDF is not acting in the public interest but in its own self-interest by proposing a remedy that would continue to exclude the most recent fishing history, as required by the MSA, in an effort to protect its own Pacific whiting fishery permits that it has acquired. There have been no recent whiting landings under EDF's permits, which makes them less valuable if recent fishing history years are included in the IFQ allocations. Parker Decl. at ¶4.

Movants claim to be concerned about the IFQ Program. However, their "concern" disregards plaintiffs' proposed remedy. Plaintiffs have simply proposed that the IFQ Regulations be remanded to defendants for reconsideration consistent with the MSA and the MSJ Order. Plaintiffs are not suggesting that this Court impose any remedy that would harm or enjoin the IFQ Program. Plaintiffs plan to meet with defendants and their lawyers this week to propose requesting changes that should resolve the matter for 2012 and the litigation. Parker Decl. at ¶5.

Plaintiffs will propose that the agency take up the matter and the March 2012 Council meeting, which is more than two weeks away. Plaintiffs will recommend that defendants present as their preferred position that the allocation for Pacific whiting (and only Pacific whiting) for 2012 be revised to include the following history: (1) Harvesters (mothership and shoreside), 1994-2010; (2) Shoreside, 1998-2010; and (3) Bycatch, 2003-2010. Plaintiffs believe that defendants have adequate legal authority and time to implement these changes by May 15, 2012.

The only changes to the IFQ Program that plaintiffs will request are the Court-ordered inclusion of the recent fishing history years. This is a simple allocation issue among participants of two sectors of the whiting fishery. There is no conservation issue here and no management changes to the fishery are required or expected due to the inclusion of the recent history years and the reallocation of the IFQs. Whiting fishermen who have consistently participated in the whiting fishery with a reasonably consistent level of fishing effort during the initial years of 1994-2003 *and* the recent period of 2004-2010, will maintain their IFQ quota share with little or no change. Those who had strong participation or whiting landings in the initial period of 1994-2003 but have weak history or no history in the recent period of 2004-2010 will experience a reduction in their IFQ quota share. Those who have a stronger history of landings during the recent period of 2004-2010 due to changes in whiting distribution, changes in by-catch management or changes in community participation in the fishery, including markets at shoreside processing plants, will experience an increase in their IFQ quota share.

Thus, the only rational and fair way to comply with the MSA is to include all relevant history and to make the allocations based on the time each permit holder, vessel owner, or processor has spent and invested in the fishery. Notably, plaintiffs do not seek to curtail any support for the Program. They are not advocating the exclusion of the early history years, only the inclusion of the

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recent years as being the most fair to all participants and communities over time and in compliance with the law as determined by the Court in its MSJ Order. If defendants' response is consistent with plaintiffs' recommended remedy, then plaintiffs contend the litigation will be over.

C. The Filing of Movants' Brief Would Prejudice Plaintiffs by Rehashing Issues Already Decided on Summary Judgment in an Effort to Delay Defendants' Compliance with the MSA.

Plaintiffs would be prejudiced if Movants are given the opportunity to file their proposed brief. Plaintiffs will have insufficient time to respond to the arguments raised in Movants' proposed brief by the February 13 deadline to file their reply to defendants' supplemental brief on remedy. Movants' brief rehashes issues and arguments raised in the summary judgment motions, which are unrelated to the determination of a remedy at this stage in the proceedings. Movants' 14-page brief contains multiple, lengthy arguments and is accompanied by extensive declarations, which plaintiffs should have a full opportunity to address.

Plaintiffs will also be prejudiced by any delay in a remand order by the Court. Plaintiffs have proposed a remedy that contemplates remand in time for the Council's March meeting. Movants desire to delay the remand of the IFQ Regulations for such meeting. Thus, they are attempting to re-introduce issues already considered by the Court at the remedy stage in an effort to delay the potential reallocation of fishing years for 2012 to comply with the MSA.

II. CONCLUSION

Movants have failed to establish they have any unique information to assist this Court in crafting a remedy at such a late stage in the proceedings. In addition, plaintiffs will be prejudiced if movants are permitted to file their proposed brief and Movants' motion should be denied.

DATED: February 6, 2012.

Respectfully submitted,

/s/ James P. Walsh

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **DECLARATION OF BURTON PARKER IN SUPPORT OF PLAINTIFFS' OPPOSITION TO MOTION OF MIDWATER TRAWLERS COOPERATIVE AND ENVIRONMENTAL DEFENSE FUND FOR LEAVE TO FILE *AMICI CURIAE* BRIEF ON REMEDY**

I, Burton Parker, declare as follows:

1. I am one of the managing owners of Pacific Dawn, LLC with business offices at 2324 N.W. 90th Street, Seattle, Washington. Pacific Dawn, LLC owns and operates the 116-foot trawl vessel PACIFIC CHALLENGER and possesses all the necessary permits for the vessel to operate in the Pacific whiting fishery. I make this Declaration based on my personal knowledge in support of Plaintiffs' Opposition to Motion of Midwater Trawlers Cooperative ("MTC") and Environmental Defense Fund ("EDF") for Leave to File *Amici Curiae* Brief on Remedy. If called as a witness, I could testify to the facts set forth in this Declaration truthfully and competently.

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

2. I have been fishing in the Pacific Northwest ever since I was a young boy when I went fishing with my father. As an adult, I first started fishing in the Pacific whiting fishery in 1988. Our company is a member of the United Catcher Boats ("UCB") Association, which is an organization of vessel owners, which trawl for groundfish in West Coast commercial fisheries, the Bering Sea, and Alaska. UCB is an organization for groundfish harvesters in support of rational fisheries management, sustained yields, reduced bycatch, and maintaining our vessels in a competitive industry. UCB interacts with both MTC and EDF. As a result, I am familiar with both MTC and EDF.

3. I have read MTC's and EDF's proposed joint brief on a remedy in this case. MTC is an association of largely Oregon fishermen that support federal fishery management regulations which are acceptable to and benefit only their membership, not the Pacific whiting fishery as a whole. Many members of MTC fished early in the Pacific whiting fishery prior to 2003. They have a greater interest in using the earlier years for quota shares because they are better off in their allocation if they exclude the more recent fishing history years. Many of the MTC members are now going to Alaska to try to build recent history there in anticipation of a proposed ITQ program. They want to have the best of both worlds – old fishing history years in the Pacific whiting fishery and new, recent history in Alaska. Therefore, MTC desires to avoid any reallocation that would include recent fishing history years because they benefited from the incorrect application of the Magnuson-Stevens Act ("MSA") in the initial 2011 allocation of IFQs. In their motion, it is clear that MTC is really seeking to undermine the Court's summary judgment ruling by proposing a remedy that maintains the status quo, and an ongoing violation of the MSA. MTC is trying to game the system so that some permit holders get higher quotas than should be allowed and then sell their quota, despite a much more limited participation in the fishery than plaintiffs and others.

4. EDF is neither a harvester nor a processor of Pacific whiting and has interests that are inconsistent with the interests of MTC and plaintiffs. I am shocked that EDF would side with one group of fishermen, e. g. members of MTC, over another in an allocation dispute by supporting a remedy that benefits MTC to the detriment of others who actively participated in the Pacific whiting fishery for a longer period. EDF is not acting in the public interest but in its own self-

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interest by proposing a remedy that would continue to exclude the most recent fishing history, as required by the MSA. Upon information and belief, EDF bought permits in the Pacific whiting fishery. However, I believe there have been no recent whiting landings under those permits, which makes them less valuable if recent fishing history years are included in the IFQ allocations. Nevertheless, including more recent fishing history (after 2003) is "fair" to everyone in this fishery, particularly to those entities that have long participated in harvesting Pacific whiting because then the allocation would be based primarily on a particular permit holders' participation in the fishery and ongoing support for local fishing communities.

5. Upon information and belief, representatives of MTC and EDF recently met with defendants to discuss the Court's summary judgment ruling in this case and to urge their narrow objectives on the government. I, and other plaintiffs, plan to meet with defendants and their lawyers this week to propose a remedy that would resolve this case in its entirety.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed this 6th day of February in Seattle, Washington

/s/Burton Parker
Burton Parker

Davis Wright Tremaine LLP

Suite 800
505 Montgomery Street
San Francisco, CA 94111-6533

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budwalsh@dwt.com

February 7, 2012

Mr. William W. Stelle, Jr.
Northwest Regional Administrator
[Delivered via Mariam McCall, Office of General Counsel, NOAA]
7600 Sand Point Way NE
Seattle, WA 98115-0070

RE: Plaintiffs in PACIFIC DAWN LLC, et al., v. Bryson, Case No. CV 10 4829 TEH, Federal District Court, Northern District of California

Dear Mr. Stelle:

The plaintiffs in the above-captioned litigation present this letter to the National Marine Fisheries Service (NMFS), via their counsel, for the agency's consideration in responding to the soon-to-be-issued remand order from Judge Henderson in the case. Shortly, the Judge will order a remand and reconsideration of the agency's 2010-2011 regulations making IFQ allocations in accordance with his December 22, 2011 summary judgment ruling. In the interests of finding a mutually acceptable resolution of the case, our clients offer the following suggestions for promulgation of limited amendments to the regulations found to be in violation of the Magnuson-Stevens Act, with such changes to be effective by May 15, 2012.

It is our view that a remand that simply reviews the issues and comes up with a post-hoc rationalization of the existing IFQ allocation regulations for Pacific whiting with respect to "recent history" will not be legally sufficient and will lead to additional litigation. We believe that substantive changes to the regulations are required because "considering" but not incorporating recent fishing and processing history will not, and cannot possibly, comply with the substantive provisions of the Magnuson-Stevens Act. Only by incorporating <u>all</u> fishing history from 1994 to 2010, all processing history from 1998 to 2010, and all bycatch history from 2003 to 2010 will the agency meet the requirements set forth in 16 U.S.C. §§ 1851, 1853(b)(6), and 1853a(c), among other provisions. More pointedly, we see no rational basis for excluding any of the more recent fishing history years, except to favor those who have less fishing history. Why not simply let the fishing and processing history in the fishery be the primary determining factor with respect to distribution of IFQ? Nothing could be more neutral and/or objective in allocating the benefits of IFQ to those in the industry than how much time an entity has invested in the fishery, especially one that is soundly managed and not overfished such as the Pacific whiting fishery.

Timing

The agency has the authority and capacity to have this issue placed on the agenda for the March meeting of the Council that is scheduled for March 2-7, 2012. Because of the Judge's ruling, the issue of IFQ allocation in the Pacific whiting fishery deserves the agency's, and the Council's, immediate attention. We believe that this issue is one that falls more within the agency's purview under the Magnuson-Stevens Act: namely, it is NMFS's obligation to ensure that every fishery management plan is consistent with applicable law (16 U.S.C. § 1854(a)(3)). Our view is that the failure to include the most recent fishing and processing years in the Pacific whiting IFQ allocation was something that the agency should have addressed and resolved during agency review in 2010. It was an obvious legal issue to spot, given the total failure to include any information in the record on the question and to simply defer to the Council's much-outdated "control date" notices. In this instance, we believe it possible that the pressure to approve another "catch share" program quickly to please certain environmental groups and/or the NOAA Administrator may have led NMFS to consciously overlook this obvious flaw.

We also believe that the Court's order can be the basis for "emergency" action by the Secretary, pursuant to 16 U.S.C. § 1855(c), obviating the need for the usual meeting notice requirements if such requirements actually pose an issue here.[1] See 16 U.S.C. § 1852(i)(2)(C). Based on NMFS Instruction 01-101-07 (signed March 31, 2008), the circumstances of this case fall within both the listed Emergency Criteria and Emergency Justification. First, this is a situation that "[r]esults from recent, unforeseen events or recently discovery circumstances" that presents serious management problems in the fishery that can be addressed through emergency regulations. Second, emergency action is justified "to prevent significant economic loss or preserve a significant economic opportunity that otherwise might be foregone." The agency has had plenty of time to begin consideration of this issue, given that the Court's ruling was issued on December 22, 2011 and the agency's opening Supplemental Brief on Appropriate Remedy was not even due until January 30, well over 30 days prior to the March Council meeting. We hope the agency has not purposefully delayed placing the issue before the Council in order to please other groups and individuals who may have their own parochial concerns that are contrary to the Court's ruling.

We ask that the agency commit to place the issue on the Council's March agenda and that both the agency and plaintiffs present a common position at that meeting that resolves the issue quickly and without further litigation.

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1 This is exactly the authority NMFS used to obtain compliance with a court-ordered change in harvest Pacific groundfish specifications in 2011. See 76 Fed. Reg. 27508 (May 11, 2011).

Revisions to the Pacific Whiting Regulations

Plaintiffs are interested in those aspects of the 2010-2011 IFQ allocation regulations that impact only the Pacific whiting fishery, including the mothership and shoreside harvesting sector and the shoreside processing sector. We ask for the following regulatory changes to achieve compliance with the law:

(1) For the harvesting sector (mothership and shoreside), include all history up to and through 2010, leaving the starting history year at 1994 as in the current regulations;

(2) For the shoreside processing sector, include all history up to and through 2010, leaving the starting year as 1998 as in the current regulations;

(3) For bycatch allocations for the Pacific whiting fishery, use the history years of 2003 through 2010; and

(4) Allow both the harvesting sector and the shoreside processing sector a total of four (4) years to drop in making the relative percentage allocation, rather than the two (2) years in the current regulations.

These regulatory changes can be surgically made without any other material alteration of the existing IFQ allocation regulations.

We believe that, because of the remand, the agency must view "recent history" from the perspective of the current date, 2012, not 2010. The agency must determine whether any regulatory changes to the IFQ program satisfy the Magnuson-Stevens Act as of the date such changes are reviewed, i.e. 2012. The agency has in its possession all history of fishing in the Pacific whiting fishery through the year 2010, the last year prior to the initiation of the IFQ system in January 2011. Thus, recent history in the statute means all history through 2010. In addition, that information is the best scientific information available as of this date.

It is clearly possible for the agency to issue draft and final regulations in plenty of time to have them in place before May 15, 2012 to prevent another year of improper IFQ allocations.

We are fully aware that certain groups and individuals who were economically benefited by the existing IFQ regulations will want to retroactively approve the existing history dates. However, we consider it highly unlikely that the agency will come up with any rational basis to exclude any of the years we have asked to be included. On the contrary, from the perspective of the agency, NMFS will be much better off as a matter of law and policy by including all the history years and thereby let historical statistics be the basis of allocation, not arbitrary exclusions of various years. Those who participated in the fishery for the longest time, and during that time supported local fishing communities by their operations, should gain the higher share of the IFQ allocations in the Pacific whiting fishery.

We hope that the agency gives our suggestions proper consideration. We believe that our approach complies with the law, is fair and equitable to all fishermen and processors, and will result in the termination of this litigation. We know there are those who are fearful that our request will lead to an undermining of the IFQ Program for fisheries other than Pacific whiting. However, a quick resolution of the issue based on the Court's ruling will allow everyone to move on and prevent further litigation. If, however, the agency allows the illegal plan to linger for another year, the delay will surely open the door to tinkering with the entire program. If the agency believes it will be better off by delaying the resolution of the case for well over a year, it is likely to be sadly mistaken.

We look forward to our meeting at 12:30 p.m. on Wednesday, February 8, 2012 in your offices to discuss this matter further. We ask that this letter be included in the administrative record of the agency's court-ordered reconsideration of the IFQ regulations.

Very truly yours,

DAVIS WRIGHT TREMAINE LLP

James P. Walsh

cc: Meredith Flax, U.S. Department of Justice

Agenda Item F.1.d
Supplemental Public Comment 2
March 2012

COVER SHEET
for
PLAINTIFFS' REPLY BRIEF FILED FEBRUARY 13, 2012 IN THE PACIFIC DAWN CASE

This supplemental public comment is provided in its entirety on the Council website under the March Briefing Book (http://www.pcouncil.org/resources/archives/briefing-books/march-2012-briefing-book/#March2012). The table below lists the parts of the submission provided by the plaintiffs and identifies which have been printed for display in this supplemental public comment.

Exhibit	**Hardcopy Provided**
Cover Letter of February 14, 2012 from Davis Wright Tremaine, LLP—1 page	Yes
Plaintiffs' Reply in Support of Supplemental Memorandum in Support of Request for Relief—9 pages	Yes
Exhibit 1: Declaration of Pierre Marchand, Jr. in Support of Plaintiffs' Supplemental Memorandum in Support of Request for Relief—3 pages	Yes
Exhibit 2: **Natural Resources Defense Council, et al v. Gary Locke, et al** -- Order Granting in Part and Denying in Part Parties' Cross-Motions for Summary Judgment—49 pages	Only pages 1-3.
Exhibit 3: Order of Remedy (NRDC v. Gary Locke)—3 pages	Yes
Exhibit 4: 212th Session of the Pacific Fishery Management Council (Proposed March Council Meeting Agenda)—9 pages	Yes; however, it is contained in Agenda Item A.4
Exhibit 5: Council Operating Procedure 1—8 pages	No
Exhibit 6: National Marine Fisheries Service Policy Guidelines for Use of Emergency Rules—6 pages	Yes
Exhibit 7: *Federal Register*/Vol. 76, No.91/Wednesday, May 11, 2011 (Final Rule for 2011-2012 groundfish harvest specifications and management measures)—56 pages	Only Pages 1-3.
[Proposed] Order on Remedy [Alternative 1]—2 pages	Yes
[Proposed] Order on Remedy [Alternative 2]—2 pages	Yes

PFMC
02/22/12

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February 14, 2012

Via Electronic Mail and Overnight Delivery

Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Comments for Supplemental Briefing Book for March 2-7, 2012 Meeting

Dear Sir or Madam:

We are submitting the enclosed materials to be included in the supplemental briefing book for the Pacific Fishery Management Council's ("Council's") March 2-7, 2012 meeting on behalf of our clients, Pacific Dawn LLC, Chellisa LLC, James and Sandra Schones, Da Yang Seafood Inc., and Jessie's Ilwaco Fish Company. These organizations and individuals are plaintiffs in a case titled *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, filed in the Northern District of California, challenging the 2011 allocation of individual fishing quotas ("IFQs") for the Pacific whiting fishery.

Enclosed please find supplemental materials to the comments and materials that we submitted for the Advance Briefing Book on February 8, 2012. The following document is a reply brief filed yesterday by the plaintiffs in the *Pacific Dawn* case:

- Plaintiffs' Reply in Support of Supplemental Memorandum in Support of Request for Relief, including Exhibits 1-7, *Pacific Dawn LLC, et. al v. Bryson, et, al,* Case No. CV10-4829, Northern District of California (Docket No. 58, February 13, 2012)

Because of the impact of the Court's ruling on the IFQ allocations for Pacific whiting, we request that the accompanying materials be reviewed by the Council in its consideration and plan for the upcoming 2012-2013 the Pacific whiting fishing season. Thank you for your consideration. Please let me know if you have any questions or would like additional information.

Very truly yours,

Davis Wright Tremaine LLP

James P. Walsh

cc: Mariam McCall (via email only)
Meredith Flax (via email only)

DWT 19020661v1 0092855-000001

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DA YANG SEAFOOD INC. and JESSIE'S ILWACO FISH COMPANY

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **PLAINTIFFS' REPLY IN SUPPORT OF SUPPLEMENTAL MEMORANDUM IN SUPPORT OF REQUEST FOR RELIEF**

The only rational and fair way for defendants John Bryson, National Oceanic and Atmospheric Administration ("NOAA") and National Marine Fisheries Service ("NMFS") (collectively, "defendants") to comply with the Magnuson-Stevens Fishery Conservation and Management Act ("MSA") and the Court's summary judgment order ("MSJ Order") is to base the individual fishing quota ("IFQ") allocations for the Pacific whiting fishery (the "IFQ Regulations) on *all* relevant (i.e., historical and current) fishing history. Defendants, however, are reluctant to do this in a timely manner, which exemplifies their intent to defy the MSJ Order. By leaving the existing regulations in place for the next two years (per defendants' estimation), defendants will be making ongoing allocations under regulations that the Court has already deemed a violation of the

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

MSA. Thus, plaintiffs request relief directing defendants to act by the start of the Pacific whiting fishing season on May 15 or to suspend the IFQ Regulations pending review by defendants.

I. ARGUMENT

Plaintiffs only seek to have the IFQ Regulations include the recent fishing history years as ordered by the Court. This is a simple allocation issue among Pacific whiting fishery participants that can be revised in a timely manner. There is no other conservation or management issue here; nevertheless, defendants are reluctant to take action to timely comply with the MSA and the MSJ Order.

On February 8, 2012, plaintiffs and their counsel met with defendants, including Will Stelle, Northwest Region Administrator for the National Marine Fisheries Service at NOAA's offices in Seattle, Washington. Declaration of Pierre Marchand in Support of Plaintiffs' Supplemental Memorandum in Support of Request for Relief, dated February 9, 2012 ("Marchand Decl.") at ¶3.[2] At the meeting, plaintiffs presented their recommendations regarding the revision of the IFQ allocations for the 2012 Pacific whiting season in light of the MSJ Order and defendants' failure to include current fishing history for processors and harvesters. *Id*. The agency informed plaintiffs that would take two years to revise the IFQ allocations to comply with the Court's order. The agency suggested that it wanted to leave the existing allocations in place while they revised the IFQ allocations. *Id*.

Contrary to defendants' position, it is feasible for the IFQ Regulations to be revised in time for the start of the Pacific whiting fishing season on May 15, 2012. Defendants' proposed timetable is irrational and incorrect. This Court has already found that the IFQ Regulations are unlawful under the MSA. Nevertheless, under defendants' two year timetable, they would continue to make illegal allocations under the existing IFQ Regulations for the next two years to the plaintiffs' detriment while the quotas are recalculated to include current fishing history consistent with the MSA.

Leaving the existing allocations in place will cause economic harm to plaintiffs and therefore a remedy that either compels defendants to take timely action or suspends the IFQ

[2] A copy of the Marchand Decl. is attached hereto as Exhibit 1.

Regulations pending their revision is necessary. Defendants' reticence to move quickly to revise the IFQ Regulations signifies their intent to defy the Court's MSJ Order and leave the existing IFQ Regulations in place for the next two years, during which time they will continue to make illegal allocations. The ongoing implementation of unlawful allocations contravenes the public interest. Thus, plaintiffs now propose two alternative remedies that would avoid the ongoing, unlawful allocation of Pacific whiting quota under the existing regulations.[3] Under "Alternative 1," the Court would suspend the existing IFQ Regulations while defendants review and revise the quotas to include all current fishing history. Under "Alternative 2," the Court would remand the IFQ Regulations to defendants to revise by May 15, 2012, in time for the start of the Pacific whiting season. The Court, however, would retain jurisdiction over the matter and require regular reports from defendants on their efforts to comply with the remedy order under either alternative.

A. **Plaintiffs Propose that the Court Suspend the IFQ Regulations Pending Defendants' Review to Avoid Unlawful Allocations for the Next Two Years (Alternative 1).**

Plaintiffs contend that defendants have misrepresented the length of time it should take to review and revise the IFQ Regulations. Assuming *arguendo*, that it would take up to two years to revise the regulations, the existing IFQ Regulations should be suspended during this time. Specifically, plaintiffs propose that the Court:

1. Direct defendants to suspend the IFQ Regulations for the mothership and shoreside sectors of the Pacific whiting fishery and make no allocations based on the existing IFQ Regulations to any entity operating in those sectors until further order of this Court; and

2. Order that the existing IFQ Regulations with respect to IFQ allocations to the mothership and shoreside sectors of the Pacific whiting fishery shall remain suspended pending the implementation of revised, final IFQ Regulations for Pacific

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[3] When plaintiffs filed their Supplemental Memorandum in Support of Order Request for Relief ("Supp. Brief"), they believed in good faith that defendants would use their best efforts to revise the IFQ Regulations in a timely manner. However, based on defendants' supplement brief on remedy and conversations with them last week, it is apparent that a more stringent order is necessary and appropriate, which would require the vacatur of the IFQ Regulations if defendants fail to act by May 15. *See e.g.*, *Hall v. E.P.A.*, 273 F.3d 1146, 1161 (if "the decision of the agency is not sustainable on the administrative record made, then the ... decision must be vacated and the matter remanded … for further consideration.") (internal quotations and citations omitted). Thus, plaintiffs request that the proposed order on remedy that they submitted with their Supplemental Brief is withdrawn and the Court consider the two alternative proposed orders submitted with this Reply instead.

> whiting that are consistent with the MSA and the MSJ Order; provided, however, that all other fishery management measures for the Pacific whiting fishery that have been issued in accordance with the MSA will remain in effect during this time.

Under this alternative, defendants would cease any further unlawful IFQ allocations, while they revised the regulations.[4] All other fishery management measures would remain in place. The fishery would still operate under the restrictive quotas for bycatch that are in place under the existing regulations. Thus, there would be no economic or conservation impact on the Pacific whiting fishery if the IFQ Regulations were suspended. The fishery would continue to operate for as long as it would take defendants to revise the IFQ Regulations.

The Court has authority to shape an equitable remedy and therefore order defendants to suspend the IFQ Regulations pending review and revision. Plaintiffs here contend that (1) they are "likely to suffer irreparable harm" if defendants continue to make unlawful allocations under the existing IFQ Regulations; (2) the balance of equities tips in their favor; and (3) suspension of the IFQ Regulations pending review is in the public interest. *See generally*, *M.R. v. Dreyfus*, 663 F.3d 1100, 11007-1108 (9th Cir. 2011) (setting out test for injunctive relief and holding preliminary injunction justified where Department of Social and Health Services promulgated regulations that would reduce hours of covered in-home personal care services.)

First, Plaintiffs have already succeeded on the merits as to the legality of the IFQ Regulations under the MSA. Second, defendants have expressed their intent to continue to leave the existing regulations in place for the next two years while they revise the IFQ allocations. During this time, they would continue to make allocations that would not comply with the Court's order. Thus, plaintiffs would likely suffer irreparable harm to their businesses by continuing to receive an unfair allocation of their quota share than they are otherwise entitled to under a standard that includes all recent fishing history. *See* Marchand Decl. at ¶4 (Exh. 1). Third, the only fair and rational way to allocate Pacific whiting quota is to include all fishing history so that one group of fishermen does not receive an unfair advantage over another while defendants revise the rules to comply with the law. Lastly, it is in the public interest for the IFQ Regulations to be suspended

[4] Plaintiffs recently contacted defendants to offer this alternative as a remedy; however, defendants were not receptive to the idea.

pending review by defendants to avoid unlawful allocations of quota share for Pacific whiting for, as defendants claim, the next two years while they recalculate the quota shares.

An order with instructions to defendants is appropriate. In fact, courts have taken similar action in comparable circumstances involving NMFS. In *NRDC v. Locke*, C01-0421 (N.D. Cal. 2010) (Docket No. 340, April 23, 2010, the "NRDC MSJ Order"), the Natural Resources Defense Council sued NMFS and NOAA for violations of the MSA related to 2009-2010 fishing specifications for certain groundfish species. The Court held that the specifications violated the MSA and ordered NMFS to publish new specifications in light of the Court's ruling within one year of the remedy order. *See* NRDC MSJ Order at 2-3.[5] The Court vacated the specifications but ordered that prior specifications to be reinstated while NMFS established new specifications. *See* NRDC Order on Remedy at ¶4. (Docket No. 342, April 29, 2010, "NRDC Remedy Order").[6] Thus, the fishery management was returned to the status quo measures in effect before the unlawful specifications were implemented.

A similar order is requested and appropriate here.[7] Because the 2011 IFQ Regulations were a new program, a return to the status quo would simply mean that the Court suspend the IFQ Regulations for the mothership and shoreside sectors but leave all other fishery management measures that were in effect prior to the IFQ program. If, as defendants claim, it will take up to two years to recalculate the IFQ shares, then no further allocations should be made until defendants are able to comply with the MSA and the MSJ Order.

B. <u>Plaintiffs Propose that Defendants be Ordered to Review and Revise the IFQ Regulations by the Start of the 2012 Pacific Whiting Season (Alterative 2).</u>

Defendants have misled the Court regarding their ability to reconsider the IFQ Regulations in time for the start of the 2012 Pacific whiting season. Defendants assert that the season starts as

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[5] A copy of the NRDC MSJ Order is attached hereto as <u>Exhibit 2</u>.

[6] A copy of the NRDC Remedy Order is attached hereto as <u>Exhibit 3</u>.

[7] *North Carolina Fisheries* is distinguishable and defendants rely on dicta to support their argument that the Court should not impose a remedial order. The focus in that case was not about the timing required for defendants to comply with an order, which is all that plaintiffs seek here. Rather, the Court dismissed the appeal for lack of jurisdiction and did not rule on the merits of the order. *North Carolina Fisheries Ass'n v. Gutierrez*, 550 F.3d 16, 21 (D.C. Cir. 2008). The Court in NRDC was also not swayed by the government's same argument that they use here. *See* NRDC MSJ Order at 48.

early as April; however, the statutory start of the Pacific whiting season starts on May 15 for harvesters and processors in the mothership sector. 50 C.F.R. §660.373(b)(1)(iii)(B). Revising the IFQ Regulations in time for the start of the Pacific whiting season is entirely feasible. Thus, plaintiffs propose as a second alternative an order that requires defendants to remand and revise by May 15, 2012 and if they fail to do so, the IFQ Regulations will be vacated. Specifically, the order would require that:

1. The IFQ Regulations are remanded to NMFS for reconsideration and revision based on "current and historical harvest" for harvesters and processors for Pacific whiting within the meaning of 16 U.S.C. §1853a(c)(5)(A)(i) and consistent with the MSA and the MSJ Order;

2. Defendants use their best efforts and all available authority, including taking emergency action and interim measures pursuant to 16 U.S.C. §1855(c) as appropriate, to implement revised, final IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012; and

3. The existing IFQ Regulations remain in effect pending the implementation of revised, final IFQ Regulations for the 2012 Pacific whiting; provided, however, that if Defendants fail to implement revised IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012, the existing IFQ Regulations will be vacated.

Defendants' claim that they cannot act by May 15 is disingenuous. First, defendants glossed over the fact that the earliest of the Pacific Fishery Management Council (the "Council") meetings at which the Pacific whiting quotas can be addressed is in March and not April. (Defs. Brief at 6:14-16); *see* Proposed March 2012 Council Meeting Agenda at p. 3 (Part F.1).[8] In fact, the Council has put "[p]lanning and necessary actions for the 2012-2013 Pacific whiting fishing season, including potential impacts from the Pacific Dawn litigation" on its agenda for the March 2-7, 2012 meeting. *See* Exh. 4 at p. 3 (Item F.1). Moreover, public comments are accepted up to the week before the Council meeting to be distributed at the meeting and to give the Council sufficient time to consider all positions. *See* Council Operating Procedure (revised 9/12/08) at p. 1-2.[9]

Further, defendants implemented the 2011 IFQ Regulations on an abbreviated timetable, which shows that they can move quickly when necessary. On April 5, 2011, NMFS issued a

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[8] A copy of the Council's proposed agenda is attached hereto as Exhibit 4.
[9] A copy of the Council Operating Procedure is attached hereto as Exhibit 5.

proposed rule for Pacific whiting and accepted comments until April 19, 2011. 76 Fed. Reg. 18709 (April 5, 2011) (*see* Exhibit 2 to Plaintiff's Supplemental Memorandum in Support of Request for Relief "Supp. Brief"). NMFS then published the final rule weeks later on May 19, 2011 made applicable to May 15. 76 Fed. Reg. 28897 (May 19, 2011) (*see* Exhibit 3 to Supp. Brief). Thus, under the existing timetable, it is possible for defendants to review and revise the IFQ Regulations to comply with the MSJ Order by the start of the 2012 Pacific whiting season.

Second, defendants are also vested with authority to take emergency and interim action, which would allow them to move quickly to implement the revised IFQ Allocations that include all recent fishing history. "If the Secretary finds that an emergency exists or that interim measures are needed to reduce overfishing for any fishery, he may promulgate emergency regulations or interim measures necessary to address the emergency or overfishing, without regard to whether a fishery management plan exists for such fishery." 16 U.S.C. §1855(c). NMFS Policy Guidelines for the Use of Emergency Rules describe the criteria for implementing emergency authority.[10] NMFS defines an emergency situation as one that "[r]esults from recent, unforeseen events or recently discovered circumstances;…[p]resents serious…management problems in the fishery; and…[c]an be addressed through emergency regulations for which the immediate benefits outweigh the value of advance notice, public comment, and deliberative consideration of the impacts on participants to the same extent as would be expected under the normal rulemaking process." *Id.* at p. 2. An important justification for taking emergency action is "economic" – "to prevent significant direct economic loss or preserve a significant economic opportunity that otherwise might be foregone." *Id.*

An economic justification surely exists for defendants to take emergency action to comply with the MSA and the Court's order. When the IFQs are revised to include all recent fishing history, the allocations will be made fairly and without giving one group of participants an unfair advantage over another. Whiting fishermen who have consistently participated in the whiting fishery with a reasonably consistent level of fishing effort during the initial years of 1994-2003

[10] A copy of National Marine Fisheries Service Instruction 01-101-07, Policy Guidelines for the use of Emergency Rules, is attached hereto as Exhibit 6.

and the recent period of 2004-2010, will maintain their IFQ quota share with little or no change. Those who had strong participation or whiting landings in the initial period of 1994-2003 but have weak history or no history in the recent period of 2004-2010 will experience a reduction in their IFQ quota share. Those who have a stronger history of landings during the recent period of 2004-2010 due to changes in whiting distribution, changes in by-catch management or changes in community participation in the fishery, including markets at shoreside processing plants, will experience an increase in their IFQ quota share.

However, until this happens, certain fishery participants who received a quota share based on the unlawful allocations will continue to be unfairly affected until the regulations are revised to include all recent fishing history. If the agency leaves the existing allocations in place pending their review for the next two years, these fishermen will be harmed. Marchand Decl. at ¶4 (Exh. 1). Under the existing allocations, the quota share for these fishermen is lower than what they would be entitled to if the agency revised the allocations to comply with the law. Fishermen who participated most actively and recently in the fishery, however, would have have a higher initial allocation of IFQ if the current fishing history were taken into account. Thus, by leaving the existing allocations in place, these fishermen will lose business because of the failure of the agency to timely revise the allocations to comply with the law. Waiting two years for the revised allocations would therefore mean another two years of a lower quota share, which would have a negative financial impact on certain businesses. *Id*.

Leaving the existing allocations in place for the next two years will also have an unfair and disproportionate effect across participants in the Pacific whiting fishery. Under the agency's timetable, the allocations for certain other Pacific whiting fishery participants will continue to be higher than what they would receive if the current fishing history years were included in the allocations. It will therefore benefit some participants, who will continue to receive a higher allocation under the existing, illegal program than they would be entitled to if all current fishing history was included in the allocations. It will at the same time, harm others who will then continue to receive a lower allocation by leaving the illegal program in place. Thus, the agency's unnecessary delay in revising the allocations to include all current fishing history will cause

DAVIS WRIGHT TREMAINE LLP

financial harm to fishing companies who receive a lower than their fair share of the quota. Marchand Decl. at ¶5 (Exh. 1).

Third, defendants have used this emergency authority in similar circumstances to revise regulations to comply with a court order. In the NRDC case described above, NMFS took emergency action to establish new specifications for certain overfished species to meet a one year deadline set by the court. *See* 76 Fed. Reg. 27508 at 27508-27509 (May 11, 2011) (describing justification for provisions implemented through emergency rule).[11] The Court in the NRDC case ordered defendants to comply with its order within one year, finding "the Agency has been able to meet a one-year deadline before and should be able to now." *See* NRDC MSJ Order at 48 (Exh. 2); NRDC Remedy Order at ¶5 (Exh. 3). There is no reason that defendants could not take emergency action in this case to comply with the MSJ Order. It defies logic why they insist on an unnecessary delay that will do nothing but cause ongoing unlawful allocations to be made in defiance of the Court's order.

II. CONCLUSION

Plaintiffs respectfully request that the Court grant the above-described relief to remedy the violations of law while defendants take legally required corrective action.

DATED: February 13, 2012.

Respectfully submitted,

/s/ James P. Walsh
James P. Walsh
DAVIS WRIGHT TREMAINE LLP

Attorneys for Plaintiffs, Pacific Dawn LLC, Chellissa LLC, James and Sandra Schones, Da Yang Seafood, Inc. and Jessie's Ilwaco Fish Company

[11] A copy of 76 Fed. Reg. 27508 (May 11, 2011) is attached hereto as Exhibit 7.

Exhibit 1

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DAVIS WRIGHT TREMAINE LLP

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, V. GARY LOCKE, Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **DECLARATION OF PIERRE MARCHAND, JR. IN SUPPORT OF PLAINTIFFS' SUPPLEMENTAL MEMORANDUM IN SUPPORT OF REQUEST FOR RELIEF**

I, PIERRE MARCHAND, JR., declare as follows:

1. I am the President and owner of Jessie's Ilwaco Fish Company located at 117B Howerton Way SE, Ilwaco, Washington. I have been part of the Company since 1964. I make this Declaration based on my personal knowledge in support of Plaintiffs' Supplemental

Memorandum in Support of Request for Relief. If called as a witness, I could testify to the facts set forth in this Declaration truthfully and competently.

2. Jessie's Ilwaco Fish Company ("Ilwaco") participates in the Pacific whiting fishery. The Magnuson-Stevens Fishery Management Act ("Magnuson-Stevens Act") recognizes fishing communities that are especially dependent on fishing, fish processing, or fishery-dependent support businesses. Ilwaco has a long tradition in the fish processing business and is unquestionably the kind of coastal community Congress had in mind to assist when it enacted the Magnuson-Stevens Act. Our company has long been the flagship fishery business for the Ilwaco community and surrounding area.

3. On February 8, 2012, I attended a meeting at the National Oceanic and Atmospheric Administration's office in Seattle Washington. Plaintiffs requested this meeting, which Will Stelle, Northwest Regional Administrator, attended (among others). At the meeting, we presented our recommendations regarding the revision of IFQ allocations for the 2012 Pacific whiting season in light of the Court's recent ruling that the failure to include years beyond 2003 for harvesters and 2004 for processors in the 2011 allocations was arbitrary and capricious. At the meeting, I was informed that it would take up to two years for the agency to revise the IFQ allocations to comply with the Court's order. It is my understanding from the meeting that the agency wants to leave the existing allocations in place while they revise the allocations.

4. If the agency leaves the existing allocations in place pending their review for the next two years, my business will be harmed. Under the existing allocations, my quota share is lower than what I would be entitled to if the agency revised the allocations to comply with the law. I would have a higher initial allocation of IFQ if the current fishing history were taken into account. Thus, I will lose business because of the failure of the agency to timely revise the

allocations to comply with the law. Waiting two years for the revised allocations would therefore mean another two years of a lower quota share, which would have a negative financial impact on my business.

5. Leaving the existing allocations in place for the next two years will have an unfair and disproportional effect across participants in the Pacific whiting fishery. Under the agency's timetable, the allocations for certain other Pacific whiting fishery participants will continue to be higher than what they would receive if the current fishing history years were included in the allocations. It will therefore benefit some participants, who will continue to receive a higher allocation under the existing, illegal program than they would be entitled to if all current fishing history was included in the allocations. It will at the same time, harm others who will then continue to receive a lower allocation by leaving the illegal program in place. Thus, the agency's unnecessary delay in revising the allocations to include all current fishing history will cause financial harm to my company and others similarly situated.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed this 9th day of February, 2012 in Ilwaco, Washington

/s/ Pierre Marchand, Jr.
Pierre Marchand, Jr.

DAVIS WRIGHT TREMAINE LLP

Exhibit 2

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al.,

Plaintiffs,

v.

GARY LOCKE, et al.,

Defendants.
_______________________________/

No. C 01-0421 JL

ORDER GRANTING IN PART AND DENYING IN PART PARTIES' CROSS-MOTIONS FOR SUMMARY JUDGMENT (Docket #s 302, 312)

I. INTRODUCTION

A. Summary and Appearances

This Court has original jurisdiction over this federal question case. The Natural Resources Defense Council ("NRDC") alleges that Defendants, the Department of Commerce by Secretary Gary Locke, the National Oceanographic and Aerospace Administration ("NOAA") and the National Marine Fisheries Service (collectively "Federal Defendants" or "NMFS" or "the Agency") violated the Magnuson-Stevens Act ("MSA"),16 U.S.C. §§ 1801-1891, and the National Environmental Policy Act of 1969 ("NEPA"), 42 U.S.C.A. § 4321 et seq., when they published the 2009-2010 Specifications for seven overfished species of Pacific groundfish: darkblotched rockfish, cowcod, yelloweye rockfish, canary rockfish, bocaccio, Pacific Ocean Perch, and widow rockfish. The Agency denies that the 2009-2010 Specifications for the Pacific Coast groundfish violate these statutes or the applicable case law, and moves for summary judgment. All parties consented to this Court's jurisdiction under 28 U.S.C. §636©).

The Court permitted an extended briefing schedule and oversized briefs by the two parties and two amici. The parties' cross-motions for summary judgment at Docket Numbers 302 (Plaintiff) and 312 (Federal Defendants) came on for hearing. Appearing for Plaintiff were Selena Kyle, Laura Pagano, and Michael Wall, Natural Resources Defense Council. Appearing for Federal Defendants were Erik Petersen and Ruth Storey, Wildlife & Marine Resources Section, United States Department of Justice, Environment & Natural Resources Division, Washington, D.C. Appearing for the Office of General Counsel, National Oceanic and Atmospheric Administration ("NOAA") were Mariam McCall and Kevin Duffy. Appearing for Amicus West Coast Seafood Processors Association was James Walsh, Davis Wright Tremaine. Appearing for Amicus Makah Indian Tribe was Marc D. Slonim, Ziontz Chestnut Varnell Berley & Slonim, Seattle, Washington. The Court permitted post-hearing submissions on new case law and the motions were then submitted.

The Court carefully considered the moving and opposing papers and the arguments of counsel and amici, and the extremely voluminous record in this case, much of it produced on compact discs as well as several boxes of hard copies of the entire Administrative Record and the parties' excerpts of record. This Court grants in part and denies in part the parties' cross-motions, and holds that the 2009-2010 Specifications for darkblotched rockfish, cowcod, and yelloweye rockfish violate the MSA by failing to rebuild the species in as short a time as possible. *Natural Resources Defense Council v. National Marine Fisheries Service, ("NRDC v. NMFS"), infra*. For darkblotched rockfish and cowcod but not yelloweye, the Court orders the Agency to apply its 2008 harvest levels in 2010. For yelloweye, the Court orders the Agency to apply the yelloweye harvest levels the Agency set for 2009 and 2010 in the original "ramp-down" plan it approved for yelloweye in the 2007-2008 Specifications. This sets 2009 yelloweye harvests at 17 metric tons, and 2010 yelloweye harvests at 14 metric tons (rather than the 17 metric tons the Agency has allowed for 2010 under the 2009-2010 Specifications). 16-4 Final Rule, 71 Fed. Reg. at

78,651, PER00458. NRDC shall prepare a Proposed Order on Remedy reflecting this ruling. The Agency shall publish new Specifications in light of this Court's ruling, within one year of issuance of the Order on Remedy.

B. Background

1. The Specifications process

Vastly oversimplified, every two years:

1) The Agency takes the results of the most current stock assessment, which is a measure of the population of the groundfish species, expressed as a percent (%) of unfished biomass;

2) The Agency calculates when the species could be rebuilt, that is, restored to 40% of unfished biomass, with a harvest level of zero fishing mortality;

3) If the species can be rebuilt within 10 years using a zero harvest level, the Agency must use that harvest level or Optimal Yield ("OY"), unless doing so would result in disastrous consequences to fishing communities; *NRDC v. NMFS,* 421 F.3d 872, at 880; see also § 1854 (e)(4)(A)(i);

4) The Agency estimates short-term economic consequences to fishing communities by using FEAM and IMPLAN data (discussed in more detail below) to calculate fishing revenues, combined with its holistic analysis of the effects of different harvest levels for overfished species on catches of commercially valuable species such as whiting, sablefish and petrale sole;

5) The Agency then calculates new harvest levels which would mitigate or remove severe negative consequences to fishing communities and calculates new target rebuilding dates using those harvest levels.

The seven overfished groundfish species discussed in this order are not targeted for fishing, but are incidentally caught as bycatch by fishermen targeting other species. Groundfish caught as bycatch almost always die. *Natural Resources Defense Council v. National Marine Fisheries Service*, 421 F.3d 872, 880 (9th Cir. 2005) ("Almost no groundfish that are caught as bycatch survive even if they are thrown back into the ocean."). Groundfish are deepwater fish, inhabiting midwater or even the very bottom of the ocean, and are acclimated to the extreme pressure at that level. When dragged to the surface in a net as bycatch, the fish suffer lethal pressure trauma, their swim bladders bursting, even if they are quickly returned to the water. PER01062, 01212; *Natural Resources Defense Council v. Evans* ("*NRDC v. Evans*"), 168 F. Supp. 2d at 1152 (discussing bocaccio rockfish bycatch).

2. Specifications at issue in these motions

On March 6, 2009 the Agency issued its 2009-2010 Specifications for the Pacific groundfish fishery. 09-10 Final Rule, 74 Fed. Reg. at 9,874, PER00002-47. The 2009-2010 Specifications revised Amendment 16-4's rebuilding periods for four of the seven overfished species in accordance with the FMP's rebuilding framework as amended through Amendment 16-4. *Id.* at 9,874, PER00002.

The Agency's current rebuilding periods and harvest measures for overfished Pacific Coast groundfish are the product of several actions: Amendments 12, 16-1, 16-2, 16-3 and 16-4 to the FMP, through which the Agency approved its current rebuilding framework for overfished Pacific Coast groundfish and the current rebuilding periods for three of the seven overfished species; and the 2009-2010 Specifications, through which the Agency established the current rebuilding periods for the remaining four overfished species.

The Agency in its brief in opposition to Plaintiff's motion and in support of its cross-motion asserts that the prior amendments and regulations have been superseded, are no longer effective, and therefore any proceeding with respect to them is moot. (Def. Opp. and Cross-motion at 1:20-24, Docket # 312). This Court accepts the Agency's representation that these prior amendments and regulations are not in effect and therefore not at issue.

3. Preliminary Issue

A. NRDC has standing

Amicus West Coast Seafood Processors Association again challenges NRDC's standing to sue Defendants. This Court has already resolved this issue by its order issued April 3, 2009, finding that NRDC has standing, and declines to reconsider its previous ruling. (See Docket Number 261 at 13:9 - 19, citing Complaint at ¶ 6). This order is currently on appeal (USCA Case Number 9-16796). The Court acknowledges that its previous ruling was limited in scope. NRDC in its pleadings filed in the current motion has reiterated more than enough evidence to support its standing (See NRDC Memo of Points and Authorities at ¶ 13 -14 and declarations of NRDC members regarding their professional and recreational enjoyment of Pacific groundfish. Garrison Decl. ISO Pltf motion, ¶¶ 6-7; Gifford Decl. ¶¶ 17-18; Brakke Decl. ¶¶ 4-5.). These facts establish standing under Article III because they show that NRDC's members have suffered (1) individual "injury in fact" that is concrete and particularized as well as actual or imminent; (2) fairly traceable to Defendants' conduct; and (3) likely to be redressed by a favorable decision. *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs. (TOC), Inc.*, 528 U.S. 167, 180-81 (2000) (citing *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560-61 (1992)).

The Court finds that the Association fails to raise any new substantive issue, as required to justify reconsideration under Rule 59 or 60, Federal Rules of Civil Procedure, and Civil Local Rule 7-9, which would require allegation of a material difference in fact or law which could not have been discovered by reasonable diligence, or the emergence of new material facts or a change of law since the Court's ruling, or manifest failure by the Court to consider material facts or dispositive legal arguments which were presented to the Court before such an interlocutory order.

The Court finds equally unconvincing the Association's renewed substantive argument against NRDC's standing. The Association argues, *inter alia*, that "given the small biomass of the seven overfished/depleted stocks relative to the overall available fish biomass, the likelihood that NRDC's members can ever be assured of catching any of these stocks is surely quite remote. But that should not prevent them from a satisfying day of fishing on other stocks." (Opp. at 15, n. 26) According to the Association's argument, since the species are depleted, NRDC members are less likely to catch them, so they have no standing to complain that the species are depleted. This is at best circular reasoning. The Association also discounts NRDC members' interest in marine mammals as having any connection with the groundfish fishery. This is odd, since the Agency takes marine mammals into consideration in the course of its planning for the fishery, because groundfish are a source of food for marine mammals such as seals, which are sometimes injured by fishing gear. (PER01063). As discussed above and in its previous rulings, the Court finds that NRDC has standing.

II. APPLICABLE LAW

A. Standard for summary judgment

Summary judgment is appropriate where "there is no genuine issue as to any material fact" and "the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56©); *Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986). Review of NRDC's MSA and NEPA claims is governed by the Administrative Procedure Act ("APA"), 5 U.S.C. §§ 701-706, which provides for courts to "hold unlawful and set aside agency action" that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A); 16 U.S.C. § 1855(f)(1)(B); *Turtle Island Restoration Network v. U.S. Dept. of Commerce,* 438 F.3d 937, 942 (9th Cir. 2006*).* APA review is "searching and careful." *Marsh v. Or. Natural Res. Council,* 490 U.S. 360, 378 (1989) (citing *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416 (1971), abrogated on other grounds, *Califano v Sanders*, 430 U.S. 99 (1977)). It requires a court to decide whether the agency has acted "based on a consideration of the relevant factors," *Motor Vehicle Mfrs. Ass'n of U.S. v. State Farm Mut. Auto. Ins.,* 463 U.S. 29, 30-31 (1983), and articulated "a rational connection between the facts found and the choices made." *Id.* at 43. If the record reveals that the agency has "entirely failed to consider an important aspect of the problem" before it, the agency's action must be set aside. *Id.*

Where a court's review requires it to interpret statutory language, the court cannot defer to an agency's interpretation of that language "if Congress's intent can be clearly ascertained through analysis of the language, purpose and structure of the statute." *NRDC v. NMFS*, 421 F.3d 872, 877 (9th Cir. 2005) (quoting *Chevron, U.S.A., Inc. v. NRDC*, 467 U.S. 837, 842-43 (1984)). If Congress's intent is unclear, the court may defer to the agency's interpretation only if it is "based on a permissible construction of the statute." *Id.* (quoting *Chevron*, 467 U.S. at 843).

The parties submitted separate statements of material facts not in dispute, and responses to those statements. Their most significant differences are: a) the holding in *NRDC v NMFS*, *infra*, which is a finding of law, not fact; b) the harvest limits set by NMFS for several species of groundfish, from 2001 to the present; and c) calculations of fishing revenues. The Court makes its own rulings on the law in the course of this order but must accept the Agency's own versions of its Specifications, as long as they are supported by citations to the administrative record. The issue of fishing revenues is dealt with below.

B. Standard and scope of judicial review under the Magnuson-Stevens Act

All parties agree on the standard of review to be employed by the Court. (Docs. # 32, ¶. 5-6; # 35, ¶. 35; # 37, ¶. 6-7). The Magnuson-Stevens Act adopts portions of the standard of review set forth in the Administrative Procedures Act. 16 U.S.C. § 1855(f)(1)(B), (2). The scope of the Court's review is limited to the administrative record, and in this case the applicable review standard is whether the agency action is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law. 5 U.S.C. § 706(2)(A); *Midwater Trawlers Cooperative v. Department of Commerce*, 393 F.3d 994, 1002 (9th Cir.2004) (finding that Under Section 305(f) of the Magnuson-Stevens Act, 16 U.S.C. 1855(f), which adopts the standard of review set forth in the Administrative Procedure Act ("APA") at 5 U.S.C. § 706, regulations promulgated by the Secretary may be set aside only if they are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. 706(2)(A). This Court's only task is to determine whether

the Secretary has considered the relevant factors and articulated a rational connection between the facts found and the choices made. *Washington Crab Producers, Inc. v. Mosbacher*, 924 F.2d 1438, 1441 (9th Cir.1990).

Under the arbitrary and capricious standard, the reviewing court "gives deference to the agency decision by reviewing for clear error, and by refraining from substituting its own judgment for that of the agency. However, the court must also look beyond the scope of the decision itself to the relevant factors that the agency considered." *Sierra Club v. U.S. Army Corps. of Engineers*, 295 F.3d 1209, 1216 (11th Cir.2002) (citations omitted). A regulation will be found to be arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Southern Offshore Fishing Association v. Daley*, 995 F.Supp. 1411, 1425 (M.D.Fla.1998) (quoting *Motor Vehicle Manufacturers Association of U.S. v. State Farm Mutual. Automobile Ins*urance, 463 U.S. 29, 43 (1983)).

C. Provisions of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801-1891

1. The rebuilding period for an overfished species must be "as short as possible."

After reauthorizations since 1976, the original Fishery Conservation and Management Act is now named the Magnuson-Stevens Fishery Conservation and Management Act, aka the Magnuson-Stevens Act or MSA. In 1996, Congress amended the Magnuson-Stevens Act with the Sustainable Fisheries Act (SFA). Pub. L. No. 104-297. The SFA added significant conservation requirements to address overfishing, bycatch, and fish habitat protection. *Id.*

The U.S. Court of Appeals for the Ninth Circuit interpreted section 1854(e)(4)(i)'s mandate that a rebuilding period be "as short as possible" while giving consideration to "the status and biology of the overfished species and the needs of the fishing communities" as Congress' way of ensuring that overfished species would be rebuilt as quickly as possible while "leaving some leeway to avoid disastrous short-term consequences for fishing communities." *NRDC. v. NMFS,* 421 F.3d 872, at 880; see also § 1854 (e)(4)(A)(i). With this interpretation of section 1854(e)(4)(i), the court declared that Congress intended section 1854(e)(4)(ii) as a limit on the Agency's discretion. *Id.* When it is possible to rebuild a species within ten years, the Agency "may consider the short-term economic needs of fishing communities" but "may not use those needs to go beyond the ten year-cap set in subsection (ii)." *Id.* This cap may not be breached unless required by an international agreement, or if the biology of the species makes it impossible to rebuild within ten years, even with a total moratorium on fishing. *Id.* These circumstances, however, do not relieve the Agency of its obligation to rebuild the species in a time frame that is "as short as possible." *Id.* The court concluded that the needs of the fishing communities may still be taken into account even when the biology of the fish dictates exceeding the 10-year cap--so long as the weight given is proportionate to the weight the Agency might give to such needs in rebuilding periods under 10 years. . . *Id.* at 881

As a consequence of increased fishing pressure, and because of the inadequacy of fishery conservation and management practices and controls, certain stocks of fish declined to the point where their survival is threatened, and other stocks of fish have been so substantially reduced in number that they could become similarly threatened. Section 1854(e)(4)(i).

Part of the reason Congress elevated conservation over economic interests is that conserving fish populations yields the double benefit of both improving the environment and providing long-term economic return. "Fishery resources are finite but renewable. If placed under sound management before overfishing has caused irreversible effects, the fisheries can be conserved and maintained so as to provide optimum yields on a continuing basis." Section 1801(a)(5).

The guidance of the court of appeals to this Court in reference to this same fishery is that the purpose of the Magnuson-Stevens Act is clearly to give conservation of fisheries priority over short-term economic interests. The Act sets this priority in part because the longer-term economic interests of fishing communities are aligned with the conservation goals set forth in the Act. Without immediate efforts to rebuild depleted fisheries, the very survival of those fishing communities is in doubt. *NRDC v NMFS,* 421 F.3d at 879.

2. The Agency must apply the "best available science" in a Fishery Management Plan ("FMP").

National Standard Two of the Magnuson-Stevens Act mandates that upon promulgating an FMP, "conservation and management measures shall be based upon the best scientific information available." In general, the term "best scientific information available" refers to use of scientific information when science is unsettled or incomplete, when no better information is available, and when the decision by the Council furthers conservation of the fishery resource. "Scientific information" includes, but is not limited to, biological, ecological, economic, or social information. To ensure the success of an FMP, the data must undergo a thorough analysis and must be of high quality. Thus, while National Standard Two does not propose specific analytical tools or methodologies for information gathering, it has one restriction: that agencies use the "best available science" in their decision-making.

The Councils view "best available science" as referring to the most recent and relevant information available at the time an FMP is devised. This interpretation logically follows from the ordinary meaning of the word "best" - the most relevant and contemporary information is seen as the best information.

Of further importance, the Magnuson-Stevens Act requires the best scientific information *available*. National Standard Two does not, however, call for the best scientific data *possible*. Inherent in both the statutory language, as well as the spirit of the Magnuson-Stevens Act, is the notion that scientific information may be incomplete; it need not be exact or absolutely comprehensive. Furthermore, there may be differences among the relevant information available to a Council. If so, the Secretary may exercise discretion and choose among the various findings, so long as the choice is justified. Likewise, if there is no other proposed scientific information, then what is available is therefore "best." As such, the Magnuson-Stevens Act does not force the Secretary of Commerce or the Councils to "sit idly by" and watch the deterioration of a fishery resource merely because the data is incomplete or the accuracy is somewhat uncertain. *Fishing for the Truth:*

Achieving the "Best Available Science" by Forging a Middle Ground Between Mainstream Scientists and Fishermen, 30-SPG Environs Envtl. L. & Pol'y J. 275, 282 -286 (Spring 2007).

a. Science may be the best available if incomplete, but not if unreliable.

In *A.M.L. International, Inc. v. Daley*, the court found that, in arriving at the fishery management plan at issue, the agency had used the best available science, even though that science was incomplete. 107 F.Supp.2d 90, 101 -102 (D.Mass.,2000).

But another court, in *Natural Resources Defense Council, Inc. v. Daley*, found that an agency decision was not based on the best science available, where the statistics were unreliable. ("The disputed 1999 TAL [total allowable landings] had at most an 18% likelihood of achieving the target F [fishing mortality rate].") 209 F.3d 747, 754 (D.C. Cir. 2000), disagreed with on other grounds by *NRDC v. NMFS* (Stating in dicta that the MSA might acknowledge a conflict between conservation of species and short-term economic interests, but not a conflict between conservation and long-term economic interests.) 421 F.3d 872 at 878.

D. NATIONAL ENVIRONMENTAL PROTECTION ACT ("NEPA"), 42 U.S.C.A. § 4321 et seq.

1. The Statute imposes procedural requirements.

NEPA imposes only procedural requirements to ensure that the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts. *Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 371 (1989); *Lands Council v. Powell*, 395 F.3d 1019, 1026 (9th Cir. 2005). NEPA's mandate to federal agencies is "essentially procedural. . . . It is to insure a fully informed and well-considered decision. . . ." *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, 435 U.S. 519, 558 (1978). The NEPA process is designed to "identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment." 40 C.F.R. § 1500.2(e). "[I]t is now well settled that NEPA itself does not mandate particular results, but simply prescribes the necessary process." *Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 350 (1989) (citations omitted). See also *'Ilio'ulaokalani Coalition v. Rumsfeld*, 464 F.3d 1083, 1093 (9th Cir. 2006) ("NEPA does not . . . mandate any substantive outcome.").

NEPA requires a comprehensive environmental impact statement ("EIS") for "major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332©); 40 C.F.R. 1502. The agency first prepares an environmental assessment ("EA"), which serves to "briefly provide sufficient evidence and analysis for determining whether to prepare an [EIS] or a finding of no significant impact," and "shall include brief discussions of the need for the proposal, [and] of alternatives." 40 C.F.R. 1508.9(a)(1) and (b). In the EIS, the agency must consider reasonable alternatives to the proposed action. 40 C.F.R. § 1502.14; "However, this requirement is tempered by the recognition that 'the detail that NEPA requires in an EIS depends upon the nature and scope of the proposed action.'" *Northwest Coalition for Alternatives to Pesticides v. Lyng,* 844 F.2d 588, 592 (9th Cir. 1988), quoting *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982).

2. An agency's withholding of information about the shortcomings of the science it relies on may invalidate that reliance, due to lack of transparency

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In *Lands Council v. Powell*, 395 F.3d 1019 (9th Cir. 2005), the court held that the Forest Service violated NEPA by approving a timber harvest as part of a watershed restoration project. In particular, the court found that the agency's "heavy reliance" on the WATSED model to analyze the cumulative effects of timber harvests on in-stream sedimentation violated NEPA. The court found,"Moreover, the Forest Service knew that WATSED had shortcomings, and yet did not disclose these shortcomings until the agency's decision was challenged on the administrative appeal. We hold that this withholding of information violated NEPA, which requires up-front disclosures of relevant

shortcomings in the data or models." *Id.* at 1032. In this case, NRDC argues that the Agency relies on outdated and misleading data on fishery revenue, exaggerating the negative economic effects of rebuilding.

III. ARGUMENT

A. NRDC

NRDC asks this Court to grant its motion for summary judgment, by finding that there is no material fact in dispute that NMFS's rebuilding amendments and 2009-2010 Specifications for seven overfished [1] species of Pacific Coast groundfish – bocaccio, canary, cowcod, darkblotched, pacific ocean perch, yelloweye, and widow – violate important mandates which require the Agency to rebuild overfished species in as short a time as possible and on the basis of sound and transparent analysis.

NRDC bases its motion on these contentions: (1) The rebuilding amendments and 2009-2010 Specifications establish rebuilding periods for the seven overfished species of Pacific Coast groundfish that are not "as short as possible," in violation of MSA section 304(e)(4)(A)(i); (2) These rules fail to apply the best available science and to account for the long-term benefits of rebuilding, in violation of the MSA and APA; (3) Amendment 16-4 and the 2009-2010 Specifications do not clearly explain the reasoning and methodology the Agency used to establish its current rebuilding periods and associated harvest measures, in violation of the MSA and APA; (4) The 2009-2010 Specifications were approved without analysis of a reasonable range of alternative harvest measures that would rebuild overfished Pacific Coast groundfish species in "as short [a time] as possible," in violation of NEPA.

NRDC asks the Court to approve its challenge to Defendants' failure to restore seven overfished species of Pacific Coast groundfish to healthy populations in the time required by law. Section 304(e)(4)(A)(i) of the Magnuson-Stevens Fishery Conservation and Management Act ("MSA"), 16 U.S.C. §§ 1801-1891, requires Defendant National

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[1] The term "overfished" is a term of art. An overfished stock is one whose biomass is estimated to be less than 25 percent of its previous estimated "unfished" biomass size. A stock of fish that is over this 25 percent threshold is considered "depleted" and subject to a recovery plan until it reaches a biomass equal to 40 percent of its "unfished" biomass. NRDC admits as much in its Brief at 7 n.4. Thus, only bocaccio, darkblotched rockfish, cowcod, and yelloweye rockfish are considered overfished. The other three species---pacific ocean perch, canary rockfish and widow rockfish are considered "depleted" but still subject to rebuilding requirements. Association brief in Opposition, P. 1, n.1

Marine Fisheries Service ("NMFS" or "the Agency") to rebuild overfished species in "as short [a time] as possible," while taking into account species' biology, the "needs of fishing communities," and certain other concerns. 16 U.S.C. § 1854(e)(4)(A)(i).

NRDC contends that, in the four years since the court of appeals ruling in *NRDC v. NMFS*, the Agency has repeatedly violated section 304(e)(4)(A)(i) by adopting rebuilding periods and harvest levels for Pacific Coast groundfish that unlawfully prioritize revenue gains over faster rebuilding, in direct contravention of the court of appeals' ruling. NRDC asks the Court to find that the Agency has also relied on outdated and incomplete economic information that exaggerates the costs of rebuilding in violation of the MSA and fails to explain how it has weighed the needs of fishing communities in deciding to delay rebuilding, in violation of the Administrative Procedure Act ("APA"), 5 U.S.C. §§ 701-706.

Finally, NRDC argues that the Agency failed to analyze a reasonable range of alternative harvest measures for the Pacific Coast groundfish fishery that would ensure overfished species are rebuilt in as short a time as possible, in violation of the National Environmental Policy Act ("NEPA"), 42 U.S.C. §§ 4321-4347. NMFS's current rebuilding periods and harvest measures for Pacific Coast groundfish, and the actions pursuant to which the Agency approved those periods and measures, violate the MSA, APA, and NEPA and should be set aside.

B. NMFS

NMFS argues that: (1) It employed its expertise to weigh "the difficult and often conflicting short-term and longterm socio-economic and biological considerations in fisheries management, which require sustaining both the long-term productive capacity of marine resources and the ability of fishing communities to harvest those resources." PER00495; (2) It articulated a rational basis for approving the regulations implementing Amendment 16-4 and the 2009-2010 Specifications, and the agency's decision is entitled to deference; (3) It ensured that it considered all relevant factors in the MSA and stated a rational connection between the facts and the agency's decision. *Yakutat, Inc. v. Gutierrez*, 407 F.3d 1054, 1066 (9th Cir. 2005); (4) It adopted rebuilding periods that are as short as possible, taking into account the statutory factors of the MSA in approving and implementing Amendment 16-4; (5) It employed its expertise to weigh "the difficult and often conflicting short-term and longterm socio-economic and biological considerations in fisheries management, which require sustaining both the long-term productive capacity of marine resources and the ability of fishing communities to harvest those resources." PER00495.

The Agency argues that in issuing the final rule implementing Amendment 16-4, it reasonably determined that the amendment is consistent with the MSA as interpreted by the Ninth Circuit. In *NRDC v. NMFS*, the court of appeals considered NMFS' obligation to rebuild overfished species in the context of the 2002 OY for darkblotched rockfish. Concluding that there is ambiguity in the mandate of MSA Section 1854(e)(4)(A)(I) to rebuild species in as short a time as possible, while considering the needs of fishing communities, the court found that the "natural reading" of the statute is that "Congress intended to ensure that overfished species were rebuilt as quickly as possible, but wanted to leave some leeway to avoid disastrous short-term consequences for fishing communities." *NRDC v. NMFS*, 421 F.3d at 880. NMFS therefore argues that it may consider the short-term economic needs of fishing communities in establishing rebuilding periods, but may not use such short-term economic needs as justification for exceeding the 10- year cap in Section 1854(e)(4)(A)(ii). *Id.* at 881. NMFS has discretion under the Act to determine whether a rebuilding period is "as short as possible," id. at § 1854(e)(4)(A)(I), although its discretion is constrained by the requirement that "if a species can be rebuilt within 10 years, it must be." *Id.* at 878.

Where the biology of the stock dictates exceeding the 10-year cap, NMFS may consider the needs of fishing communities "so long as the weight given is proportionate to the weight the Agency might give to such needs in rebuilding periods under 10 years." *Id.* at 881. See also *id.* at 880 (noting that 10-year cap would not apply where "the current number of fish in the fishery and the amount of time required for the species to regenerate make it impossible to rebuild the stock within 10 years, even with a total moratorium on fishing"). Under the court of appeals decision, NMFS may allow some catch of overfished species in order to avoid the adverse impacts that would result from reducing the allowable catch to zero, because ". . .an absolute ban on catching any of a species of groundfish could mean a total moratorium on all fishing in the parts of the fishery containing groundfish, with obvious adverse consequences for fishing communities." See *id.*

C. West Coast Seafood Processors

The Association contends that "Overfishing has ended; all stocks on road to recovery." It asks this Court to deny NRDC's motion and refrain from "taking over management of a fishery that is now considered one of the most successfully managed fisheries in the nation, if not the world." (Association Opp. at 1) It points to a reduction of harvest levels by over half since 1999. The Association submits an article in the most recent edition of *Science*, in which the authors concluded that the California Current System fishery has shown a "substantial decline in fishing pressure" and the stock biomass has "recently been increasing above the long-term average." Hence overfishing is no longer occurring and all overfished Pacific groundfish are "on the appropriate recovery path, consistent with applicable law," and therefore the 2009 - 2010 Specifications propounded by the Agency are in full compliance with the MSA and NEPA. Therefore NRDC fails to identify any serious error by the Agency with respect to weighing the economic impact of various OY levels on fishing communities. *Ocean Mammal Institute v. Gates*, 546 F.Supp.2d 960 (D.Haw. 2008).

The Association rejects NRDC's prediction that the proposed Specifications will result in increased income to fishing communities, and that this is the motive for the Agency to increase harvest levels for overfished species. To the contrary, the Agency has calculated that the total combined value of the anticipated fish harvest will actually decline by $15.1 million relative to the previous Specifications. FDER000219. Table 7-2a of the Final EIS at page 405, PER00296. Total domestic landings of all groundfish (excluding whiting) have gone from 45,349 metric tons in 1999 to 25,111 metric tons in 2007. The rockfish landings have declined from 16,408 metric tons in 1999 to 3,453 metric tons in 2007. Average landings for groundfish for 1981-2007 was 65,453 metric tons; average landings for 1998-2007 was 30,836 metric tons. For rockfish, the 1981-2007 average was 28,504 metric tons; for 1998-2007 it was 8,187 metric tons. These reductions in landings have resulted in an increase in the total groundfish biomass, as noted in the *Science* article and in the Final EIS, according to the Association.

The Association also argues that the Agency used an analytical tool which is within its Guidelines, and therefore NRDC's challenge that the Agency failed to use the best economic information available must fail. It argues that the Agency properly rejected NRDC's economic forecasting approach because "the necessary data to improve economic modeling of the Fishery is lacking." Fed. Def. brief at 34-35. The Association argues that the Agency has met its burden to provide a rational basis for its decision and that the Court must defer to the Agency where analysis requires a high level of technical expertise, as described in *Midwater Trawlers*, 393 F.3d at 1002-1003.

With respect to specifications for individual fisheries, the Association observes that the court of appeals previously approved rebuilding plans which NRDC had challenged for three species, disapproving only the plan for darkblotched rockfish. *NRDC v NMFS*, 421 F.3d at 873. The plans include substantial area closures to minimize bycatch of overfished stocks, and each closure impacts a nearby fishing community.

D. Makah Tribe

The Makah Tribe rejects NRDC's argument which assumes that any increase in harvest levels necessarily and impermissibly delays rebuilding. The Tribe argues that the best available science indicates otherwise: for canary and widow rockfish, the higher harvest levels adopted in the 2009-2010 Rule were expected to result in no change in the estimated median year in which the stock would be rebuilt compared to maintaining constant harvest levels from prior years, and for Pacific Ocean Perch the expected change was at most one year. Moreover, for all three stocks the higher harvest levels were justified by the "rebuilding paradox" (and, in the case of canary, by specific adverse impacts that had resulted from the prior 44 metric tons harvest level). The "rebuilding paradox" is a phenomenon which occurs as fish become more abundant. They become difficult to avoid and their level of bycatch increases (a large incoming class increases the specie's biomass as well as the fishery's interception rate).

As a threshold matter, the Tribe disagrees with NRDC's suggestion that, under a constant harvest rate policy, harvest levels will "increase in mathematical lockstep with the NMFS's fluctuating stock assessment results." Tribe's Reply Brief at 1, citing NRDC Opposition and Reply Memorandum (Doc. No. 322) at 10-11. However, under the Groundfish Fishery Management Plan, the Council must review each rebuilding plan at least every two years and determine whether to retain or modify the existing harvest rate. Tribe Excerpt of Record "TER" 22-23. This review provides the opportunity for the Council and the Agency to adjust the harvest rate (up or down) based on the most current information, consistently with the Magnuson-Steven's Act (MSA)'s mandate to rebuild the stock in the shortest possible time taking into account the needs of fishing communities.

IV. ANALYSIS

A. NRDC alleges impermissible flaws in the NMFS analysis. NMFS argues it employed the best available science in arriving at the 2009-2010 Specifications.

1. FEAM and IMPLAN

NRDC argues that the Agency measured the economic health of today's fishery by reference to statistics from the overfishing days of the late 1990s – before the Agency declared an overfishing disaster, declared nine species (including the seven in this case) overfished, and cut capacity in the fishing fleet – even though more current information was available to the Agency. This tends to give priority to short-term economic interests over conservation, a violation of the MSA. *NRDC v. NMFS,* 421 F.3d at 879-880. Further, the Agency assigned no value to the longer-term economic benefits of accelerated rebuilding, again by ignoring information available to the Agency. These flaws led the Agency to exaggerate the economic costs of faster rebuilding for purposes of deciding what rebuilding periods are "as short as possible" under MSA section 304(e)(4)(A)(i), in violation of that section and National Standard 2.

NMFS states that it relied on a variety of social and economic information, both quantitative and qualitative, for its socioeconomic analysis. PER00882. One aspect is the Fishery Economic Assessment Model ("FEAM"), which the Agency has determined is the best available science. *Id.* The model, which is primarily "prediction of changes in landings, exvessel (per vessel) revenues, and personal income impacts for commercial fisheries," PER00376 – uses a computer software package called Impact Analysis for Planning ("IMPLAN"), which estimates income impacts from fish harvesting and processing at a local level for 17 port areas. PER00882. Because the process of updating the FEAM is time-consuming and resource intensive, the current version of the model is based on IMPLAN data from 1998. *Id.* NRDC criticizes the use of 1998 data. Pl. Mem. at 28-29. NMFS responds that it was entitled to rely on the best available model, and was not required to revise the model for the rulemaking. See, e.g., *Commonwealth of Massachusetts by Division of Marine Fisheries v. Daley*, 10 F. Supp. 2d 74, 77 (D. Mass. 1998) (National Standard Two does not impose an affirmative obligation on agency's part to collect better data). The Ninth Circuit has accepted the Agency's use of three year old fish population data to calculate quotas, when "budgetary constraints" prevents gathering data more often. The court held such a practice was neither arbitrary and capricious, nor a failure to take the requisite "hard look" at the evidence before making a decision. *NRDC v. NMFS,* 421 F.3d at 882.

However, neither decision expressly condones failing to use available data to update a statistical model which is currently relying on data that is over ten years old, and which also reflects revenue from unsustainable fishing prior to time when the species at issue were declared as overfished.

a. Comparing revenue from unsustainable fishing with revenue from sustainable fishing distorts the Agency's analysis by exaggerating short-term economic consequences of rebuilding, weighting analysis toward economics and against conservation.

NMFS's economic analysis relies on information from a software package known as IMPLAN that incorporates income statistics from select ports within the Pacific Coast groundfish fishery. 16-4 EIS at 648, PER00882; PER00976. NMFS feeds IMPLAN data into its core Fishery Economic Assessment Model, known as FEAM. 16-4 EIS at 648, PER00882. Although FEAM incorporates information from sources besides IMPLAN, the IMPLAN data is a "prominent feature" of the model. *Id.*; PER00976 (NRDC comments on Amendment 16-4).

At the time the Agency approved its EIS for Amendment 16-4, even though the Agency had access to IMPLAN data for the year 2002, it chose instead to rely on IMPLAN data from 1998, despite urgings from NRDC that it update its information. PEER01013-14; PER01257. The result is that the Agency has evaluated the "needs of fishing communities" by reference to an income benchmark set a decade ago, during the unsustainable era of overfishing and overcapacity in the fishery. Since 1998, the Agency has cut the fleet by a third and the catch by half. As far as the Court can tell from the descriptions in the 2009-2010 EIS, the Agency did not update the IMPLAN data for the economic analysis it did for the 2009-2010 Specifications. 09-10 FEIS at 481 n.14, PER00372; *id.* at 484, PER00375 (describing economic analysis by reference to FEAM modeling done for the 2005-2006 Specifications, which predated Amendment 16-4); PER00915, 917 (NRDC comments on 2009-2010 Specifications urging the Agency to update IMPLAN data).

NMFS' decision to project fishery income statistics from an era when there was considerably more fishing – and far more than the fishery could withstand – has the effect of exaggerating the income levels necessary to support today's smaller Pacific Coast groundfish fleet and associated fishing communities. This, in turn, biased its rebuilding analysis by exaggerating the harvest levels necessary, in the short run, to avoid serious economic consequences for fishing communities. NMFS does not deny that its decision to use 1998 instead of 2002 IMPLAN data affected its analysis; it simply claims the FEAM model is too hard to update to justify inclusion of the newer data. 16-4 EIS at 648, PER00882 ("While some elements of the FEAM model could benefit from updating, the process used to generate the FEAM regional, per-pound marginal income impacts is time consuming and resource-use [sic] intensive; thus, the FEAM [model] can only be updated periodically.") NMFS suggests that the impact of using "1998 versus 2002 data is not likely to be large," *id.*, but does not explain how it could reasonably have made this judgment without actually feeding the 2002 data into FEAM. NMFS also does not indicate when and if it ever intends to update the FEAM data. The more than ten year period that has already passed far exceeds the three-year period permitted by the court in *NRDC v. NMFS, supra.*

Since the early 2000s, when NMFS launched its buyback program and significantly cut the number of vessels in the trawl fleet, exvessel revenues have generally increased from year to year, with strong gains in recent years. See generally 09-10 EIS at 409, PER00300 (Table 7-2c) (listing inflation-adjusted "total groundfish" revenues of $59.1 million in 2002, $65.5 million in 2003, $62.9 million in 2004, $77.9 million in 2005, $82.5 million in 2006, and $84 million in 2007). Total exvessel revenues for the fishery in 2007 were the highest since 2000. Id. Revenues increased over twenty percent between 2007 and 2008 alone, from roughly $85 million to over $92 million.11 Id. at 499, PER00390 (Table 7-57a) (sums of "Non-tribal groundfish landings," "Tribal groundfish shoreside landings," and "Tribal groundfish at-sea landings" for 2007 and 2008). NMFS predicts revenues will increase by more than fourteen percent over 2008 levels this year, to nearly $106 million. Id. (sum of "Non-tribal groundfish landings," "Tribal groundfish shoreside landings," and "Tribal groundfish at-sea landings" for the first year of the 2009-2010 Specifications period).

NMFS's projections for "income impacts," a broader economic measure NMFS included in its latest EIS in an effort to capture a range of economic activities related to fishing, are similarly encouraging. See 09-10 FEIS at 502, PER00393 (Table 7-58a) (defining income impacts to include "total harvesting, processing, and support activities connected with Council-managed ocean area commercial fisheries"). NMFS estimates that personal income in the directed groundfish fishery, which accounts for most of the catch, increased twenty-three percent between 2007 and 2008 and will increase nearly twelve percent more this year. Id. (listing $172 million in 2007; $190 million in 2008; and $212 million for the first year of the 2009-2010 Specifications period).

NMFS's record shows that total exvessel revenues for 2008 ($92 million) were comparable to those in 1998 ($88 million), and considerably above revenues in 2002, at the inception of the rebuilding era ($59 million). 09-10 EIS at 409, PER00300 ("Total Groundfish" col.); *id.* at 499, PER00390 (Table 7-57a) (sum of "Non-Tribal," "Tribal groundfish shoreside," and "Tribal groundfish at-sea" revenues for the year 2008, or "No Action"); *id.* at v, 129 (identifying 2008 as the "No Action" year).

It is therefore reasonable to assume that had the Agency used more current IMPLAN data as an economic benchmark, today's fishery would look better positioned to weather modest harvests than the Agency's modeling suggests. By choosing instead to rely on decade-old data from an era when there were many more boats fishing for Pacific Coast groundfish, the Agency arbitrarily biased its analysis in favor of higher short-term harvest levels and against faster rebuilding, giving priority to short-term economic interests over conservation, in violation of section 304(e)(4)(A)(i). *Greenpeace, American Oceans Campaign v. National Marine Fisheries Service*, 237 F. Supp. 2d 1181, 1199 (W.D. Wash. 2002) (holding it was arbitrary and capricious for the Agency to largely ignore data that had been revised to correct a "significant bias" in the data actually relied on by the Agency). This is a significant decision because it is similar to what occurred here.

The Court finds that use of the 1998 IMPLAN data weights the Agency's analysis toward short-term economic concerns, and against conservation, giving priority to economics over conservation, which violates the MSA, as stated in *NRDC v. NMFS, supra*. The data is flawed, not so much because it is old, but because it is on the other side of a significant watershed for the fishery – when the species at issue in this case were all declared overfished between 1999 and 2001. Furthermore, the 2002 data which is available and could be used to update the model, is on the near side of that watershed, after all the species at issue in this case had been declared overfished and attempts to rebuild had begun to be implemented. The 1998 IMPLAN data reflects the income from unsustainable fishing, just prior to the realization that these species were crashing. The 1998 benchmark distorts current revenue losses by comparing income from unsustainable fishing with income from hopefully more sustainable fishing. It therefore weights the Agency's analysis in favor of short-term economic interests and against conservation, in violation of the MSA.

2. Can long-term benefits of faster rebuilding be quantified?

a. NRDC offered contrary evidence that long-term economic benefits of faster rebuilding could be quantified.

National Standard 2 of the MSA, provides that "[c]onservation and management measures shall be based upon the best scientific information available." 16 U.S.C. § 1851(a)(2); see also 50 C.F.R. § 600.315(b)(1) ("Scientific information includes . . . information of a biological, ecological, economic or social nature.") (see also section 304(e)(4)(A)(i) of the MSA.) To show that the Agency failed to use the best scientific evidence available, NRDC must introduce evidence of contrary science. *Oregon Trawlers,* 452 F.3d at1120. In this case, NRDC proffered evidence of studies that it argues demonstrate that the long-term economic benefits of rebuilding can be quantified. Pl. Mem. at 30. NMFS responded to NRDC's criticism of the NOAA guidelines cited by NRDC, Pl. Mem. at 30-31, stating that they "do not prescribe particular methods and do not require the use of quantitative analyses." PER00881. The guidelines recognize that there may be insufficient data to develop complex economic models, in which case it is preferable to use a "well developed qualitative analysis," which is what the Agency claims it did here. *id.*

NMFS's economic analyses, according to NRDC, also neglected important and available information on the long-term economic benefits of faster rebuilding, as a lawful alternative to prioritizing short-term benefits over rebuilding a species as quickly as biologically possible. NMFS set its current rebuilding periods by reference to the economic analyses of alternative harvest levels in its EIS's for Amendment 16-4 and the 2009-2010 Specifications. See generally 16-4 Final Rule at 78,639-43, PER00446-50; 09-10 Final Rule at 9,878-82, PER0006-10. Both EIS's consider the effects of alternative harvest levels by comparing revenues for only the two-year Specifications period during which each EIS was prepared to projected revenues for the first year of the following Specifications period. See generally 16-4 EIS at 523-96, PER00769-842 (comparing revenues from 2005-2006 to projections for 2009); 09-10 EIS at 488-553, PER00379-443 (comparing revenues in 2007-2008 to projections for 2009). Neither document considers the economic effects of alternative harvest levels over the length of the rebuilding periods the Agency actually adopted, which are many decades long for some species. 16-4 EIS at 523-96, PER00769-842; 09- 10 EIS at 488-553, PER00379-443.

b. NMFS declined to consider the contrary science offered by NRDC, and explained why it did so. Thus, the Agency did not abuse its discretion when it rejected the contrary science offered by NRDC.

The EIS for Amendment 16-4 sets forth how the Council and the Agency assessed the needs of fishing communities. In reviewing impacts on fishing communities, fisheries and other data were used to develop indicators to characterize communities' relationships with the groundfish fishery, other fisheries, and non-fishing industries. NMFS identified vulnerable communities based on their levels of engagement in commercial or recreational fishing and their levels of resiliency. PER00766-767.

NMFS explained in detail the indicators it used to determine engagement, dependence, resilience, and vulnerable areas, such as unemployment rates, percent of population below the poverty line, isolation from other communities, and population densities. FDER000081-95. NMFS then ranked communities based on their relative engagement and dependency, FDER000096-112, and their resiliency. FDER000112-117. See also PER00006 ("Communities that are highly dependent on the groundfish fishery and with very low resilience to changes in economic activities associated with groundfish fishing are considered more vulnerable to negative socioeconomic impacts under more conservative rebuilding alternatives."). The EIS explains how the Agency took into account substantial fishing community needs in setting the rebuilding periods. Contra Pl. Mem. at 34. NMFS is not required to set a "threshold," as NRDC asserts; rather, the Agency may consider impacts on a case-by-case basis. PER00006 ("Declaration of a 'disaster threshold' is not a requirement under [the] MSA or any other applicable laws."). See also PER00446 (noting that "there are no formal quantitative definitions of what is a sufficient level of annual economic impact required for declaring a disaster under either" the MSA or the Interjurisdictional Fisheries Management Act).

The court of appeals interpreted section 1854(e)(4)(i)'s mandate that a rebuilding period be "as short as possible" while giving consideration to "the status and biology of the overfished species and the needs of the fishing communities" as Congress' way of ensuring that overfished species were rebuilt as quickly as possible while "leaving some leeway to avoid disastrous short-term consequences for fishing communities." *NRDC. v. NMFS,* 421 F.3d at 880; see also § 1854 (e)(4)(A)(i). Using this interpretation of section 1854(e)(4)(i), the court declared that Congress intended section 1854(e)(4)(ii) as a limit on the Agency's discretion. *Id.* When it is possible to rebuild a species within ten years, the Agency "may consider the short-term economic needs of fishing communities" but "may not use those needs to go beyond the ten year-cap set in subsection (ii)." *Id.* This cap may not be breached unless required by an international agreement, or if the biology of the species makes it impossible to rebuild within ten years, even with a total moratorium on fishing. *Id.* These circumstances, however, do not relieve the Agency of its obligation to rebuild species in a time frame that is "as short as possible." *Id.* The court concluded that the needs of the fishing communities may still be taken into account even when the biology of the fish dictates exceeding the 10-year cap--so long as the weight given is proportionate to the weight the Agency might give to such needs in rebuilding periods under 10 years.

NMFS asks the Court to uphold the Agency's analysis under the APA, because "'the agency's path may reasonably be discerned.'" *Ranchers Cattlemen Action Legal Fund v. U.S. Department of Agriculture*, 415 F.3d 1078, 1096-97 (9th Cir. 2005) (district court erred in rejecting agency's use of qualitative standards where administrative record provided adequate basis to discern agency's conclusions). Here, the Agency claims to have met its obligation to "inform its audience of the actual scientific basis supporting" the FMP, and the Agency is required to do no more under the MSA. *Blue Ocean Institute v. Gutierrez*, 585 F. Supp. 2d 36, 47 (D.D.C. 2008), quoting *Hadaja, Inc. v. Evans*, 263 F. Supp. 2d 346, 354 (D.R.I. 2003).

In response to the *NRDC v NMFS* decision, the Council and NMFS adopted in Amendment 16-4 what they characterize as a "holistic approach" that rebuilds in as short a time as possible, taking into account the "biological and economic correlation" between the overfished species. FDER000158. Rather than considering individual species "in isolation," the Council analyzed "the interactions of groundfish species with each other and with other marine species within the California Current ecosystem." PER00496.

The Council began its analysis by considering the impacts on overfished species that would result from rebuilding in the shortest possible time period (F=0). PER00156. NMFS argues that the MSA does not require the Agency to set optimal yields (OYs) at zero to expedite rebuilding; rather, that the Agency "must" consider the economic impact on fishing communities. 16 U.S.C. § 1851(a)(8). See also *NRDC v. NMFS*, 421 F.3d at 880. This is a significant mis-citation of the court's decision, which was that the Agency "may" consider the needs of fishing communities.

The Council considered the needs of fishing communities, finding that they require "a sustainable fishery that is safe, well managed, and profitable, that provides jobs and incomes, that contributes to the local social fabric, culture, and image of the community, and helps market the community and its services and products." PER00693. The Council

evaluated the potential impacts of each alternative by port area, for both commercial and recreational activities. PER00796-815. Consistent with the U.S. Court of Appeals for the Ninth Circuit's opinion – and with National Standard Eight, 16 U.S.C. § 1851(a)(8), which requires the Agency to consider the importance of fishery resources to fishing communities

– the Agency evaluated whether Amendment 16-4 *would* result in disastrous short-term consequences for fishing communities:

> The Pacific groundfish fishery has experienced ever-increasing restrictions on harvest since the late 1990s. The result is that fishing communities have already experienced severe economic impacts and there is evidence that many of the communities are at the breaking point; further restrictions on even one or two of the overfished stocks *may* result in disastrous economic consequences to many vulnerable fishing communities.

(NMFS opening brief at 22:25-27, citing Decision Memorandum dated November 29, 2006, approving Amendment 16-4 and 2007-2008 Specifications at FDER000158 (Emphasis added)

> " NMFS' holistic approach in Amendment 16-4 lowers the OY for some of the most sensitive rebuilding species, and in doing so, groundfish fishery-based revenues to communities are projected to be lower than the levels that triggered the economic disaster declaration [in 2000]. . . . To mitigate against short-term disastrous consequences to communities, the OYs for the least sensitive rebuilding species were increased compared to status quo harvest levels with the intention of shifting fishing effort away from the most sensitive rebuilding species and toward the least sensitive rebuilding species. "

(*Id.*; See also PER00886 ("Disastrous consequences can occur at OY levels that are so low that allowed economic activity levels are insufficient to maintain basic community infrastructure during the time of rebuilding.").

NMFS concluded that ". . . in order to reduce the OY of one overfished species without creating disastrous effects for fishing communities, fishing effort may have to be moved into an area where another overfished species is more likely to be incidentally caught." FDER000166. As a result, the Agency predicted that there would be a minimal increase in the rebuilding times for certain groundfish species – darkblotched rockfish (one year beyond the time to rebuild if all fishing mortality were to cease in 2007); Pacific Ocean perch (two years); and widow rockfish (two years) – but reduced OYs or faster rebuilding schedules for other species. FDER000168. Amendment 16-4 also increased the OY for bocaccio, a relatively productive species which is difficult for fishermen to avoid, resulting in a rebuilding time of five years beyond the time to rebuild with zero fishing mortality. FDER000168-169.

NMFS argues that it is only making modest increases in rebuilding times, which are justified in light of the need to avoid severe adverse economic impacts in the short-term, and therefore furthers the long-term needs of fishing communities. See, e.g., PER00840 ("If communities and fishery sectors cannot survive short-term restrictions, longer-term efforts at sustainability apply only to the biology of fish – not to sustaining communities.").

Due to the multi-species nature of the Fishery, lowering the take of a rebuilding species requires reducing the take of more abundant species that co-occur with the rebuilding species. PER00884. Attempts to quantify the value of rebuilding an individual overfished species "fail to account for diminished harvest of more abundant co-occurring species that would be necessary to reduce the take" of the overfished species. *Id.*

This Court accordingly refrains from substituting its judgment for that of the Agency, and finds that its reliance on a holistic analysis is within the scope of its discretion under the MSA. *Sierra Club v. U.S. Army Corps. of Engineers*, 295 F.3d at 1216.

D. NMFS explored a reasonable range of alternative harvest measures for some species.

To comply with NEPA, an EIS must identify a reasonable range of alternatives to an agency's proposed action and present this information in a manner that "foster[s] both informed decision-making and informed public participation." *'Ilio'ulaokalani*, 464 F.3d at 1094 (citation omitted); 42 U.S.C. § 4332(2)(C)(iii); 40 C.F.R. §§ 1502.1, 1502.14, 1502.16. The EIS for the 2009-2010 Specifications violates NEPA because it does not present reasonable ranges of alternative harvest measures that would rebuild some of the overfished Pacific Coast groundfish at issue in "as short [a time] as possible" under MSA section 304(e)(4)(A)(i). "The alternatives analysis section is the heart of the [EIS]." *'Ilio'ulaokalani*, 464 F.3d at 1095. "The existence of reasonable but unexamined alternatives renders an EIS inadequate." *Id.* (citation omitted). In evaluating whether an agency has included a reasonable range of alternatives, courts must bear in mind that "the statutory objectives underlying the agency's action work significantly to define its analytic obligations." *Oregon Natural Desert Ass'n v. Bureau of Land Management*, 531 F.3d 1114, 1130 (9th Cir. 2008). To be reasonable, a range of alternatives must embrace the full range of options an agency can lawfully pursue under its substantive mandates. *Id.* at 1145 (invalidating NEPA analysis for land use plan that failed to consider alternatives that would close more than a small fraction of the land to off-road vehicle use, despite the agency's discretion to set aside more land). Otherwise, it cannot meaningfully inform the agency's choice among those options.

As part of the NEPA process, an agency must examine alternatives to the project at issue. 42 U.S.C. § 4332(2)(E). In reviewing a federal agency's range of alternatives, courts determine "whether the alternatives analysis provided satisfies the rule of reason," recognizing that the agency is "fully authorized within the decision-making context to limit its consideration to . . . alternatives designed to substantially meet the objectives of the [underlying p]lan" and, hence, the "purpose and need" for the project. *Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1174-75 (10th Cir. 1999). However, " An agency is under no obligation to consider every possible alternative to a proposed action, nor must it consider alternatives that are unlikely to be implemented or those inconsistent with its basic policy objectives." *Seattle Audubon Society v. Moseley*, 80 F.3d 1401, 1404 (9th Cir. 1996). Put otherwise, "[t]o make an impact statement something more than an exercise in frivolous boilerplate the concept of alternatives must be bounded by some notion of feasibility." *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council*, 435 U.S. 519, 551 (1978), reversed in part sub nom. *Baltimore Gas and Elec. Co. v. Natural Resources Defense Council, Inc.* (Holding that a policy judgment for a limited purpose is within the bounds of reasoned decision making.) "It is not our task to determine what decision we, as Commissioners, would have reached. Our only task is to determine whether the Commission has considered the relevant factors and articulated a rational connection between the facts found and the choice made." 462 U.S. 87, 105-106 (1983)

In judging the adequacy of the range of alternatives, a court begins by examining the purpose and need. See, e.g., *Westlands Water District v. U.S.Dept. of Interior*, 376 F.3d 853, 865-66 (9th Cir. 2004). Agencies are afforded considerable, though not unlimited, discretion to define the purpose and need of a project. *Friends of Southeast's Future v.*

Morrison, 153 F.3d 1059, 1066 (9th Cir. 1998). A purpose and need statement is reviewed under a "reasonableness standard." *Westlands*, 376 F.3d at 866. While the statement cannot be unreasonably narrow, it also need not be so broad as to require consideration of alternatives that are inconsistent with the proposed action's overarching purpose. *Morrison*, 153 F.3d at 1067 (citing *City of Angoon v. Hodel*, 803 F.2d 1016 (9th Cir. 1986)).

In this case, the purpose of the action, as defined in the EIS, to "ensure that Pacific Coast groundfish subject to Federal management are harvested at or below OY levels during 2009 and 2010 and in a manner consistent with the groundfish FMP and the Magnuson-Stevens Act and its national standards guidelines." The need for the action is to "constrain commercial and recreational harvests in 2009 and 2010 to levels that will ensure that groundfish stocks are maintained at, or restored to, sizes and structures that produce the highest net value to the nation, while balancing environmental and social values." PER00110.

NRDC points to an example of the rebuilding alternatives and argues that the blending of higher and lower harvest levels makes it impossible for NRDC to evaluate the options considered by the Agency. However, NRDC does not articulate why that is so or how the alternatives fail to meet the purpose and need. For example, a party claiming that an agency's analysis of alternatives in an EIS is arbitrary and capricious may not simply speculate that the agency should have considered other alternatives. The party must identify alternatives not considered and the party has the burden of adducing "specific evidentiary facts showing that the alternatives [to the agency's action] were reasonable and viable." *City of Angoon*, 803 F.2d at 1022 . NRDC has failed to identify any reasonable alternative not considered and therefore, failed to meet that burden here. The Court finds that the Agency adequately explained the source of its modeling and the path to the 2009-2010 Specifications. Accordingly, the Agency did not abuse its discretion under the MSA, with the exception of its Specifications for the three species discussed below.

E. The 2009-2010 Specifications for three species violate the MSA for setting rebuilding periods which are not as short as possible. Specifications for four other species do not violate the MSA.

1. DARKBLOTCHED ROCKFISH

Darkblotched rockfish was declared overfished in January 2001. PER00064. The shortest time to rebuild this species with zero fishing would be by 2018. PER000004. The Agency proposes a rebuilding target date of 2028. This is the same species whose 2002 harvest level and associated rebuilding period the U.S. Court of Appeals for the Ninth Circuit invalidated in *NRDC v. NMFS*, 421 F.3d at 882. It appears as if the Agency is proposing to do exactly the same thing the court of appeals expressly disapproved in that case – extend the rebuilding period and increase harvesting of a species because it is doing worse than previously thought. *Id.*

The 2002 stock assessment at issue for darkblotched rockfish in *NRDC v. NMFS* was that the species was at 12% of unfished biomass. *Id.* The latest stock assessment available to the Agency when it approved Amendment 16-4 and the 2007-2008 Specifications showed that darkblotched was at 16%. 16-4 Final Rule, 71 Fed. Reg. at 78,705, PER00477 (note z). NMFS relied on this assessment to set a target rebuilding year of 2011 and harvest levels of 290 and 330 metric tons for 2007 and 2008. *Id.* (note z) (2007); ROD at 6, PER00114 (2008).

However, before approving the 2009-2010 Specifications, the Agency received a more pessimistic stock assessment for darkblotched that shows the species is "substantially behind schedule" in rebuilding. 09-10 Proposed Rule, 73 Fed. Reg. at 80,527, PER00060. NMFS acknowledges that the new assessment fundamentally changed its understanding of the darkblotched fishery's capacity to rebuild itself. *Id.* at 80,529, PER00062. Nevertheless, rather than reduce harvest levels, the Agency decided instead to postpone the species' target rebuilding date from 2011 to 2028 and set darkblotched harvest levels of 285 and 291 metric tons – comparable to 2007 levels – for 2009 and 2010. 09-10 Final Rule, 74 Fed. Reg. at 9,887, PER00015; ROD [2] at 6, PER00114.

Darkblotched, like cowcod, has the misfortune of commingling with profitable target species. 09-10 Final Rule, 74 Fed. Reg. at 9,877, PER00005 (Darkblotched "limits access

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[2] Record of Decision, Final Environmental Impact Statement, Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific Coast Groundfish Fishery ("ROD")

to some of the most valuable target stocks.") These include whiting, sablefish and petrale sole. PER00062. In the last four years alone, the Agency has twice delayed the re-building of darkblotched in order to increase revenues in the commercial fishery, although it has also put in place closed areas, trip limits and bycatch limits in the associated whiting fishery. FDER 00053.

The Council's Groundfish Management Team ("GMT") estimated that due to the co-occurrence of darkblotched with desirable commercial fish, for each 1% reduction in the darkblotched harvest the trawl fishery lost 6% in exvessel revenues. FDER00058. A document circulated within the Agency in March 2006, when it was developing its 2007-08 Specifications, reasons that "if the objective is to maintain total exvessel revenues at the highest possible level, then it arguably would make sense to keep the catch of species associated with high valued target species – such as darkblotched rockfish in the bottom trawl fishery – relatively high." PER02322-23. NMFS went on to set 2007-2008 harvest levels for darkblotched that were forty to sixty percent above 2006 levels. Compare 16-4 EIS at xi, PER00566 (200 metric tons in 2006) with 16-4 Final Rule, 71 Fed. Reg. at 78,702, PER00474 ("OY" col.) (290 metric tons in 2007) and ROD at 6, PER00114 (330 metric tons in 2008).

In declining to return to more sustainable harvest levels for 2009-2010, the Agency again emphasized short-term economic gains, reasoning that "[b]ecause marginal changes in the darkblotched harvest rate have a relatively large effect on economic benefits from the groundfish commercial fisheries, a darkblotched OY that is slightly less conservative than those for other overfished species and results in a slightly longer rebuilding period is justified." 74 Fed. Reg. at 9,877, PER00005.

Contrary to the intent of the MSA, the Agency responded to a new and more pessimistic understanding of darkblotched's biological capacity to rebuild by keeping harvests at about the levels it set in 2007 – when it thought the species was far more resilient – and extending the species' rebuilding period by nearly two decades. This is directly contrary to the court of appeals' ruling in *NRDC v NMFS*, on virtually identical facts. It is likely that the darkblotched rockfish population is no closer to recovery today than it was in 2005; there has been no progress toward rebuilding since the court of appeals' ruling. 421 F.3d 872, at 882.

The Agency's actions violated section 304(e)(4)(A)(i), which requires the Agency to prioritize rebuilding whenever possible, 16 U.S.C. § 1854(e)(4)(A)(i), not just when economically desirable in the short run. The difference is significant, because as the Agency acknowledges, there will always be some short-term economic gain associated with extending rebuilding periods to increase harvests. 09-10 Final Rule, 74 Fed. Reg. at 9,878, PER00006 ("Changes in OYs for any of the overfished species affect the time to rebuild for that species and the ability of fishermen to harvest other species of groundfish, including healthy species.") (emphasis added). If section 304(e)(4)(A)(i) allowed the Agency to extend a species' rebuilding period whenever the Agency could identify some short-term economic benefit to fishing communities, it is hard to imagine circumstances under which the Agency could not delay rebuilding. That is precisely why, if it is to serve the MSA's overarching conservation mandate, the section's balance between rebuilding and the "needs of fishing communities" must remain heavily weighted towards rebuilding. *NRDC v. NMFS*, 421 F.3d at 879-82. Conservation has priority over short-term economic interests. *Id.* at 878-879.

Nevertheless, the Agency concluded that setting the OY for darkblotched at zero could not be done, because it would "close all the trawl fishing seaward of the RCA (Rockfish Conservation Area), in addition to greatly restricting the whiting fishery, thus having detrimental economic effects on fishing communities along the Pacific Coast." This, despite the fact that rebuilding the darkblotched population within ten years (by 2018) is possible, albeit with a zero harvesting limit. FDER00052 The Agency justifies an extended rebuilding period for darkblotched on the basis that reducing the OY further would result in "potentially large detrimental impacts to communities." It concludes that an OY of 285 metric tons in 2009 and 291 metric tons in 2010 complies with the MSA "by rebuilding the stock as soon as possible, taking into account the status and biology of the stocks, the needs of fishing communities, and the interaction of the overfished stock within the marine environment." FDER00053

In the Agency's analysis, the "status and biology of the stocks" in this context relate to conservation, the "needs of fishing communities" relate to short-term economic interests, and the "interaction of the overfished stock within the marine environment" also relates to short-term economic interests. Even though the third factor sounds environmental, it isn't. It is shorthand for the fact that overfished species are often found at the same depth and geographic location as some of the most commercially valuable fish, and for that reason the Agency is willing to postpone their rebuilding for the sake of the revenue from those more commercially valuable fish. Two out of three factors the Agency considered in setting the darkblotched harvest levels were economic. Thus the Agency gives priority to short-term economic interest over conservation, a violation of the MSA.

2. COWCOD

Cowcod was declared overfished in January 2000. PER00064. The species could have rebuilt with zero fishing by 2009. PER00009. NMFS has set a target date for rebuilding of 2072. NMFS observes that additional fishery restrictions would be necessary with an OY of 3 metric tons, but not with an OY of 4 metric tons. *Id.* On the basis of a stock assessment showing cowcod to be at 18% of unfished biomass (PER00009), the Agency initially established a target rebuilding year of 2039 for cowcod. 71 Fed. Reg. at 78,655, PER00462. Before approving the 2009-2010 Specifications, the Agency reassessed cowcod's population and concluded cowcod was at only 4.6% of its estimated historic population, roughly a quarter of the level the Agency had previously assumed. Proposed Rule, 2009-2010 Specifications (hereinafter "09-10 Proposed Rule"), 73 Fed. Reg. 80,516, 80,520-80,521 (Dec. 31, 2008), PER00053-54. The harvest rates are for bycatch only, that is, accidental harvesting of cowcod while fishing for other species. FDER000053

NMFS responded to the new and more dire population figure by maintaining its 2007 and 2008 harvest levels of 4 metric tons per year for 2009 and 2010 and delaying cowcod's target rebuilding date by 33 years, to 2072. 74 Fed. Reg. at 9,887, PER00015 (target date); ROD at 6, PER00064, PER00114 (harvest levels). NMFS describes cowcod as "the most constraining species in the southern trawl fishery." PER00009.

Despite the previous decision by the court of appeals in *NRDC v NMFS*, the Agency, having just discovered that cowcod has already been depleted to less than one twentieth of its historic population, chose to postpone rebuilding the species by an additional three decades so the same harvest levels it allowed in 2007 and 2008 could continue in 2009 and 2010. NMFS explains that it did so in order to preserve a projected increase in harvests and revenues for sablefish, a profitable target species that sometimes commingles with cowcod and whose harvests therefore lead to bycatch of cowcod. 09-10 Proposed Rule, 73 Fed. Reg. at 80,528, PER00061 ("The majority of incidental catch of cowcod has occurred in the recreational and trawl fisheries. With the increased sablefish OY the trawl fishery could be curtailed if the 3 [metric ton] cowcod OY were specified.").

NMFS rationalizes a need to promote the interests of fishermen in the limited entry bottom trawl part of the fishery, despite projected earnings of $2.8-$3 million *more* in exvessel revenue in 2009 than in 2008, largely from harvests of sablefish and two other species. NMFS's claim that these profits are "largely driven by increases in the abundance of sablefish [and two other species], as opposed to changes in rebuilding species OYs," 73 Fed. Reg. 80,527, PER00060, does not help its case. That sablefish may have become easier to catch hardly proves that the Agency is powerless to reduce harvests where necessary to comply with the MSA's rebuilding mandates. 09-10 EIS at 493, PER00384 (revenue projection), PER00129 (explaining that "No Action Alternative" corresponds to the Agency's 2008 harvest levels). NMFS's decision to delay rebuilding the most depleted overfished species by more than a generation in exchange for a multimillion-dollar year-on-year increase in fishery revenue violates section 304(e)(4)(A)(i).

3. YELLOWEYE ROCKFISH

Yelloweye rockfish was declared overfished in January 2002. PER00066. It is the longest-lived of the seven overfished species, with an estimated lifespan of up to 120 years. PER01417. The shortest time to rebuild this species with zero fishing would be by 2049. PER00477. NMFS has set the target year for rebuilding at 2084. PER000015.

Yelloweye rockfish are a transboundary stock ranging from the Bering Sea and Gulf of Alaska south to Baja California. On the U.S. West Coast the distribution of yelloweye is skewed to the north, with the areas of highest density off the north Washington coast. Canadian fisheries target yelloweye rockfish a few miles north of the U.S.-Canadian border. The Canadian TAC (Total Allowable Catch; analogous to an OY) for yelloweye in 2006 was 284 metric tons. The OY analyzed in a 2006 EIS for 2007-2008 Specifications under Amendment 16-4 was 12.6 metric tons. TER00064.

Counsel for the Makah Tribe commented at the hearing that his clients are frustrated when they are out fishing and observe Canadian fishermen pulling in tons of fish which they were precluded from catching.

THE COURT: Well, do they have the same kind of problems there that we have below the border?

MR. SLONIM: Well, for yelloweye, the Makah Tribe fishes under the NMFS quotas. You can see the boats across the border, and the analysis and the records suggest that it's the same stock, that they're not two different stocks. We're managing the same stock.

(Tr. of January 20, 2010 hearing at 45:3-9).

Successful rebuilding of yelloweye rockfish may ultimately depend on an international agreement with Canada to develop a joint assessment and management approach. This same reasoning may also apply to such other transboundary stocks as canary and POP. The Canadian TACs for canary and POP in 2006 were 1,193 metric tons and 6,148 metric tons, respectively.

In 2005 yelloweye's unfished biomass had been estimated at 21%. FDER 000173-174. At the time the Agency approved Amendment 16-4 and the 2007-2008 Specifications, its latest stock assessment showed that yelloweye was at 17.7% of its estimated historic population. 16-4 Final Rule, 71 Fed. Reg. at 78,705, PER00477 (note "aa"). Yelloweye was estimated to be at 14.5% of its unfished spawning biomass in 2007. PER0055. The stock has been declining. NRDC argues that yelloweye is the species that is in the worst shape, because the Agency does not think it is biologically capable of rebuilding before 2049 and does not intend to rebuild it until 2084, more than a decade later than cowcod, and decades later than any other overfished species. 09-10 EIS at 31, PER00166 (Table 2-5 and note "a" (listing a target rebuilding year of 2084 and a "TF=0" of 2049 for yelloweye, and defining TF=0 as "the median time to rebuild the stock if all fishing-related mortality were eliminated beginning in 2009")).

In response to the more pessimistic assessment, the Agency adopted a new strategy it calls a "ramp-down," to provide time to gather more data and develop new management strategies. FDER000173-174. Under the ramp-down strategy, NMS sets a higher initial OY, rather than a constant harvest rate. The OY is then reduced, but over a period of four years. So the proposed harvest rate for 2007 was 23 metric tons, 2008 was 20 metric tons, 2009 was 17 metric tons, and 2010 is 14 metric tons and finally 12.6 metric tons in 2011 and thereafter. PER 00874. In adopting the "ramp-down" strategy, the Agency rejected its own scientists' recommendations to allow no more than 12.6 metric tons of yelloweye harvest. PER00458; http://www.pcouncil.org/bb/2006/0306/agf3b_supp_ssc.pdf (harvest limits) at 2 (scientists' recommendations) (site last visited April 21, 2010), PER01220 (groundfish management team's recommendations); 16-4 EIS at 87-88, PER00580, 586-87 (Table 2-3).

Before it approved the 2009-2010 Specifications, the Agency received a revised stock assessment that estimated yelloweye at only 14% of its historic population, below the Agency's previous estimate. 09-10 Final Rule, 74 Fed. Reg. at 9,929, PER00027 (note "aa"), PER0034. NMFS responded to this gloomier assessment not by decreasing but by increasing the 2010 yelloweye harvest level from the 14 metric tons in its original ramp-down plan to 17 metric tons. This decision further defers the immediate harvest reductions its scientists had recommended three years earlier. 09-10 Final Rule, 74 Fed. Reg. at 9,877, PER00005; 09-10 Proposed Rule, 73 Fed. Reg. at 80,528, PER00061-00064 (discussing rebuilding period extension), and extends the rebuilding period even farther, into 2084.

This is essentially what the Agency did to darkblotched rockfish between the 2001 and 2002 Specifications cycles, and what the court of appeals so decisively rejected in *NRDC v. NMFS*. ("Whatever the outer limits of the range of permissible constructions of the Act, we are certain that what lies beyond them is an interpretation allowing [NMFS], upon discovering that a species is in significantly worse shape than previously thought, to increase dramatically the fishing pressure on that species.") 421 F.3d at 881

NMFS characterizes a zero harvest rate for yelloweye as having "severe economic consequences," projected to result in "a loss of at least $100 million in commercial exvessel revenues and approximately 1.2 million recreational angler trips." PER00458. NMFS's proposed rule for the 2009-2010 Specifications explains the latest extension to yelloweye's rebuilding period by recycling the language from the final rule on the 2007-2008 Specifications. 09-10 Proposed Rule, 73 Fed. Reg. at 80,528, PER00061 (emphasizing a need to collect more data and "reduce the immediate adverse impacts to fishing communities"). NMFS argues that yelloweye is "the most constraining species in a certain portion of the California recreational fishery," and that "an OY of 17 metric tons rather than 14 metric tons allows for an additional three months of fishing in that area." PER00006.

NMFS suggests in its accompanying EIS that it had no choice but to delay rebuilding, once again, because yelloweye co-occurs with enough target species to affect harvests across the fishery. 09-10 EIS at 204, 113 AR B.50 ("Most 2009-10 West Coast groundfish fisheries will likely be constrained by the low [alternative] yelloweye OYs considered, including the OYs under the status quo ramp-down strategy."). The Agency will presumably face that same issue every Specifications cycle until (and if) yelloweye rebuilds, many decades from now, and there is no indication the Agency will change its approach in future cycles. NMFS claimed this extended schedule would give it "time to collect much-needed additional data that could better inform new management measures for greater yelloweye rockfish protection, and reduce the immediate adverse impacts to fishing communities" while delaying the target rebuilding date less than a year from what it would have been under the 12.6 metric ton recommendation. 16-4 Final Rule, 71 Fed. Reg.

at 78,643, PER00450.

The penalty assessed against yelloweye for being "the most constraining species" in its part of the groundfish fishery gives priority to short-term economic interests over conservation. NMFS's invocation of the same rationale – that it needs more time even though the species is doing worse than projected, for two specifications periods in a row, underscores the conclusion that the Agency has exceeded its narrow discretion under section 304(e)(4)(A)(i). The possibility of short-term "adverse impacts" and professed need to collect yet more information is insufficient to delay the species' rebuilding. Using this reasoning, the Agency could delay rebuilding indefinitely. The court of appeals has already emphasized that section 304(e)(4)(A)(i)'s command to rebuild overfished species in "as short [a time] as possible" applies to all rebuilding periods, 421 F.3d at 880. The MSA "does not contemplate that [NMFS] grant the least protection to the fish species in the worst shape." *Id.* at 881. Yelloweye is biologically capable of rebuilding by 2049, three and a half decades earlier than the Agency's current harvest levels for the species will allow. PER00061. Accordingly, the NMFS "ramp-down" harvest plan does not provide for rebuilding within the shortest time possible and violates the MSA.

4. CANARY ROCKFISH

The species was declared overfished in January 2000. PER00063. The shortest time to rebuild this species with zero fishing would be by 2019. NMFS has set the target

year for rebuilding at 2021. The 2005 stock assessment estimated that canary was at 9.4% of its historic population. 16-4 Final Rule, 71 Fed. Reg. at 78,704, PER00476 (note r). NMFS relied on that estimate to set a target rebuilding year of 2063 and approve annual canary harvest levels of 44 metric tons in 2007 and 2008. *Id.* at 78,655, PER00462 (target year); *id.* at 78,701, PER00473 ("OY" col.") (2007); ROD at 6, PER00114 (2008). Before approving the 2009-2010 Specifications, the Agency received a new stock assessment that estimated canary at 32.4% of its historic population. 09-10 Final Rule, 74 Fed. Reg. at 9,877, PER00053, PER0005 (admitting uncertainty but adopting assessment as recommended by the Scientific and Statistical Committee "SSC," and Stock Assessment Review, "STAR" panel); *id.* at 9,928, PER00026 (note "r") (estimate). NMFS reacted by more than doubling the annual canary harvest to 105 metric tons for 2009 and 2010. ROD at 6, PER00114. NMFS also reset the rebuilding period to 2021. 09-10 Final Rule, 74 Fed. Reg. at 9,877, PER00005.

When the Council prepared the 2009-2010 Rule, a new stock assessment indicated canary's spawning biomass was 32.4 percent of its unfished level, well above the overfished threshold of 25 percent and the previous estimate of 9.4 percent. PER 00053 The estimated median year by which the stock would be rebuilt in the absence of fishing was now 2019. PER 00064 The Council maintained the existing harvest control rule (F88.7%) and adopted a target rebuilding year of 2021, only two years beyond TF=0 (zero fishing mortality). PER 00064

Because canary are broadly distributed, "a lower canary rockfish OY would result in dramatic fishery restrictions and closures coastwide, affecting vulnerable fishing communities from the U.S. border with Canada to Point Conception, California." FDER 00170. The canary rebuilding plan had created significant adverse consequences in all sectors of the West Coast groundfish fishery, with many of the most vulnerable fishing communities losing infrastructure and seeing many fishery-related business losses. PER 00005. The impacts on fishing communities from the 44 metric tons OY in 2007-2008 were worse than expected, especially in the remote fishing village of Neah Bay. Vessels in Astoria, Oregon lost access to fishing grounds they had relied upon heavily in the past. The Agency concluded that a 44 metric tons OY would be extremely restrictive in the trawl fishery and others. PER00005.

On the basis of these impacts, the Council determined that a rebuilding plan that was only one year longer than the estimated time to rebuild in the absence of any fishing (and which reduced the harvest rate in the meantime) was as short as possible taking into account the needs of fishing communities. If the most recent stock assessment is accurate, canary rockfish is close to the 40% level, indicating that the species is nearly rebuilt. This would indicate that the rebuilding efforts of the Agency up to now have been succeeding, and no modification is warranted.

5. **BOCACCIO**

Bocaccio was declared overfished in March 1999, PER00063.The shortest time to rebuild this species with zero fishing would be by 2021. NMFS has set the target date for rebuilding at 2026. When the Agency approved the 2009-2010 Specifications, it had new stock assessments for this species indicating that bocaccio was more abundant than the Agency had assumed in setting its 2007-2008 Specifications. Compare 16-4 Final Rule, 71 Fed. Reg. at 78,704, PER00476 (note t) (listing bocaccio at 10.7%, for 2005), with 09-10 Final Rule, 74 Fed. Reg. at 9,928-29, PER00026-27 (note t) (listing bocaccio at 13.8% , for 2007). With bocaccio, as with POP and widow, the Agency responded by maintaining the periods it set in Amendment 16-4 and substantially increasing annual harvests. ROD at 6, PER00114 at 6 (listing harvest levels for 2008, 2009 and 2010); compare 16-4 Final Rule, 71 Fed. Reg. at 78,655, PER00462 (establishing target rebuilding date of 2026 for bocaccio) with 50 C.F.R. § 660.355 (same target date in effect today). NMFS asserts that there was no need for it to adjust the rebuilding periods for these species because its latest stock assessments show they were rebuilding according to the schedule the Agency assumed when it set the periods in Amendment 16-4.

Bocaccio is a relatively productive species which is difficult for fishermen to avoid, so the Agency set a rebuilding time of five years beyond the time to rebuild with zero fishing mortality. FDER000168-169. The agency justifies the increase in rebuilding time in light of the need to avoid severe adverse economic impacts in the short-term, which it argues furthers the long-term needs of fishing communities. See, e.g., PER00840. A stock assessment update prepared for bocaccio in 2007 indicates that the stock biomass is continuing to increase. PER00053. During the eight years of rebuilding, the cumulative total mortality of the stock has been 40 percent below the cumulative OY, "indicating excellent management performance overall." FDER000017.

Because the rebuilding progress was considered adequate, and the stock assessment update did not change the fundamental understanding of the stock's status, the SSC recommended maintaining the status quo rebuilding plan adopted under

Amendment 16-4. PER00062. The Council maintained the target rebuilding year of 2026 and SPR harvest rate (F77.7%), resulting in an OY of 288 metric tons in both 2009 and 2010. *Id.* Thus, although the OY will increase from the 2008 level (218 metric tons), the SPR harvest rate will remain constant as the stock continues to grow. This species is making progress toward rebuilding in as short a time as possible. Therefore, no modification of the Specifications for this species is necessary.

6. PACIFIC OCEAN PERCH ("POP")

Pacific Ocean Perch ("POP") was declared overfished in March 1999, PER00063, 00065. The shortest time to rebuild this species with zero fishing would be by 2010. NMFS has set the target date fo rebuilding at 2017. PER00026. When the Agency approved the 2009-2010 Specifications, it had a new stock assessment for this species indicating that it was more abundant than the Agency had assumed in setting its 2007-2008 Specifications. Compare 16-4 Final Rule, 71 Fed. Reg. at 78,704, PER00476 (note o) (listing POP at 23.4%, in 2005), with 09-10 Final Rule, 74 Fed. Reg. at 9,928-29, PER00026-27 (note o) (listing POP at 27.5%, for 2007). With POP, as with bocaccio and widow, the Agency responded by maintaining the period it set in Amendment 16-4 and substantially increasing annual harvests. ROD at 6, PER00114 at 6 (listing harvest levels for 2008, 2009 and 2010); compare 16-4 Final Rule, 71 Fed. Reg. at 78,655, PER00462 (establishing target rebuilding date of 2017 for POP) with 50 C.F.R. § 660.355 (same target date in effect today).

NMFS asserts that there was no need for it to adjust the rebuilding periods for this species because its latest stock assessments show it was rebuilding according to the schedule the Agency assumed when it set the periods in Amendment 16-4. In the absence of fishing mortality, it was estimated the median year in which the stock would be rebuilt was 2015. FDER 00172. The Council adopted a harvest control rule and a 2007-2008 OY level that were substantially lower than those in 2005-2006, and which yielded a target rebuilding year of 2017 (two years beyond TF=0). FDER 00172-173; FDER 00183. The 2007-2008 OY level of 150 metric tons was higher than the actual catch in 2005, but was intended to address "a potentially significant increased incidental encounter rate," which the Council anticipated based on the relative abundance of POP. FDER 00172-173; TER 00117.

When the 2009-2010 Rule was prepared, a 2007 stock assessment update for Pacific Ocean Perch estimated the spawning biomass was at 27.5 percent of its unfished biomass, with an increasing trend. PER 00054. In the absence of fishing, it was estimated that the stock would be rebuilt in 2010. PER 00065. The Council retained the existing harvest control rule (F86.4%) and target year for the stock to be rebuilt (2017). TER 00120-21. However, given the improved condition of the stock, the estimated median year in which the stock would be rebuilt was now 2011, only one year beyond TF=0. PER 00065. Applying the harvest control rule to the increased stock size yielded 2009 and 2010 OY levels of 189 and 200 metric tons, respectively. *Id.* This species is currently at a biomass above the 25% level, and making steady progress, indicating that the Agency's rebuilding efforts are restoring the species in the shortest time possible, in compliance with the MSA.

7. WIDOW ROCKFISH

Widow rockfish was declared overfished in January 2001. PER00065.The shortest time to rebuild this species with zero fishing would be by 2013. NMFS has set the target rebuilding date at 2015. When the Agency approved the 2009-2010 Specifications, it had new stock assessments for this species indicating that it was more abundant than the Agency had assumed in setting its 2007-2008 Specifications. Compare 16-4 Final Rule, 71 Fed. Reg. at 78,704, PER00476 (note q) (listing widow at 31.1%, in 2005) with 09-10 Final Rule, 74 Fed. Reg. at 9,928-29, PER00026-27 (note q) (listing widow at 36.2%, in 2007). The Agency responded by maintaining the period it set in Amendment 16-4 and substantially increasing annual harvests. ROD at 6, PER00114 at 6 (listing harvest levels for 2008, 2009 and 2010); compare 16-4 Final Rule, 71 Fed. Reg. at 78,655, PER00462 (establishing target rebuilding date of 2015 for widow) with 50 C.F.R. § 660.355 (same target date in effect today). NMFS asserts that there was no need for it to adjust the rebuilding period for this species because its latest stock assessments show it was rebuilding according to the schedule the Agency assumed when it set the periods in Amendment 16-4.

Although the harvest control rule was lower than the status quo rule, the 2007-2008 OY was higher, reflecting the increasing abundance of the stock, and was intended to prevent an early closure of the Pacific whiting fishery as a result of variable and increasing encounter rates with widow rockfish. FDER 183, TER 118. A lower OY and anticipated severe in-season fishery restrictions would primarily affect vulnerable fishing communities north of 40° N. latitude with a stronger commercial fishing focus, such as Grays Harbor County in Washington, and Clatsop, Coos, Curry and Lincoln Counties in Oregon. FDER 173.

In the absence of fishing, the stock was estimated to be rebuilt in 2009. PER 65. The Council retained the existing harvest control rule (F95.0%) and the target rebuilding year of 2015. *Id.* However, given the continuing improvement in the condition of the stock, the estimated median year in which the stock would be rebuilt was now 2009, the same as TF=0. *Id.* Applying the harvest control rule to the increased stock size yielded 2009-2010 OY levels of 522 and 509 metric tons, respectively. *Id.* All indicators are that this species is approaching the 40% threshold at which it will be considered to be rebuilt and therefore the Specifications for this species fulfill the mandate of the MSA.

8. Conclusion re Bocaccio, Pacific Ocean Perch and Widow Rockfish

The Court concludes that bocaccio, at 13.8% of unfished biomass, up from 10.7% formerly, is making steady progress toward being rebuilt; POP is near the level of 25%, the threshold above which it would not be overfished; and widow rockfish is approaching the 40% level which would amount to being rebuilt. All indicators are that these species are on track to rebuild in the shortest time possible and therefore the 2009-2010 Specifications for these species comply with the MSA.

G. Leaving the 2009-2010 Specifications in place for darkblotched rockfish,

cowcod, and yelloweye rockfish is not the appropriate remedy.

1. NRDC seeks a one-year timeline for implementation of this Court's order.

NRDC argues that because the Agency's rebuilding amendments and the 2009-2010 Specifications are arbitrary and capricious and contrary to law, the Court should hold them unlawful, set them aside, and enjoin the Agency from relying on these actions to manage the Pacific Coast groundfish fishery. 5 U.S.C. § 706(2)(A); 16 U.S.C. § 1855(f)(1)(B) (incorporating 5 U.S.C. § 706(2)(A)).

It contends the Court should also: (a) order the Agency to publish, within one year, a final rule revising the FMP's rebuilding framework to establish a simple and transparent standard for determining when the Agency may rely on the "needs of fishing communities" to delay rebuilding under MSA section 304(e)(4)(A)(i); (b) reinstate on an interim basis the harvest levels the Agency established in its 2007- 2008 Specifications, measures the Agency has already deemed sufficient to meet the needs of fishing communities, until the Agency has adopted revised Specifications that comply with the MSA, APA, and NEPA; and (c) retain jurisdiction over the Agency's actions on remand. This Court has broad discretion to remedy the Agency's violations of law and order relief that serves the public interest. *Northwest Environmental Defense Center v. Bonneville Power Admin.*, 477 F.3d 668, 680-81 (9th Cir. 2007) (discussing the scope of courts' equitable powers under APA section 706).

Although NRDC argues that the Court should enjoin the 2009-2010 Specifications for the reasons set forth above, it is aware of the economic consequences of simply suspending fishing regulations until the Agency has had the opportunity to develop revised Specifications and FMP provisions that rebuild overfished species in "as short [a time] as possible," and that are founded on sound science and a reasoned consideration of alternatives. NRDC therefore asks the Court to order the Agency to reinstate on an interim basis the harvest levels it established in the 2007-2008 Specifications, pending the Agency's development of revised Specifications and FMP provisions that comply with law.

Specifically, for all overfished species but yelloweye, NRDC asks the Court to order the Agency to apply its 2007 harvest levels in 2009, and to apply its 2008 harvest levels in 2010. For yelloweye, NRDC asks the Court to order the Agency to apply the yelloweye harvest levels the Agency set for 2009 and 2010 in the original "ramp-down" plan it approved for yelloweye in the 2007-2008 Specifications. This would mean setting 2009 yelloweye harvests at 17 metric tons, and 2010 yelloweye harvests at 14 metric tons (rather than the 17 metric tons the Agency has allowed for 2010 under the 2009-2010 Specifications). 16-4 Final Rule, 71 Fed. Reg. at 78,651, PER00458. NRDC also asks the Court to order the Agency to revise its Specifications and FMP provisions within a year of the Court's ruling and to retain jurisdiction over the Agency's actions on remand, to ensure that unlawful harvest measures remain in place no longer than strictly necessary.

These remedies are within the Court's equitable authority, which includes the power to mandate affirmative relief that serves the interests of justice and the public interest. *N.W.. Environmental Defense Center*, 477 F.3d at 680-81 (citation omitted); *id.* at 680 (noting that "where the public interest is involved, equitable powers assume an even broader and more flexible character than when only a private controversy is at stake") (quoting *U.S. v. Alisal Water Corp.*, 431 F.3d 643, 654 (9th Cir. 2005). They are also consonant with the MSA's statutory scheme, which empowers the Agency to impose interim harvest measures where necessary to prevent overfishing, 16 U.S.C. § 1855(c), and reviewing courts to take any action "in the interests of justice," *id.* § 1861(d). Finally, they are consistent with the FMP itself, which provides for Specifications to remain in effect after the expiration of the biennial cycle for which they were adopted if the Agency has not yet approved replacement Specifications. PER02296.

2. NMFS contends it can't comply within one year and shouldn't have to.

NMFS asks the Court to leave the 2009-2010 Specifications in place pending remand. Harvest levels from 2007-2008, are based on out of date stock assessments and out of date economic analyses, not consistent with National Standard Two, which requires that management measures be based upon the best scientific information available. 16 U.S.C. § 1851(a)(2). There would be significant disruption of the regulated community from an interim change, due to confusion as to which management measures apply. Reverting to the harvest levels in the 2007-2008 Specifications would not result in a significant benefit to any of the overfished species, such that it would outweigh the potential disruption to the regulated community. Further, argues the Agency, NRDC's proposal to reduce the OYs without any consideration of the economic impacts does not serve the public interest.

NMFS also asks the Court to decline to order it to "within a year, issue a final rule . . . revising the FMP's rebuilding framework. . . ," Pl. Mem. at 40, because it considers this timeline to be unreasonable in light of the statutorily-mandated process for revising the FMP. Pursuant to the MSA, it is the Council's role to develop FMP amendments, which are approved, partially approved, or disapproved by the Agency. 16 U.S.C. § 1854(a), (b). Only under certain limited circumstances, not present here, may the Secretary take the lead in preparing a plan or plan amendment. 16 U.S.C. § 1854(c)(1).

NMFS argues that one year is not sufficient time to permit the Council to reevaluate the rebuilding approach and make any necessary modifications in the form of an FMP amendment, and for the Agency to issue proposed and final regulations. Declaration of Frank D. Lockhart ("Lockhart Decl."), at ¶¶ 5-9, 16. NMFS asks the Court to follow the precedent of Congress, which has via the MSA permitted up to two years for councils to prepare and implement rebuilding plans for overfished stocks. 16 U.S.C. § 1854(e)(3). NMFS asks the Court to decline to reduce OYs for overfished species to 2007-2008 levels, which would lead to further adverse impacts for West Coast fishing communities.

Arguing that detailed remedial orders such as that sought by NRDC are generally disfavored, citing *North Carolina Fisheries Association v. Gutierrez*, 550 F.3d 16, 20 (D.C. Cir. 2008), NMFS asks this Court, if it is inclined to remand, to remand to the Agency for further action consistent with the Court's ruling. *Id.* NMFS argues that even if the Court determines that remand is appropriate, it should decline to adopt NRDC's proposal to reinstate the 2007-2008 Specifications and should instead leave the 2009-2010 Specifications in place. Pl. Mem. at 38. Courts generally set aside rules enacted in violation of the APA, see *Western Oil & Gas Ass'n v. U.S. Environmental Protection Agency*, 633 F.2d 803, 813 (9th Cir. 1980). At the same time, the U.S. Court of Appeals for the Ninth Circuit has recognized that the determination of whether to vacate a rule pending remand is an equitable one. See, e.g., *Idaho Farm Bureau Federation v. Babbitt*, 58 F.3d 1392, 1405 (9th Cir. 1995) ("Ordinarily when a regulation is not promulgated in compliance with the APA, the regulation is invalid. However, when equity demands, the regulation can be left in place while the agency follows the necessary procedures.") (citation omitted).

4. This Court finds remand with instructions to be the proper remedy.

This Court finds that the Agency exaggerates the dicta in the *North Carolina Fisheries* case, in which the court held that a remand to an agency under the circumstances of that case would be preferable, where the district court had made no ruling on the Amendment at issue. However, the *North Carolina Fisheries* decision is distinguishable from this case. This Court has made its ruling and the ruling should be implemented, due to the dire circumstances of several of the species.

The *Idaho Farm Bureau* case, which involved the Endangered Species Act, actually contradicts the Agency's argument in this case. The agency in that case had violated its own procedure by neglecting to make a report available to the public, before deciding not to list a species of snail as endangered. The court chose to leave the process in place, rather than vacate the regulations and restart the listing process from the beginning. In that way the Agency could more quickly list the snail, if it decided to do so after the report was published. 58 F.3d 1392, 1405. This Court for the same reason vacates the Specifications which place the overfished species at greater risk, to further the goal of the regulations, conservation of the species, for the longterm benefit of both the fishery and all those who depend on it.

This Court finds that the Agency has been able to meet a one-year deadline before, and should be able to now. Following the court of appeals reversal and remand of the 2002 darkblotched rockfish Specifications, the district court (Hon. Charles R. Breyer) remanded the Specifications to the Agency for revision by December 31, 2006. (Order e-filed December 8, 2005, Docket # 119). The Agency published the Final Rule December 29, 2006. (Federal Defendants' Notice of Satisfaction of Remand, e-filed March 2, 2007,

United States District Court
For the Northern District of California

Docket # 133.)

Under the circumstances of this case, and in light of the applicable law and the record regarding this fishery, further delay in implementing this Court's ruling would impermissibly exacerbate the pressure on these three species and compound the violation of the MSA mandate that a fishery be rebuilt "as soon as possible."

V. CONCLUSION

This Court grants in part and denies in part the parties' cross-motions, and holds that the 2009-2010 Specifications for darkblotched rockfish, cowcod, and yelloweye rockfish violate the MSA as delineated in *NRDC v NMFS, supra*. For darkblotched rockfish and cowcod, but not yelloweye, the Court orders the Agency to apply its 2008 harvest levels in 2010. For yelloweye, the Court orders the Agency to apply the yelloweye harvest level the Agency set for 2010 in the original "ramp-down" plan it approved for yelloweye in the 2007-2008 Specifications. This sets 2010 yelloweye harvests at 14 metric tons (rather than the 17 metric tons the Agency has allowed for 2010 under the 2009-2010 Specifications). 16-4 Final Rule, 71 Fed. Reg. at 78,651, PER00458. NRDC shall prepare a Proposed Order on Remedy reflecting this ruling. The Agency shall publish new Specifications, within one year of issuance of the Order on Remedy.

IT IS SO ORDERED.

DATED: April 22, 2010

James Larson
James Larson
U.S. Magistrate Judge

Exhibit 3

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Attorneys for Plaintiff Natural Resources Defense Council, Inc.

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, INC., Plaintiff,	Case No. C 01-0421 JL
v.	**~~[PROPOSED]~~ ORDER ON REMEDY**
GARY LOCKE, Secretary of Commerce, et al., Defendants.	

After consideration of the parties' cross-motions for summary judgment (Dkt. Nos. 302, 312), the memoranda of the parties and amici, supporting declarations and exhibits, and the administrative record, and for the reasons set forth in its April 23, 2010 Order (Dkt. No. 340), the Court hereby declares and orders:

1. Defendants violated National Standard 2 of the Magnuson-Stevens Fishery Management and Conservation Act ("MSA"), 16 U.S.C. § 1851(a)(2), by failing to use the best scientific information available on the economic status of fishing communities in their 2009-2010 Biennial Specifications and Management Measures for the Pacific Coast Groundfish Fishery ("2009-2010 Specifications").

2. Defendants violated Section 304(e)(4)(A)(i) of the MSA, 16 U.S.C. § 1854(e)(4)(A)(i), by establishing rebuilding plans for darkblotched rockfish, cowcod and yelloweye rockfish in the 2009-2010 Specifications that do not rebuild those species in time periods that are "as short as possible" within the meaning of Section 304(e)(4)(A)(i).

3. The 2009-2010 Specifications are hereby REMANDED to Defendant National Marine Fisheries Service ("NMFS").

4. The 2009-2010 Specifications for darkblotched rockfish, cowcod and yelloweye rockfish are VACATED. As a result of the vacatur, and for the remainder of 2010, the most recent annual harvest levels (also known as optimum yields, or "OYs") that NMFS specified for darkblotched rockfish, cowcod and yelloweye rockfish in its 2007-2008 Biennial Specifications and Management Measures for the Pacific Coast Groundfish Fishery are in effect. For yelloweye rockfish, the OY in 2010 is 14 metric tons.

5. NMFS, within one year of the date of issuance of this Order on Remedy, shall establish new Specifications for the Pacific Coast Groundfish Fishery that:

a. are based on the "best scientific information available" within the meaning of MSA National Standard 2, 16 U.S.C. § 1851(a)(2); and

b. establish rebuilding periods for darkblotched rockfish, cowcod and yelloweye rockfish that are "as short as possible" within the meaning of MSA Section 304(e)(4)(A)(i), 16 U.S.C. § 1854(e)(4)(A)(i).

6. The Court retains jurisdiction over Defendants' actions on remand.

IT IS SO ORDERED.

DATED: April 29, 2010

The Hon. James Larson
United States Magistrate Judge

Exhibit 4

212th Session of the Pacific Fishery Management Council
March 2-7, 2012

Doubletree Hotel Sacramento
2001 Point West Way, Sacramento, California 95815
Telephone: 916-929-8855

<table>
<tr><th colspan="7">Proposed March 2012 Council Meeting Agenda Summary</th></tr>
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<tr><td rowspan="6">Advisory Body Meetings
–
schedule begins on page 8</td><td>8:00 am General Session</td><td>Coastal Pelagic Species Management</td><td rowspan="4">Salmon Management</td><td>Pacific Halibut Management</td><td rowspan="3">Groundfish Management</td><td>Groundfish Management</td></tr>
<tr><td rowspan="4">Highly Migratory Species Management</td><td>Habitat Issues</td><td rowspan="3">Groundfish Management</td><td rowspan="2">Administrative Matters</td></tr>
<tr><td>Closed Session</td></tr>
<tr><td rowspan="3">Groundfish Management</td><td rowspan="3">Salmon Management</td><td rowspan="3">Salmon Management</td></tr>
<tr><td rowspan="2">Pacific Halibut Management</td><td rowspan="2">Salmon Management</td></tr>
<tr><td>Open Comment Period</td></tr>
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Schedule of Ancillary Meetings begins on page 8

Refer to the Schedule of Ancillary Meetings beginning on page eight for a complete list of technical and administrative committees, advisory bodies, work groups, state delegations, and special sessions scheduled throughout the week of February 29 through March 7, 2012.

Proposed Detailed Agenda begins on next page

The following items are on the Pacific Council agenda; however the order of the agenda items may change as required to effectively address the issues.

212th Session of the Pacific Fishery Management Council
March 2-7, 2012

Proposed Detailed
AGENDA

Friday, March 2, 2012

Doubletree Hotel Sacramento
Grand Ballroom

8:00 am	General Council Session

A. Call to Order
A.1 Opening Remarks — Dan Wolford, Chairman
A.2 Roll Call — Don McIsaac
A.3 Executive Director's Report — Don McIsaac
A.4 Agenda — Dan Wolford
- a. **Council Action**: Approve Agenda

B. Highly Migratory Species Management
B.1 National Marine Fisheries Service Report
- a. Agenda Item Overview — Kit Dahl
- b. Regulatory Activities — Mark Helvey
- c. Fisheries Science Center Activities — Russ Vetter
- d. Reports and Comments of Advisory Bodies and Management Entities
- e. Public Comment
- f. Council Discussion

B.2 Update on and Recommendations for International Management Activities
- a. Agenda Item Overview — Kit Dahl
- b. Reports and Comments of Advisory Bodies and Management Entities
- c. Public Comment
- d. **Council Action**: Consider and Adopt Recommendations on International Management Activities Concerning a Management Framework for Albacore Tuna and the U.S.-Canada Treaty

B.3 Swordfish Management Data Report and Future Management Recommendations
- a. Agenda Item Overview — Kit Dahl
- b. Reports and Comments of Advisory Bodies and Management Entities
- c. Public Comment
- d. **Council Action**: Consider Available Management Data and Determine Whether or Not to Proceed Toward Developing a West Coast Fishery

C. Open Comment Period
C.1 Comments on Non-Agenda Items
- a. Advisory Body and Management Entity Comments
- b. Public Comment
- c. Council Discussion and Comments as Appropriate

Saturday, March 3, 2012

8:00 am ***Grand Ballroom***

A. Call to Order (reconvene) — Dan Wolford

A.5 Commencing Remarks — Don McIsaac

D. Coastal Pelagic Species Management

D.1 Exempted Fishing Permits (EFP) for 2012

a. Agenda Item Overview — Kerry Griffin
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt EFP Proposals for Public Review

E. Habitat

E.1 Current Habitat Issues

a. Agenda Item Overview — Jennifer Gilden
b. Report of the Habitat Committee — Joel Kawahara
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action:** Consider Habitat Committee Recommendations

Closed Executive Session

This session is closed to all except Council members, their designees, and others designated by the Council Chair to discuss litigation and personnel matters.

F. Groundfish Management

F.1 Planning and Necessary Actions for the 2012-2013 Pacific Whiting Fishing Seasons, Including Potential Impacts from the Pacific Dawn Litigation

a. Agenda Item Overview — John DeVore
b. NMFS Briefing — Frank Lockhart
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action:** Council Decisions and Planning as Necessary for Implementation of the 2012-2013 Pacific Whiting Fishing Seasons

F.2 Briefing on and Limited Actions for Emerging Issues in the 2013-2014 Biennial Specifications Process

a. Agenda Item Overview — Kelly Ames and John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Consider and Adopt Preferred Alternatives for Emerging Issues, Including Specifications for the Other Fish Stock Complex and Lingcod

Sunday, March 4, 2012

8:00 am ***Grand Ballroom***

A. Call to Order (reconvene) Dan Wolford

A.6 Commencing Remarks Don McIsaac

G. Salmon Management

G.1 National Marine Fisheries Service Report

a. Agenda Item Overview Chuck Tracy
b. Regulatory Activities Bob Turner
c. Fisheries Science Center Activities
d. Reports and Comments of Advisory Bodies and Management Entities
e. Public Comment
f. Council Discussion

G.2 Review of 2011 Fisheries and Summary of 2012 Stock Abundance Forecasts

a. Agenda Item Overview Chuck Tracy
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Review and Discuss Relevant Fishery Information and Act on Relevant Status Determinations, 2012 Abundance Forecasts, and Annual Catch Limits as Necessary

G.3 Rebuilding Plan Consideration for Sacramento Fall Chinook and Strait of Juan de Fuca Coho

a. Agenda Item Overview Chuck Tracy
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Rebuilding Plans for Sacramento Fall Chinook and Strait of Juan de Fuca Coho as Necessary

G.4 Identification of Management Objectives and Preliminary Definition of 2012 Salmon Management Alternatives

a. Agenda Item Overview Chuck Tracy
b. Report of the Pacific Salmon Commission Gordy Williams
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. Council Recommendations for Initial Alternatives for Salmon Technical Team Collation and Description

H. Pacific Halibut Management

H.1 Report on the International Pacific Halibut Commission Meeting

a. Agenda Item Overview Chuck Tracy
b. Meeting Summary Gway Kirchner
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. Council Discussion

Sunday, March 4, 2012 (continued)

H. Pacific Halibut Management (continued)

H.2 Incidental Catch Regulations in the Salmon Troll and Fixed Gear Sablefish Fisheries

a. Agenda Item Overview — Chuck Tracy
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt Public Review Options for 2012

Monday, March 5, 2012

8:00 am — ***Grand Ballroom***

A. Call to Order (reconvene) — Dan Wolford

A.7 Commencing Remarks — Don McIsaac

H. Pacific Halibut Management (continued)

H.3 Update on Review of Pacific Halibut Management under the National Environmental Policy Act (NEPA) and Status of Preliminary Alternatives for Incidental Catch Retention of Pacific Halibut in the Limited Entry Fixed Gear Sablefish Fisheries

a. Agenda Item Overview — Chuck Tracy
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Provide Guidance on the Review, Scheduling, and Further Development of Alternatives for Analysis

F. Groundfish Management (continued)

F.3 National Marine Fisheries Service Report

a. Agenda Item Overview — Kelly Ames
b. Regulatory Activities — Frank Lockhart
c. Fisheries Science Center Activities — Michelle McClure, John Stein
d. Reports and Comments of Advisory Bodies and Management Entities
e. Public Comment
f. Council Discussion

F.4 Scoping for Amendment 24: Improvements to the Groundfish Management Process

a. Agenda Item Overview — Kit Dahl
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Provide Direction for Development and Scheduling of the Amendment 24 Process

F.5 Stock Assessment Planning for Management Specifications in the 2015-2016 Fisheries

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary Guidance for three Terms of Reference, a List of Stocks to be Assessed, and an Assessment Schedule

Monday, March 5, 2012 (continued)

G. Salmon Management (continued)

G.5 Council Recommendations for 2012 Management Alternative Analysis

a. Agenda Item Overview — Chuck Tracy
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. Council Direction to the Salmon Technical Team and Salmon Advisory Subpanel on Alternative Development and Analysis

Tuesday, March 6, 2012

8:00 am *Grand Ballroom*

A. Call to Order (reconvene) — Dan Wolford

A.8 Commencing Remarks — Don McIsaac

F. Groundfish Management (continued)

F.6 Consideration of Inseason Adjustments

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Final Recommendations for Adjustments to 2012 Groundfish Fisheries

F.7 Harvest Set-Aside Flexibility

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary Alternatives for Managing the Distribution of Unused Harvest Set-Asides

F.8 Trawl Rationalization Trailing Actions and Allocation Amendments and Actions

a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Refine and Adopt Appropriate Actions and Preliminary Preferred Alternatives as needed (continues on Wednesday)

G. Salmon Management (continued)

G.6 Scoping of Amendment 17: Updating Salmon Essential Fish Habitat (EFH)

a. Agenda Item Overview — Kerry Griffin
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Provide Guidance on Development and Scheduling of Preliminary Alternatives for Changes to Salmon EFH and Other Issues as Appropriate

G.7 Further Council Direction for 2012 Management Alternatives

a. Agenda Item Overview — Chuck Tracy
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. Council Guidance and Direction

Wednesday, March, 7, 2012

8:00 am *Grand Ballroom*

A. Call to Order (reconvene) — Dan Wolford

A.9 Commencing Remarks — Don McIsaac

F. Groundfish Management (continued)

F.8 Trawl Rationalization Trailing Actions and Allocation Amendments and Actions
(This item is a continuation from the Tuesday Session)

I. Administrative Matters

I.1 Approval of Council Meeting Minutes

a. Council Member Review and Comments — Dan Wolford
b. **Council Action**: Approve April and November 2011 Council Meeting Minutes

I.2 Membership Appointments and Council Operating Procedures

a. Agenda Item Overview — John Coon
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Consider Changes to Council Operations and Procedures and Appointments to Advisory Bodies

I.3 Future Council Meeting Agenda and Workload Planning

a. Agenda Item Overview — Don McIsaac
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. Council Discussion and Guidance on Future Meeting Agenda and Workload Planning

G. Salmon Management (continued)

G.8 Adoption of 2012 Management Alternatives for Public Review

a. Agenda Item Overview — Chuck Tracy
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt Management Alternatives for Public Review

G.9 Salmon Hearings Officers

a. Agenda Item Overview — Chuck Tracy
b. **Council Action:** Appoint Hearings Officers — Dan Wolford

ADJOURN

212th Session of the Pacific Fishery Management Council
February 29 through March 7, 2012

SCHEDULE OF ANCILLARY MEETINGS

Day 1—Wednesday, February 29, 2012	Time	Location
Highly Migratory Species Advisory Subpanel	8:00 am	Capitol Salon D
Highly Migratory Species Management Team	8:00 am	Sacramento Room

Day 2—Thursday, March 1, 2012	Time	
Highly Migratory Species Advisory Subpanel	8:00 am	Capitol Salon D
Highly Migratory Species Management Team	8:00 am	Sacramento Room
Scientific and Statistical Committee	8:00 am	Capitol Salon A

Day 3—Friday, March 2, 2012	Time	
Council Secretariat	11:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D
Groundfish Management Team	8:00 am	California Salon 2
Habitat Committee	8:00 am	Capitol Salon B
Scientific and Statistical Committee	8:00 am	Capitol Salon A
Groundfish Advisory Subpanel	1:00 pm	Capitol Salon C
Enforcement Consultants	4:30 pm	Sacramento Room

Day 4—Saturday, March 3, 2012	Time	Location
Council Secretariat	7:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D
Groundfish Advisory Subpanel	8:00 am	Capitol Salon C
Groundfish Management Team	8:00 am	California Salon 2
SSC Economic Subcommittee	8:30 am	Capitol Salon A
Salmon Advisory Subpanel	8:00 am	California Salon 4
Salmon Technical Team	8:00 am	California Salon 3
Chairman's Reception	6:00 pm	Capitol Salon B and Foyer
Enforcement Consultants	As Necessary	Sacramento Room
Tribal Policy Group	As Necessary	Terrace Room
Tribal and Washington Technical Group	As Necessary	Garden Room

Day 5—Sunday, March 4, 2012	Time	Location
Council Secretariat	7:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D

Groundfish Advisory Subpanel	8:00 am	Capitol Salon C
Groundfish Management Team	8:00 am	California Salon 2
Salmon Advisory Subpanel	8:00 am	California Salon 4
Salmon Technical Team	8:00 am	California Salon 3
Enforcement Consultants	As Necessary	Sacramento Room
Tribal Policy Group	As Necessary	Terrace Room
Tribal and Washington Technical Group	As Necessary	Garden Room

Day 6—Monday, March 5, 2012

	Time	Location
Council Secretariat	7:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D
Groundfish Advisory Subpanel	8:00 am	Capitol Salon C
Groundfish Management Team	8:00 am	California Salon 2
Salmon Advisory Subpanel	8:00 am	California Salon 4
Salmon Technical Team	8:00 am	California Salon 3
Enforcement Consultants	As Necessary	Sacramento Room
Tribal Policy Group	As Necessary	Terrace Room
Tribal and Washington Technical Group	As Necessary	Garden Room

Day 7—Tuesday, March 6, 2011

	Time	Location
Council Secretariat	7:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D
Groundfish Advisory Subpanel	8:00 am	Capitol Salon C
Groundfish Management Team	8:00 am	California Salon 2
Salmon Advisory Subpanel	8:00 am	California Salon 4
Salmon Technical Team	8:00 am	California Salon 3
Enforcement Consultants	As Necessary	Sacramento Room
Tribal Policy Group	As Necessary	Terrace Room
Tribal and Washington Technical Group	As Necessary	Garden Room

Day 8—Wednesday, March 7, 2011

Council Secretariat	7:00 am	California Salon 1
California State Delegation	7:00 am	Capitol Salon C
Oregon State Delegation	7:00 am	California Salon 4
Washington State Delegation	7:00 am	Capitol Salon D
Salmon Advisory Subpanel	8:00 am	California Salon 4
Salmon Technical Team	8:00 am	California Salon 3
Enforcement Consultants	As Necessary	Sacramento Room
Tribal Policy Group	As Necessary	Terrace Room
Tribal and Washington Technical Group	As Necessary	Garden Room

Exhibit 5

COUNCIL OPERATING PROCEDURE

1

General Council Meeting Operations

Approved by Council: 04/06/95

Revised: 03/07/97, 06/25/99, 04/03/00, 12/15/03, 03/11/05, 11/09/07; **09/12/08**

PURPOSE

To establish general procedures for the Council meetings and administrative matters.

MEETINGS

The Council shall, generally, meet five times per calendar year. At the call of the Council Chair or upon request of a majority of its voting members, emergency meetings may be held. Upon receiving a request for an emergency meeting from any Council member or upon the Chair's own instigation, the Council Chair shall instruct the staff to conduct a telephone poll of available voting Council members. If a quorum agrees, the Chair shall call such a meeting.

Public Participation

Council meetings are held for the purpose of conducting official Council business. However, the public will be provided an opportunity to address the Council at its meetings and submit information relevant to matters under consideration. To further encourage public participation, the Council, when practicable, shall establish a period at each meeting during which the public shall be granted an opportunity to address the Council on matters of concern to them. These discussions need not necessarily be related to items on the current meeting agenda. The following procedures shall be observed.

Written

The public shall be permitted to file written statements with the Council at any time before or after a meeting. This submission of written statements by the public is a statutory right which cannot be administratively hampered by arbitrary conditions of length, format, numbers of copies, typography, etc. All written information submitted to the Council by an interested person shall include a statement of the source and date of such information and a brief description of the background and interests of the person in the subject of the written statement. To ensure adequate review and timely action, the following procedure will be followed:

1. Written comments regarding matters on the Council agenda received at the Council office no later than two weeks prior to the beginning of the Council meeting, or no later than a specially published deadline, will be placed in the Council members' briefing books distributed prior to the meeting. If appropriate, these comments will be summarized by staff at the Council meeting.

2. Written comments submitted after the above deadline and by a published deadline during the week prior to the Council meeting will be distributed at the meeting as supplemental briefing material.

3. Written comments received after the deadline specified in number 2, above, will not be copied or distributed by the Council staff. In these instances, individuals are encouraged to attend the Council meeting and present their testimony orally and in writing. Written comments submitted in person at the meeting will be made part of the Council's record. For such late comments, individuals should make their own photocopies for distribution. At least 40 copies are necessary, each with the Agenda Item Number written in the upper right corner of the front page of the document. The public should be aware that the Council does not have time to thoroughly review extensive written comments submitted at the meeting. The Council's advisory entities may not have a chance to review such comment at all. The Council will not pay collect charges for comments transmitted to the meeting hotel by facsimile machine.

4. When multiple copies of the same or similar written public comment is received, Council staff will provide one copy of the material with a notation indicating the total number of copies received. This procedure will be used for written material received in advance of the Council meeting, per numbers 1 and 2 above.

<u>Oral</u>

Interested persons will be allowed to present oral statements or to participate in the discussion subject to such reasonable rules or procedures as may be established by the Council. Time limits on oral comments may be prescribed. Every effort should be made to set aside a portion of every meeting for public participation. Any oral statement shall include a brief description of the background and interests of the person in the subject of the oral statement. The following procedures will be followed:

1. The Council will publish in the *Federal Register* and Council meeting notices the public comment opportunities for each agenda item, as appropriate, and provide a time for public comment on items not on the agenda of the Council meeting.

2. Registration cards will be provided at the entrance of the meeting room for individuals wishing to address the Council. The following information shall be included, (1) name, (2) address, (3) affiliation, and (4) agenda item/subject of testimony. After public comment begins on each agenda item, additional cards will not be accepted for that agenda item.

3. At his or her discretion, the Council Chair may establish a sequence for calling on individuals, according to topics to be discussed. Generally, verbal testimony is limited to five minutes for individuals and ten minutes for groups or individuals representing organizations.

4. Depending upon time and Council wishes, the Council Chair may ask for comments from the public on subjects of interest to the Council after all comments have been made by individuals from the comment registration cards.

5. When there are numerous public comments, the Chair may decide to use an alternative approach to expedite the comment process. The following procedure may be used when there are two opposing factions:

   - The Chair requests, in advance of the public comment period, that each side choose a panel to present the arguments.

   - Each panel makes its presentation.

6. If new information from a state or Federal agency or from a Council advisory entity is accepted by the Council, the Chair shall insure that the Council gives comparable consideration to new information offered at that time by interested members of the public. Interested parties shall have a reasonable opportunity to respond to new data or information before the Council takes final action on conservation or management measures (pursuant to the Magnuson-Stevens Fishery Conservation and Management Act).

7. Council members shall be allowed to ask questions of individuals addressing the Council.

Electronic Mail (E-mail)

The Council will treat e-mail comments in the same regard as written comments. The public shall be permitted to file e-mail statements with the Council at any time before or after a meeting, subject to the requirements in the following paragraph. A format describing e-mail necessities and acceptance procedures will be posted on the Council website and notice of same will be placed in the Council Newsletter. Copies of qualifying e-mail will be treated the same as written public comment (described above) and subject to the same deadlines for distribution. All e-mail received designating testimony relevant to a particular Council meeting will be made part of the official meeting record.

All e-mail information submitted to the Council for purposes of comment on a Council meeting agenda item shall include the name of the person submitting the statement, a brief description of the representation or interest of the person submitting the statement, an e-mail address at which the person can be contacted, the subject or meeting agenda item the comment pertains to, and when relevant information is submitted, a statement of the source and date of such information. Attachments to e-mail may not be accepted as part of the e-mail comment.

To facilitate timely review by Council members, the following procedure will be followed:

1. Qualified e-mail comments regarding matters on a Council public meeting agenda received at the Council office no later than two weeks prior to the beginning of the Council meeting, or no later than a published notification deadline, will be printed and placed in the Council members briefing books distributed prior to the meeting. If multiple identical comments are received, only one representative copy will be included in the briefing books with the total number of such comments received noted on the copy. If appropriate, these comments will be summarized by staff at the Council meeting.

2. Qualified e-mail submitted after the above deadline and by a published deadline during the week prior to the Council meeting will be distributed at the meeting as supplemental briefing material. If multiple identical comments are received, only one representative copy will be included in the supplemental briefing material with the total number of such comments received noted on the copy. If appropriate, these comments will also be summarized by staff at the Council meeting.

3. Qualified e-mails received after the deadline specified in number 2, above, will not be copied or distributed by the Council staff. In these instances, individuals are encouraged to attend the Council meeting and present their testimony orally and in writing.

Public Notification of Meetings

News Releases

Timely public notice of each regular meeting and each emergency meeting, including the time, place, and agenda topics for the meeting, shall be widely distributed via facsimile machine, electronically (e-mail and Council website), and/or U.S. Postal Service to individuals on mailing lists maintained by the Council and to local media in the major fishing ports of Washington, Oregon, and California (and in other regional areas having a direct interest in the affected fishery, e.g., Idaho). The notice also may be announced by such other means as will result in wide publicity. For purposes of this notice, the term "timely" will be defined as two weeks prior to the actual meeting. However, the Council recognizes that due to the expediency of some Council actions and/or other reasons deemed valid, such two-week advance notice may not always be possible.

Federal Register Notices

Timely notice of each regular meeting, emergency meeting, and hearing also shall be published in the *Federal Register*. Council staff shall prepare this notice in coordination with the appropriate National Marine Fisheries Service (NMFS) regional office. In this context, the term "timely" shall denote submission of the notice to NMFS (at least 23 calendar days prior to the meeting) for publication in the *Federal Register*.

The published agenda of the meeting may not be modified to include additional matters for Council action without public notice or within 14 days prior to the meeting date, unless such modification is to address an emergency action under section 305(c) of the Magnuson-Stevens Act, in which case public notice shall be given immediately.

Voting Procedures

Robert's Rules of Order will be strictly enforced. Makers of motions must first be recognized by the Chair, and if an action is to be reconsidered, the motion for reconsideration must be made by an individual who originally cast a vote for the prevailing side.

Motions

The maker of a motion must clearly and concisely state and explain the motion. After discussion and a call for the question, the motion must be restated clearly and concisely by the Chair before the vote is taken. Motions must be recorded in written form visible to each Council member present and the public if the action 1) requires approval or amendment of a fishery management plan (including any proposed regulations), 2) requests an amendment to regulations implementing a plan, or 3) is a recommendation for responding to an emergency. The written motion, as voted on, must be preserved as part of the record or minutes of the meeting, and include the exact vote of the Council members.

In the case of a telephonic vote, the Chair or the maker of the motion must clearly read the motion aloud immediately prior to the vote, such that everyone on the call understands the wording of the motion up for vote. The motion would then become part of the written record of the call/vote, which would also include the exact vote of the Council members.

Votes

At the request of any voting member of the Council, the Council shall hold a roll call vote on any matter before the Council. The official minutes and other appropriate record of any Council meeting shall identify all roll call votes held, the name of each voting member present during each roll call vote, and how each member voted on each roll call vote. All other votes shall be by verbal indication. Council members/designees who are not in attendance may not vote by telephone.

A voting member of the Council may not vote on any Council matter that would have a significant and predictable effect on a financial interest of that Council member. A designated official (NOAA General Counsel) will determine whether a Council decision would have a significant and predictable effect on a financial interest of a member. An affected individual who may not vote may participate in Council deliberations relating to the decision after notifying the Council of the voting recusal and identifying the financial interest that would be affected.

For a vote on a Council finding that an emergency exists in a fishery, the exact number of votes (for, against, and abstaining) must be preserved as part of the record of the meeting.

Measures to Improve Meetings

Report Presentation

- Council staff, advisory body representatives, invitational speakers, and Council members should shorten all oral reports to the extent possible. For lengthy written reports, provide brief executive summaries highlighting major points.

- Provide written reports on items that are only informational and do not require Council action.

- Advisory subpanel reports should describe areas of consensus and differences. Individual subpanel members shall not provide public testimony as part of the subpanel presentation.

- In general, lengthy detailed presentations will be provided during joint advisory body meetings (e.g., Scientific and Statistical Committee, Groundfish Management Team, Groundfish Advisory Subpanel joint meetings to review stock assessment information) rather than during the Council session. Council members should endeavor to attend these advisory body meetings.

SSC Reviews for Scientific Merit

- The SSC requires good documentation and ample review time in order to provide the best possible advice to the Council. Agencies and review document authors should be responsible for ensuring materials submitted to the SSC are technically sound, comprehensive, clearly documented, and identified by author. If there is any uncertainty on the part of authors regarding SSC expectations, authors should clarify assignments and expectations of deliverables with the meeting Chair. In order that there be adequate time for careful review, documents and materials destined for review by the SSC or any of its subcommittees must be received at the Council office at least two weeks prior to the meeting at which they will be discussed and reviewed, unless otherwise approved by the Executive Director. The Council will then provide copies to appropriate SSC members at least five working days prior to the meeting. If this deadline cannot be met, it is the responsibility of the author to contact the meeting Chair prior to the two-week deadline, so appropriate arrangements, rescheduling, and cancellations can be made in a timely and cost-effective manner. This deadline applies to all official SSC activities and meetings.

Public Comments

- The Council Chair will limit the length of oral testimony to five minutes per individual and ten minutes per group or individual representing a group. At the discretion of the Chair, less time may be allotted. If less time is to be provided, the Chair shall announce this prior to the start of public testimony on an agenda item.

- The Council Chair will urge members of the public to not repeat comments provided by a previous public commenter.

- Council member debate and record development should be avoided during the public testimony period. Questions should be for clarification only.

Structure of Agenda

- As appropriate, the Council Chair will advise Council members of time limits for each agenda item. Time limits will not be rigidly enforced, but they may serve as a guide or reminder to focus discussion and be concise.

- Avoid placing too many weighty issues near the end of the meeting. Intersperse major items throughout the agenda to the extent possible.

- Review work load and next meeting agenda at or near the end of each meeting. Establish priorities for activities. Priorities should be publicized.

- Provide time for advisory subpanels to complete their work.

Council Discussion and Debate

- Debate should be complete and not be arbitrarily limited, but it should be focused on the motion. (Robert's Rules limit members to two speeches per topic and ten minutes per speech.)

MINUTES

A detailed meeting record of each Council meeting, including summary minutes, except for any closed session, shall be kept and shall contain a record of the persons present, a complete and accurate description of matters discussed and conclusions reached, and copies of all statements filed. At a subsequent meeting, the Council will review and adopt the meeting minutes. A copy of the official meeting record shall be submitted to NMFS. The chairman shall certify the accuracy of the minutes of each such meeting and submit a copy thereof to the Secretary. The meeting record shall be made available to any court of competent jurisdiction.

STAFF RESPONSIBILITIES

In addition to drafting meeting minutes, the staff will prepare brief, pre-Council meeting issue summaries, identifying issues and options for each agenda action item. These summaries are provided in the briefing books.

NEW MEMBER ORIENTATION

New Council members will be provided with a one-day to two-day briefing session with appropriate Council members, staff, and advisory Chairs (Scientific and Statistical Committee, advisory subpanels, and plan development/management Teams) prior to their first Council meeting. During this session, both mechanics of operation and management issues and techniques will be addressed. In addition, new members will attend the Council Chair's briefing for the first two Council meetings.

COUNCIL CHAIR'S BRIEFING

The Council Chair's briefing is for the purpose of briefing the Council Chair and not a forum for debate or discussion of the issues.

QUICK RESPONSE PROCEDURE

This procedure addresses Council comments to other entities on actions proposed by those entities. It does not include fishery management action items that are the responsibility of the Council and must be approved by the Council at a regular or emergency meeting.

For new policy matters that will be implemented or have a comment deadline prior to the next Council meeting, the Council Chair is authorized to send a letter on behalf of the Council using the following procedure:

> Staff will distribute a summary of the issue and a proposed response to all Council members. If the Council Chair receives a response from at least one voting member from each state, staff may send an official Council comment letter taking into account the responses received from members. Consensus is not required.

OFFICERS

The Chair and two Vice Chairs of the Council shall be elected by majority vote of Council members present and voting. Generally, elections are held during the June Council meeting. Officers shall serve one-year terms, which commence August 11 and end August 10 of the following year. Appointments may be renewed for additional one-year terms by majority Council vote at the next June meeting. The Chair may not serve more than two consecutive one-year terms.

FISHERY REGULATION DEEMING PROCESS
[Procedure for Implementing MSA Section 303(c)]

In taking final action on Pacific Fishery Management Council (Council) recommendations to adopt a fishery management plan (FMP) or FMP amendment, or to revise regulations implementing an FMP, the Council is deeming that regulations implementing the recommendations are necessary or appropriate in accordance with Section 303(c) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). In so doing, the Council implicitly requests the appropriate National Marine Fisheries Service (NMFS) Region complete regulatory language to implement the Council's final action. Unless otherwise explicitly directed by the Council, after NMFS has prepared the regulatory language, the Council authorizes the Executive Director to review the regulations to verify that they are consistent with the Council action before submitting them, along with his determination, to the Secretary on behalf of the Council.

The Executive Director is authorized to withhold submission of the Council action and/or proposed regulations and take the action back to the Council if, in his determination, the proposed regulations are not consistent with the Council action. [1]

[1] In cases where the consistency is in question, the Executive Director is expected to work with NMFS to resolve the issues. Returning the regulations to the Council would be a last resort when questions cannot be resolved without involving the whole Council.

Exhibit 6

Department of Commerce • National Oceanic & Atmospheric Administration • National Marine Fisheries Service

NATIONAL MARINE FISHERIES SERVICE INSTRUCTION 01-101-07
EFFECTIVE DATE

Fisheries Management

Policy Guidelines for the Use of Emergency Rules

NOTICE: This publication is available at: http://www.nmfs.noaa.gov/directives/.

OPR: F/SF **Certified by:** F/SF(Risenhoover)
Type of Issuance: Revision

SUMMARY OF REVISIONS:
This revision simply puts the original guidance in the required directive format. This policy will take the place of 01-101-07 and 30-111.

Signed Emily Menashes MAR 31 2008
[Approving Authority name] Date
[Approving Authority title]

Introduction

The preparation or approval of management actions under the emergency provisions of section 305 (c) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) should be limited to extremely urgent, special circumstances where substantial harm to or disruption of the resource, fishery, or community would be caused in the time it would take to follow standard rulemaking procedures. An emergency action may not be based on Administrative inaction to solve a long-recognized problem. In order to approve an emergency rule, the Secretary of Commerce (Secretary) must have an administrative record justifying emergency regulatory action and demonstrating its compliance with the national standards. The only legal prerequisite for the use of the Secretary's emergency authority is that an emergency must exist. Congress intended that emergency authority be available to address conservation, biological, economic, social, and health emergencies. In addition, emergency regulations may make direct allocations among user groups, if strong justification and administrative record demonstrates that, absent emergency regulation, substantial harm will occur to one or more segments of the fishing industry. Controversial actions with serious economic effects, except under extraordinary circumstances, should be done through normal notice-and-comment rulemaking.

The process of implementing emergency regulations limits the public participation in rulemaking that Congress intended under the Magnuson-Stevens Act and the Administrative procedures act. The Councils and Secretary must, whenever possible, afford the full scope of public participation in rulemaking. In addition, an emergency rule may delay the review of non-emergency rules, because the emergency rules take precedence. Emergency actions should not be routine events.

Rational for Emergency Action

1. The Secretary may promulgate emergency regulations to address an emergency if the Secretary finds that an emergency or overfishing exists, without regard to whether a fishery management plan exists for that fishery;
2. The Secretary shall promulgate emergency regulations to address the emergency or overfishing if the Council, by a unanimous vote of the voting members, requests the Secretary to take such action[1];
3. The Secretary may promulgate emergency regulations to address the emergency or overfishing if the Council, by less than a unanimous vote of its voting members, requests the Secretary to take such action; and
4. The Secretary may promulgate emergency regulations that respond to a public health emergency or an oil spill. Such emergency regulations may remain in effect until the circumstance that created the emergency no longer exist, provided that the public has had an opportunity to comment on the regulation after it has been published, and in the case of a public health emergency, the Secretary of Health and Human Services concurs with the Secretary's action.

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[1] The NOAA Office of General Counsel has defined the phrase "unanimous vote," to mean the unanimous vote of a quorum voting members of the Council only. An abstention has no effect on the unanimity of the quorum vote.

Emergency Criteria

The phrase "an emergency exists involving any fishery" is defined as a situation that:

1. Results from recent, unforeseen events or recently discovered circumstances; and
2. Presents serious conservation or management problems in the fishery; and
3. Can be addressed through emergency regulations for which the immediate benefits outweigh the value of advance notice, public comment, and deliberative consideration of the impacts on participants to the same extent as would be expected under the normal rulemaking process.

Emergency Justification

If the time it would take to complete notice-and-comment rulemaking or complete a fishery management plan or amendment would result in substantial damage or loss to a living marine resource, habitat, fishery, industry participants or communities, or substantial adverse impacts to the public health, emergency action might be justified under one or more of the following situations:

1. Ecological- (A)to prevent overfishing as defined in a Fishery Management Plan (FMP), or as defined by the Secretary in the absence of an FMP, or (B) to prevent other serious damage to the fishery resource or habitat; or
2. Economic- to prevent significant direct economic loss or preserve a significant economic opportunity that otherwise might be foregone; or
3. Social- to prevent significant community impacts or conflict between user groups; or
4. Public Health- to prevent significant adverse effects to health of participants in a fishery or to the consumers of seafood products.

Attachment 1

Policy - Emergency Rules

THEFT RATES OF MODEL YEAR 1995 PASSENGER MOTOR VEHICLES STOLEN IN CALENDAR YEAR 1995—Continued

Manufacturer	Make/model (line)	Thefts 1995	Production (mfgr's) 1995	1995 (per 1,000 vehicles produced) theft rate
205 ROLLS-ROYCE	SIL SPIRIT/SPUR/MULS	0	132	0.0000
206 ROLLS-ROYCE	TURBO R	0	19	0.0000
207 VOLKSWAGEN	EUROVAN	0	1,814	0.0000
208 VOLVO	LIMOUSINE	0	6	0.0000

Issued on: August 18, 1997.

L. Robert Shelton,

Associate Administrator for Safety Performance Standards.

[FR Doc. 97-22263 Filed 8-20-97; 8:45 am]

BILLING CODE 4910-59-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Chapter VI

[Docket No. 970728184-7184-01; I.D. 060997C]

Policy Guidelines for the Use of Emergency Rules

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

ACTION: Policy guidelines for the use of emergency rules.

SUMMARY: NMFS is issuing revised guidelines for the Regional Fishery Management Councils (Councils) in determining whether the use of an emergency rule is justified under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The guidelines were also developed to provide the NMFS Regional Administrators guidance in the development and approval of regulations to address events or problems that require immediate action. These revisions make the guidelines consistent with the requirements of section 305(c) of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act.

DATES: Effective August 21, 1997.

FOR FURTHER INFORMATION CONTACT: Paula N. Evans, NMFS, 301/713-2341.

SUPPLEMENTARY INFORMATION:

Background

On February 5, 1992, NMFS issued policy guidelines for the use of emergency rules that were published in the **Federal Register** on January 6, 1992 (57 FR 375). These guidelines were consistent with the requirements of section 305(c) of the Magnuson Fishery Conservation and Management Act. On October 11, 1996, President Clinton signed into law the Sustainable Fisheries Act (Public Law 104-297), which made numerous amendments to the Magnuson-Stevens Act. The amendments significantly changed the process under which fishery management plans (FMPs), FMP amendments, and most regulations are reviewed and implemented. Because of these changes, NMFS is revising the policy guidelines for the preparation and approval of emergency regulations. Another change to section 305(c), concerning interim measures to reduce overfishing, will be addressed in revisions to the national standards guidelines.

Rationale for Emergency Action

Section 305(c) of the Magnuson-Stevens Act provides for taking emergency action with regard to any fishery, but does not define the circumstances that would justify such emergency action. Section 305(c) provides that:

1. The Secretary of Commerce (Secretary) may promulgate emergency regulations to address an emergency if the Secretary finds that an emergency exists, without regard to whether a fishery management plan exists for that fishery;
2. The Secretary shall promulgate emergency regulations to address the emergency if the Council, by a unanimous vote of the voting members, requests the Secretary to take such action;
3. The Secretary may promulgate emergency regulations to address the emergency if the Council, by less than a unanimous vote of its voting members, requests the Secretary to take such action; and
4. The Secretary may promulgate emergency regulations that respond to a public health emergency or an oil spill. Such emergency regulations may remain in effect until the circumstances that created the emergency no longer exist, provided that the public has had an opportunity to comment on the regulation after it has been published, and in the case of a public health emergency, the Secretary of Health and Human Services concurs with the Secretary's action.

Policy

The NOAA Office of General Counsel has defined the phrase "unanimous vote," in paragraphs 2 and 3 above, to mean the unanimous vote of a quorum of the voting members of the Council only. An abstention has no effect on the unanimity of the quorum vote. The only legal prerequisite for use of the Secretary's emergency authority is that an emergency must exist. Congress intended that emergency authority be available to address conservation, biological, economic, social, and health emergencies. In addition, emergency regulations may make direct allocations among user groups, if strong justification and the administrative record demonstrate that, absent emergency regulations, substantial harm will occur to one or more segments of the fishing industry. Controversial actions with serious economic effects, except under extraordinary circumstances, should be done through normal notice-and-comment rulemaking.

The preparation or approval of management actions under the emergency provisions of section 305(c) of the Magnuson-Stevens Act should be limited to extremely urgent, special circumstances where substantial harm to or disruption of the resource, fishery, or community would be caused in the time it would take to follow standard rulemaking procedures. An emergency action may not be based on administrative inaction to solve a long-recognized problem. In order to approve an emergency rule, the Secretary must have an administrative record justifying emergency regulatory action and demonstrating its compliance with the national standards. In addition, the preamble to the emergency rule should indicate what measures could be taken or what alternative measures will be considered to effect a permanent solution to the problem addressed by the emergency rule.

The process of implementing emergency regulations limits substantially the public participation in rulemaking that Congress intended under the Magnuson-Stevens Act and the Administrative Procedure Act. The Councils and the Secretary must, whenever possible, afford the full scope of public participation in rulemaking. In addition, an emergency rule may delay the review of non-emergency rules, because the emergency rule takes precedence. Clearly, an emergency action should not be a routine event.

Guidelines

NMFS provides the following guidelines for the Councils to use in determining whether an emergency exists:

Emergency Criteria

For the purpose of section 305(c) of the Magnuson-Stevens Act, the phrase "an emergency exists involving any fishery" is defined as a situation that:

(1) Results from recent, unforeseen events or recently discovered circumstances; and

(2) Presents serious conservation or management problems in the fishery; and

(3) Can be addressed through emergency regulations for which the immediate benefits outweigh the value of advance notice, public comment, and deliberative consideration of the impacts on participants to the same extent as would be expected under the normal rulemaking process.

Emergency Justification

If the time it would take to complete notice-and-comment rulemaking would result in substantial damage or loss to a living marine resource, habitat, fishery, industry participants or communities, or substantial adverse effect to the public health, emergency action might be justified under one or more of the following situations:

(1) Ecological—(A) to prevent overfishing as defined in an FMP, or as defined by the Secretary in the absence of an FMP, or (B) to prevent other serious damage to the fishery resource or habitat; or

(2) Economic—to prevent significant direct economic loss or to preserve a significant economic opportunity that otherwise might be foregone; or

(3) Social—to prevent significant community impacts or conflict between user groups; or

(4) Public health—to prevent significant adverse effects to health of participants in a fishery or to the consumers of seafood products.

Dated: August 14, 1997.

Gary C. Matlock,

Acting Assistant Administrator for Fisheries, National Marine Fisheries Service.

[FR Doc. 97-22094 Filed 8-20-97; 8:45 am]

BILLING CODE 3510-22-F

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 285

[Docket No. 970702161-7197-02; I.D. 041097C]

RIN 0648-AJ93

Atlantic Highly Migratory Species Fisheries; Import Restrictions

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

ACTION: Final rule.

SUMMARY: NMFS amends the regulations governing the Atlantic highly migratory species fisheries to prohibit importation of Atlantic bluefin tuna (ABT) and its products in any form harvested by vessels of Panama, Honduras, and Belize. The amendments are necessary to implement International Commission for the Conservation of Atlantic Tunas (ICCAT) recommendations designed to help achieve the conservation and management objectives for ABT fisheries.

DATES: Effective August 20, 1997. Restrictions on Honduras and Belize are applicable August 20, 1997; restrictions on Panama are applicable January 1, 1998.

ADDRESSES: Copies of the supporting documentation are available from Rebecca Lent, Chief, Highly Migratory Species Management Division, Office of Sustainable Fisheries (F/SF1), NMFS, 1315 East-West Highway, Silver Spring, MD 20910-3282.

FOR FURTHER INFORMATION CONTACT: Chris Rogers or Jill Stevenson, 301-713-2347.

SUPPLEMENTARY INFORMATION: The Atlantic tuna fisheries are managed under the authority of the Atlantic Tunas Convention Act (ATCA). Section 971d(c)(1) of the ATCA authorizes the Secretary of Commerce (Secretary) to issue regulations as may be necessary to carry out the recommendations of the ICCAT. The authority to issue regulations has been delegated from the Secretary to the Assistant Administrator for Fisheries, NOAA (AA).

Background information about the need to implement trade restrictions and the related ICCAT recommendation was provided in the preamble to the proposed rule (62 FR 38246, July 17, 1997) and is not repeated here. These regulatory changes will further NMFS' management objectives for the Atlantic tuna fisheries.

Proposed Import Restrictions

In order to conserve and manage North Atlantic bluefin tuna, ICCAT adopted two recommendations at its 1996 meeting requiring its Contracting Parties to take the appropriate measures to prohibit the import of ABT and its products in any form from Belize, Honduras, and Panama. The first recommendation was that its Contracting Parties take appropriate steps to prohibit the import of ABT and its products in any form harvested by vessels of Belize and Honduras as soon as possible following the entry into force of the ICCAT recommendation. Accordingly, the prohibition with respect to these countries is effective August 20, 1997. The second recommendation was that the Contracting Parties take appropriate steps to prohibit such imports harvested by vessels of Panama effective January 1, 1998. This would allow Panama an opportunity to present documentary evidence to ICCAT, at its 1997 meeting or before, that Panama has brought its fishing practices for ABT into consistency with ICCAT conservation and management measures. Accordingly, the prohibition with respect to Panama will become effective January 1, 1998.

Under current regulations, all ABT shipments imported into the United States are required to be accompanied by a Bluefin Statistical Document (BSD). Under this final rule, United States Customs officials, using the BSD, will deny entry into the customs territory of the United States of shipments of ABT harvested by vessels of Panama, Honduras, and Belize and exported after the effective dates of the trade restrictions. Entry will not be denied for any shipment in transit prior to the effective date of trade restrictions.

Upon determination by ICCAT that Panama, Honduras, and/or Belize has brought its fishing practices into consistency with ICCAT conservation and management measures, NMFS will publish a final rule in the Federal Register that will remove import restrictions for the relevant party. In

Exhibit 7

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 100804324–1265–02]

RIN 0648–BA01

Magnuson-Stevens Act Provisions; Fisheries Off West Coast States; Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures

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

ACTION: Final rule.

SUMMARY: This final rule establishes the 2011–2012 harvest specifications for most of the species in the groundfish fishery and management measures for that fishery off the coasts of Washington, Oregon, and California consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Pacific Coast Groundfish Fishery Management Plan (PCGFMP). This rule also establishes, under emergency authority in section 305 of the Magnuson-Stevens Act (MSA), harvest specifications for eight overfished species, and for flatfish.

Emergency authority is being invoked to implement measures that were included in Amendment 16–5 to the PCGFMP, which NMFS disapproved in December 2010. These include a new rebuilding plan for petrale sole, revised rebuilding plans for the remaining seven overfished species, and revised status determination criteria and precautionary harvest control rule for flatfish.

DATES: This rule is effective May 11, 2011. Comments must be received no later than June 10, 2011.

ADDRESSES: Copies of this rule, the Record of Decision (ROD) and Regulatory Impact Review (RIR)/Final Regulatory Flexibility Analysis (FRFA) are available from William Stelle, Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070. Electronic copies of this final rule are also available at the NMFS Northwest Region Web site: *http://www.nwr.noaa.gov*

You may submit comments, identified by 0648–BA01, by any one of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal *http://www.regulations.gov.*
- *Fax:* 206–526–6736, Attn: Sarah Williams.
- *Mail:* 7600 Sand Point Way NE., Seattle, WA, 98115.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, *etc.*) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information. NMFS will accept anonymous comments (enter N/A in the required fields, if you wish to remain anonymous). You may submit attachments to electronic comments in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Sarah Williams, 7600 Sand Point Way NE., Seattle, WA, 98115. By phone at 206–526–4646 or fax at 206–526–6736.

Electronic Access: This final rule is accessible via the Internet at the Office of the Federal Register's Web site at *http://www.gpoaccess.gov/fr/index.html.* Background information and documents are available at the Pacific Fishery Management Council's Web site at *http://www.pcouncil.org/.*

SUPPLEMENTARY INFORMATION:

Background

NMFS published a proposed rule to implement the 2011–2012 groundfish harvest specifications and management measures on November 3, 2010 (75 FR 67810). The proposed rule comment period was extended through January 4, 2011 (75 FR 75449, December 23, 2010) to provide additional opportunity for public comment given the delay in implementation. NMFS received 35 letters of comment, which are addressed later in the preamble of this final rule. See the preamble to the proposed rule for additional background information on the fishery and on this final rule.

The amount of each Pacific Coast groundfish species or species complex that is available for harvest in a specific year is referred to as a harvest specification. The PCGFMP requires the harvest specifications and management measures for groundfish to be set at least biennially. This final rule, which implements the NMFS preferred alternative described in the Final Environmental Impact Statement (FEIS), would set 2011–2012 and beyond harvest specifications and management measures for most of the groundfish species or species complexes managed under the PCGFMP. Specifications for the overfished species and flatfish are also included in this final rule but are adopted under the emergency authority described in section 305 of the MSA. The groundfish fishery regulations include a collection of management measures intended to keep the total catch of each groundfish species or species complex within the harvest specifications. The management measures would be revised by this action for 2011 and 2012.

The Notice of Availability for the FEIS for this action was published on March 11, 2011 (76 FR 13401). The final NMFS preferred alternative in the FEIS is a modified version of the Council's final preferred alternative (FPA) which was described in the proposed rule for this action. The NMFS preferred alternative differs from the Council's FPA and the specifications discussed in the proposed rule on this action with respect to the specifications for yelloweye rockfish and cowcod, and management measures relative to the Cowcod Conservation Area (CCA). These differences are discussed in detail in the Provisions Implemented Through Emergency Rule and Changes from the Proposed Rule sections of this rule.

Provisions Implemented Through Emergency Rule

Section 305(c) of the MSA provides the Secretary of Commerce the authority to promulgate emergency regulations that are treated as an amendment to an FMP for the period the regulations are in effect. The one new and seven revised rebuilding plans, revisions to flatfish proxies, ACLs for overfished species, and specifications for flatfish contained in this final rule are being adopted under emergency authority because these measures were part of, or are based on, Amendment 16–5 to the PCGFMP, which NMFS disapproved. This emergency action is necessary because NMFS is under court order to establish new specifications for overfished species by April 29, 2011, before the Council can submit and NMFS can implement a revised Amendment 16–5.

NMFS disapproved Amendment 16–5 because at the time of NMFS' approval decision, there was not an FEIS to support the decision. Review of actions under the Magnuson-Stevens Act (16 U.S.C. 1854(a)) requires that before approving an FMP or amendment, NMFS must review the FMP or amendment for consistency with the measures of the MSA itself as well as other applicable law. One of the primary tools that NMFS uses to accomplish this review is an adequate FEIS drafted consistent with the guidance contained within NAO 216–6 (Environmental Review Procedures For Implementing the National Environmental Policy Act). NMFS completed the FEIS and made it available for public review on March 11, 2011.

As is described in the proposed rule preamble, on April 29, 2010, the district court for the Northern District of California issued an order in *NRDC* v. *Locke*, Case 3:01–cv–00421–JLI, vacating the 2009–10 harvest levels for yelloweye rockfish, cowcod, and darkblotched rockfish on the basis that the harvest levels did not meet the MSA mandate to rebuild those stocks in as short a time as possible taking into account factors including the needs of fishing communities. The court upheld the integrated or holistic approach used to develop the harvest levels for all of the overfished species and to analyze their impacts on communities, which was first applied in Amendment 16–4.

The Council, continuing the integrated or holistic approach developed in Amendment 16–4 and upheld by the district court, developed suites of overfished species ACLs, with ACLs for most of the non-overfished species held constant between the alternatives. The impacts of these suites of ACLs are analyzed in the FEIS, rather than the impacts of individual species ACLs. The DEIS included three alternative suites with lower, intermediate and higher ACLs for the overfished species, as well as the Council FPA that included the higher ACLs for all of the overfished species except for darkblotched rockfish, for which the Council adopted the intermediate ACL.

In response to public comment regarding rebuilding plans for overfished species and to ensure consistency with the court's order in *NRDC* v. *Locke*, Case 3:01–cv–00421–JLI, NMFS included in the FEIS an additional alternative (identified as Alternative 4, the NMFS preferred alternative) that was not expressly considered in the DEIS. The NMFS preferred alternative includes the same ACLs as the Council's FPA, except those for yelloweye and cowcod. It does not include changes to the CCAs that were included in the Council's FPA. For cowcod and yelloweye, the NMFS preferred alternative implements ACLs based on Spawning Potential Ratio (SPR) harvest rates that are associated with shorter rebuilding periods than those in the Council FPA. Specifically, in the NMFS preferred alternative, the target rebuilding year and the SPR harvest rate for cowcod are 2068 and 82.7 percent, and the target rebuilding year and the SPR harvest rate for yelloweye rockfish are 2074 and 76.0 percent. NMFS determined that the ACL in the Council's and NMFS' preferred alternative for darkblotched rockfish meets the MSA standard and is consistent with the court's order. Although the harvest level for darkblotched is similar to the level vacated by the court in 2010, the new rebuilding plan is based on a new stock assessment, uses a more conservative SPR harvest rate (64.9 percent rather than 62.1 percent), and rebuilds three years faster than the prior rebuilding plan (2025 rather than 2028).

The NMFS preferred alternative would rebuild as quickly as possible while avoiding serious adverse impacts to communities, and thus meets the MSA standard. Maintaining the 2010 level of economic activity in the most vulnerable communities could be expected to provide the consistency necessary for stability in the fishing community infrastructure and be adequate to support the implementation of the trawl rationalization program. At the same time the strategy would shorten the rebuilding duration for five of the overfished species (bocaccio, cowcod, darkblotched rockfish, widow rockfish and yelloweye rockfish); and maintain the upward rebuilding trajectories for the two overfished species (canary rockfish and Pacific Ocean perch (POP)) where new stock assessments redefined the starting point from which rebuilding began. Unlike the Council's FPA, the NMFS preferred alternative does not implement proposed changes to the CCAs that would allow commercial fixed gear and recreational fishing in areas shoreward of 30 fathoms and would also allow retention of shelf rockfish in depths shallower than 30 fathoms. The impacts of the proposed changes on cowcod, particularly juveniles, are uncertain, and increased impacts on juveniles could potentially delay rebuilding. In addition, because the ACL for cowcod is so extremely low, any measures that potentially increase cowcod mortality require better information on potential biological and economic effects to support such a change. In sum, NMFS concluded that the NMFS preferred alternative is more consistent with direction provided by the court in *NRDC* v. *Locke*, Case 3:01–cv–00421–JLI, and is more consistent with the MSA obligations to rebuild overfished species in the shortest timeframe possible, taking into account the obligation to rebuild, the needs of fishing communities, and the marine environment.

Comments and Responses

NMFS published a proposed rule on November 2, 2010 (75 FR 67810) with a comment period that closed on December 3, 2010. This comment period was extended to January 4, 2011 to allow more time for public comments. NMFS received 35 comments on the proposed rule. The Department of the Interior submitted a letter stating that they reviewed the proposed rule and had no comments. The Washington Department of Fish and Wildlife (WDFW), the Oregon Department of Fish and Wildlife (ODFW) and the California Department of Fish and Game (CDFG) all submitted letters in support of the Council's final action and suggested corrections to the proposed rule. 13 letters were submitted from fishing industry members in support of the Council's recommended changes to the depth restrictions in the CCA and the slope rockfish retention changes. One comment was submitted regarding a request for a processing at sea exemption. NMFS also received a number of comments from the public regarding the impacts from the overfished species specifications. The Council submitted a letter stating that the Exempted Fishing Permit that was issued in August of 2010 would actually be conducted in 2011. Oceana and the Natural Resource Defense Council (NRDC) submitted a joint letter regarding the proposed rule and FMP Amendments 16–5 and 23. In their letter they criticized NMFS for setting harvest specifications that allegedly did not comply with the MSA mandate to rebuild overfished species in a period as short as possible. Additionally, they criticized the implementation of Amendment 23 stating that the best available science was not used and that NMFS was not precautionary enough in setting harvest specifications for a number of species and species complexes. Ocean Conservancy submitted a letter raising similar issues as the joint Oceana-NRDC letter. Substantive comments received on the proposed rule are addressed in the following section:

Amendment 23 Implementation (P, ABCs, ACLs, etc) and Stock Complexes*

Comment 1: The ABC control rule makes Scientific and Statistical Committee's (SSC) involvement functionally expendable because it contemplates presenting the Council with a range of potential scientific uncertainty reduction values, based on the SSC recommended "sigma" values and a range of probabilities of overfishing, from which the Council may choose. NMFS should adopt an ABC control rule that allows the SSC to recommend P* and sigma values along with a decision framework that allows changes to the recommended ABCs to be fully informed by analyses of resulting overfishing risks and environmental consequences.

Response: The ABC control rule selected by the Council is based on the recommendation of the SSC, and is consistent with the MSA and the NS1 (74 FR 3178, January 16, 2009). The SSC recommends the OFL and determines a sigma value representing scientific uncertainty with respect to stock assessments. Once it has determined those values, it can provide the Council with the reductions from OFL that would occur based on the sigma value in conjunction with a range of probabilities of overfishing. This approach conforms with NMFS's NS 1 guidelines. In response to comments on the guidelines, NMFS explains that determining the acceptable level of risk of overfishing that results from scientific uncertainty is a policy issue for the Council to decide. The SSC must recommend an ABC to the Council after the Council advises the SSC on the acceptable probability that a catch equal to the ABC would result in overfishing (January 16, 2009, 74 FR 3178, Response to Comment 42 at 3192). The SSC's role is to determine both the level of scientific uncertainty that exists and to incorporate the Council's policy decision as to acceptable levels of overfishing risk resulting from that uncertainty in developing an ABC. The SSC's recommendations regarding the OFL and sigma limit the range of ABC reductions possible under the available range of P* values consistent with the best scientific information regarding scientific uncertainty.

Comment 2: The proposed sigma values for category 1 stocks represent underestimated and/or inaccurate quantification of scientific uncertainty; they do not account for uncertainty arising from sources other than estimates of biomass in stock assessments, and they do not accurately account for uncertainty in estimates of biomass in stock assessments.

Response: While the proposed sigma value for data-rich stocks (category 1) does not include quantification of all known sources of scientific uncertainty, it is the best scientific information available at this time and the SSC will continue to refine this value in future biennial cycles. The SSC acknowledged that its recommended sigma value for data-rich species does not account for all sources of scientific uncertainty, but recommended this value as "the current best estimate of scientific uncertainty." (Supplemental SSC Report, April 2010, Agenda I.2.b). The Supplemental SSC Report 1 included in the March 2010 briefing book, which is the Councils record for each meeting and contains reports from advisory bodies, state and Federal agencies and public comments, states that the SSC viewed quantifying the uncertainty surrounding stock size estimations as the highest priority, given the large variability in stock assessments. The SSC did not recommend quantifying other sources of uncertainty for the 2011–2012 specifications cycle, but noted that it intends to consider other types of errors for future biennial cycles, specifically forecast uncertainty and uncertainty in the optimal harvest rate. In short, the SSC's recommended sigma values are the best available scientific information at this time. In addition, with respect to longspine thornyhead and shortspine thornyhead, the ACLs for the area south of 40°10′ N.lat are reduced below the ABC to account for uncertainty associated with limited trawl surveys.

Comment 3: The proposed sigma values for category 2 and 3 stocks lack a technical basis and thus are arbitrary. The Council should have used the PSA analysis to generate an appropriate P*.

Response: The SSC noted that scientific uncertainty with respect to the biomass estimates for category 2 and 3 stocks cannot be precisely quantified due to the lack of available information about these stocks. The NS 1 guidelines recognize that precise quantification assessments are not available for all stocks, such as the category 2 and 3 stocks at issue here (See Response to Comment 36, 74 FR at 3190, January 16, 2009). With a P* approach for deciding the ABC for category 2 and 3 stocks, the SSC recommended setting the value of sigma (σ) for category 2 and 3 stocks to 0.72 and 1.44 respectively (*i.e.*, two and four times the σ for category 1 stocks). The difference between buffers determined using sigma values of 0.72 and 1.44 corresponds fairly closely to the difference between the buffers previously used for category 2 and 3 stocks (25 percent versus 50 percent) when P* is in the range 0.3 – 0.35. Also, the SSC noted that results from decision tables for some category 2 stocks indicate values for sigma of approximately .72 (PFMC I.2.b, Supplemental SSC Report, April 2010). The specific sigma values of 0.72 and 1.44 were recommended by the SSC and are considered to be the best available scientific information; however, the values are not based on a formal analysis of assessment outcomes and could change substantially when the SSC reviews additional analyses in future management cycles. These sigma values represent the SSC's best estimate given the absence of a formal analysis of assessment outcomes on which to quantify scientific uncertainty as was done for category 1 stocks. The commenters specifically mention that the Council and NMFS should have used other methods for setting the sigma values for category 2 and 3 species, such as looking at the distributions of OFLs for each stock, or the results of the PSA analysis. However, neither of these methods was suggested by commenters until very late in the development of the 2011–2012 specifications nor recommended by the SSC for this specifications cycle.

Comment 4: The P* values used in the proposed rule are too high, and allow for too great a risk of overfishing due to an inaccurate estimate of the OFL, especially for overfished species. P* and resulting ABCs for category 2 and 3 stocks are not consistent with SSC recommendations.

Response: The NS1 guidelines provide the following standards for setting the ABC: (1) The ABC may not exceed the OFL, and (2) the probability that overfishing will occur cannot exceed 50 percent and should be a lower value. The Council chose a P* value of .45, or a 45 percent probability of overfishing, for data-rich species with data-rich assessments. For category 2 and 3 species, with data-poor or no assessments, the Council generally applied a P* value of .4, or a 40 percent probability of overfishing. The comment suggests that the 50 percent cap set by the NS1 guidelines is inadequate, and that the MSA requires a lower probability of overfishing. NMFS considered this issue in developing the NS 1 guidelines and ultimately determined that while neither the MSA nor the relevant case law requires the use of a specific probability, a 50 percent probability of success is a lower bound. NMFS acknowledges that some overfishing may occur even with ABCs that account for scientific uncertainty, however, it does not believe that the MSA requires a complete elimination of any probability of overfishing, as reflected in the guidelines (Response to Comment 63, 74 FR at 3195–96, January 16, 2009). The Council's choice of P* is consistent with the guidelines.

The commenters specifically point to the ABCs for overfished species, and contend that these are not consistent with rebuilding plans. However, ACLs for the overfished species are based on and consistent with the rebuilding plans, which are in turn based on the rebuilding analyses for these species. The process for developing the ACLs is described in the preamble to the proposed rule for this action (75 FR at 67827–29, January 16, 2009) and in the FEIS. Thus, the ACLs for the overfished species are in most cases set far below the ABCs derived following the ABC control rule set forth in Amendment 23.

For category 1 stocks, the scientific uncertainty reduction from OFL that results from a P* of .45 and a sigma of .36 is 4.4 percent. For healthy stocks, this reduction is more risk-averse than the approach of setting the OY equal to ABC that was used in previous biennial cycles. For species in the precautionary zone, application of the 40–10 or 25–5 harvest control rules results in an additional reduction between ABC and ACL.

The commenters also contend that the P* values the Council adopted for category 2 and 3 stocks are inconsistent with the SSC's recommendation, which the commenters characterize as requiring P* values that would result in reductions from OFL of approximately 25 percent and 50 percent. The Council adopted a general policy of using a P* of 0.4 for category 2 and 3 stocks. The Council discussed P* values for category 2 and 3 stocks of 0.35 and 0.32, respectively. In its report the SSC noted that these P* values, in combination with the sigma values described above, would have resulted in an approximately 24 percent reduction from OFL for category 2 stocks, and an approximately 51 percent reduction from OFL for category 3 stocks, approximating the 25 percent and 50 percent reductions from former ABC that the Council used prior to this specification cycle. However, the SSC did not make a recommendation regarding appropriate P* values but did endorse the Council's final ABC values. In discussing the issue of the buffer between OFL and ABC for category 2 and 3 stocks the Council noted that previously the buffer between former ABC and OY took into account many sources of uncertainty, including scientific uncertainty, but that under NS 1 the buffer between OFL and ABC is now specific to scientific uncertainty. There was therefore concern regarding "double counting" of uncertainty that might result from using status quo buffers to determine the ABC for category 2 and 3 species. For this reason, the Council concluded that it would be inappropriate to use these reductions to quantify scientific uncertainty in the reduction from the OFL to ABC. A review of the ACLs for category 2 and 3 stocks shows that for a number of stocks, the reductions from ABC to ACL address stock status, management uncertainty, and other factors. For example, the ACLs for longnose skate, starry flounder, the other fish complex and the other flatfish complex are all reduced below the ABC to account for management uncertainty. The ACL for sablefish is reduced below the ABC according to the 40–10 harvest control rule, as this species is in the precautionary zone. The southern ACLs for longspine thornyhead and shortspine thornyhead are reduced in order to account for uncertainty associated with trawl surveys in those areas. These reductions are all described in the FEIS and the proposed rule.

The commenters specifically discuss what they see as potential negative impacts from the ABCs for lingcod, sablefish and black rockfish. The FEIS considered the risk of overfishing to all species and no OFLs were projected to be exceeded under any of the alternatives. For lingcod, the ACL (2330 mt in 2011) was set equal to the ABC, however the projected catches are only 685 mt leaving a substantial buffer. Additionally, it is likely that the catches will come in under the ACL because of the limited shelf opportunities given the Rockfish Conservation Area (RCA) configurations implemented through this rule. For sablefish the estimated catch of 5407 mt is well below the ACL value of 6813 mt and the ABC of 8418 mt. Finally, for black rockfish the estimated catch of 905 mt is well below the ACL of 1426 mt and the coastwide ABC of 1589 mt to minimize the risk of overfishing.

For the minor rockfish complexes, a P* value of 0.45 was used in combination with the SSC-recommended sigma values to determine the ABCs for the component stocks. Historically, the OY for minor rockfish north has been shared between Oregon and California with no formal catch sharing agreements because the OY was generally high enough to prevent concerns over the allocation of catch between the states. A struggle for fish could result from 2011–2012 ACLs that are significantly lower than the 2010 OY for the minor nearshore rockfish north subcomplex. (PFMC Supplemental Groundfish Management Team (GMT) Report, I.2.b April 2010). Applying a P* of 0.45 to determine the ABC for this subcomplex results in an ABC lower than the 2010 OY, but higher than the other alternatives considered for determining the ABC. This option constitutes an interim approach to accounting for scientific uncertainty given the current organization of the complexes and the time needed to work out a sharing agreement between the states if necessary. Applying a P* of .45 for the minor rockfish complex components reflects the fact that in contrast to the Other Fish and Other Flatfish complexes, the component stocks in the minor rockfish complexes are not all category 3 stocks. In addition, it reflects the fact that the complexes are not ideally organized to account for scientific uncertainty, and represents a balance between the risk of overfishing due to scientific uncertainty and the risk of unnecessarily limiting fisheries in this biennium until a thorough analysis of the rockfish complexes can be completed.

Comment 5: ACLs should be reduced from ABCs to account for management uncertainty where there is not accurate data regarding true catch amounts and no modeling of management uncertainty. The ACL and ACT control rules should identify all sources of management uncertainty. It is not clear how management uncertainty is accounted for by the use of the ACTs for yelloweye rockfish and POP.

Response: The NS1 guidelines do not expressly contemplate a buffer between ABC and ACL as the primary means to address management uncertainty. An ACT may be established to account for management uncertainty in controlling the catch at or below the ACL, but ACTs are just one type of accountability measure that can address management uncertainty. NMFS specifically considered a system such as that described by the commenter that would require that ACL be set below the ABC to account for management uncertainty, but ultimately rejected it on the basis that it was Congressional intent that ACL should be considered a true limit, not a target catch level (Response to Comment 8, 74 FR at 3183, January 16, 2009). Instead, the guidelines require that, to prevent ACLs from being exceeded, Councils must address the management uncertainty in their fisheries using appropriate accountability measures, which could possibly include setting an ACT. While the Council in fact set the ACL below the ABC for a number of stocks (longnose skate, starry flounder, the other fish complex, the other flatfish complex), consistent with the guidelines, the Council's primary means for addressing management uncertainty is through accountability measures. Section 4.1 and tables 4–1 and 4–3 in the FEIS describe the actual impacts that are expected to the stocks in the fishery as a result of the management measures included in the integrated alternatives. For most of the non-overfished stocks, expected catch levels are far below the ACLs set for these stocks. Thus, the proposed management measures are expected to ensure that for the non-overfished stocks, actual catch levels will not approach the ACLs. For the overfished stocks, the ACLs are based on the rebuilding plans. Management measures have been specifically designed to keep the catch of these stocks below their ACLs.

The NS 1 guidelines make clear that the use of ACTs is optional, not required. The proposed guidelines did require ACTs as reference points, but the final action "retains the concept of an ACT and an ACT control rule, but does not require them to be included in FMPs." The guidelines note that where fisheries lack inseason management controls to prevent ACLs from being exceeded, "AMs should utilize ACTs that are set below ACLs so that catches do not exceed the ACL." (74 FR at 3178, January 16, 2009).

The Groundfish FMP provides for inseason management to prevent catch limit overages. The current system of inseason management in the groundfish fishery has resulted in very few catch limit overages in the last four years. Catch limit overages have occurred for canary rockfish (2001–2007), Dover sole (2006), POP (2007) and darkblotched rockfish(2000, 2001, and 2007) (PFMC, Agenda item G.5.a, attachment 1, November 2009).

Projecting canary rockfish impacts has been problematic, especially in the limited entry trawl sector. Under a rationalized fishery, there is individual accountability and real time reporting that is expected to substantially improve performance relative to the 2010 fishery (*i.e.*, ability to stay within the ACL). For recreational fisheries, the Council recommended the use of HGs as an accountability measure to increase the probability that total catch will stay within the ACL. POP and Dover sole are trawl dominant and management performance is also expected to improve under a rationalized fishery structure. However, the nature of POP catch in the whiting fishery could result in high incidental catch events such as occurred in the Pacific whiting shoreside fishery in 2007. For development of the Council's FPA in the EIS, the Council recommended ACTs for POP and yelloweye rockfish for the FPA in order to increase the likelihood that catches will remain below the ACL. This final rule implements an ACT for POP, but not for yelloweye rockfish. This final rule implements an ACL for yelloweye that is 2.2 mt above the projected catch. The ACL value is based on the high end estimates of projected set aside amounts. Therefore, NMFS believes that the 2.2 mt difference between the ACL and the projected catch means that an ACT is not necessary for yelloweye. Further, with the implementation of the Trawl Rationalization program NMFS will have better inseason monitoring and will be able to track catches relative to set aside allocations and close fisheries or take other appropriate action if fisheries are projected to attain their allocations.

Comment 6: The use of stock complex ACLs must be consistent with new guidance outlined in the NS1 guidelines to ensure that stocks are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar. NMFS should either reorganize species complexes to include stocks with similar vulnerabilities to the fishery, or designate indicator species from among the most vulnerable species in each complex. In addition, species-specific ACLs should be set where possible.

Response: The Council recognized the need for reorganization of the four complexes described in the EIS to reflect the results of the vulnerability analysis conducted by the GMT. However, it was determined that this work could not be completed in time for the 2011–2012 specifications and management measures. The Council and NMFS anticipate the development of recommendations for reorganized stock complexes in time for the 2013–14 specifications.

As the commenters point out, the GMT analyzed the vulnerability of the stocks currently managed in complexes and determined that the existing complexes are comprised of stocks with a range of vulnerabilities. It was recognized that the existing complexes were created prior to the revised NS 1 and are not organized in the best possible manner for taking into account scientific uncertainty and the relevant management issues. For this reason, it has been noted by the GMT that the reorganization of stock complexes is an issue they will work on for the 2013–2014 biennial specifications and management measures cycle. The results of any analysis conducted could be presented to the Council for action. The analysis needed to support such reconsideration could not be completed in time for the current cycle.

The commenters state that until the complexes can be reorganized, indicator stocks should be designated to represent the more vulnerable stocks in the complexes. Typically indicator stocks would be used for an assemblage of similar species when most of the species do not have an assessment. This is not the case for 2011–2012 because the Council developed assessments for all species even if they were data-limited assessment for data poor stocks. The issue is not the absence of an estimate for safe levels of harvest, even if it is data poor, it is that by grouping the ACLs there is uncertainty that each individual species remains under its contributions to the group. Indicator stocks do not address this issue. Additionally, the premise behind using an indicator species is that it is representative of the group. Because the current stock complexes are not organized such that the species within each group are exposed to similar fishing pressure, it is unclear how an indicator species would be selected to represent the group. As previously stated, the analysis needed to support a reorganization of the current stock complexes or to define indicator stocks could not be completed for this biennial cycle, but will be addressed at a later date. NMFS agrees that stock complexes should be organized so they include similarly vulnerable species and that indictor stocks may be a useful tool to manage fisheries in a sustainable manner while preventing overfishing of the most vulnerable species.

To aid in the management of stock complexes, NMFS will be notifying the states of Washington, Oregon and California of the intent to propose revisions to the regulatory provisions at § 660.12 (8), § 660.130(d), § 660.230(c), and § 660.330(c) pertaining to the sorting and reporting of groundfish catch. NMFS believes that refining the sorting requirements for the rockfish complexes is necessary for catch accounting and management of the most vulnerable stocks within complexes. Because this provision would require state and Federal reporting systems to be modified including the data systems that house these data, such a change cannot happen for the 2011 fishing season.

During the process of developing the 2011–2012 ACLs, the Council considered removing several species from the minor rockfish complexes, but did not do so for this biennial cycle because changes necessary to manage these species individually under the trawl rationalization program could not be completed in time for this cycle.

Comment 7: The FPA lacks adequate buffers for the data-poor stock complexes. Specifically, the minor nearshore subcomplexes contain OFL/ABC buffers of roughly 14 percent and no buffer between ABC and ACL, even though these complexes contain highly vulnerable component species such as copper, China and quillback. The minor slope subcomplexes contain OFL/ABC buffers of roughly 9 percent, and ABC/ACL buffers of between 12–25 percent, even though these subcomplexes are composed of data-poor category 3 species and highly vulnerable rougheye and shortraker.

Response: It is unclear which kind of "buffers" the commenters see as inadequate and therefore it is difficult to respond to this comment. The ABCs for the species included in the complexes were recommended by the SSC and adopted by the Council as described above in response to Comment 4. The Council specifically accounted for management uncertainty in the ACLs for the Other Fish and Other Flatfish by adopting ACLs lower than the sum of the ABCs for the individual components of these complexes. The ACLs for the minor shelf and slope rockfish subcomplexes are also significantly lower than the ABCs for these subcomplexes (shelf north—50 percent lower, slope north—12 percent lower, shelf south—49 percent lower, slope south—25 percent lower). In addition, the projected catches of the complexes and subcomplexes, with the exception of the minor nearshore rockfish north subcomplex, are all significantly below the ACLs. For the minor nearshore rockfish north subcomplex, as is discussed in the FEIS, monitoring may indicate a need for inseason management measures to prevent exceeding the ACL (FEIS at pg 352). In summary, given the reductions between OFL and ABC, and ABC and ACL, and the fact that catches are expected to be lower than the ACL for most of the complexes and subcomplexes, overfishing on these complexes and subcomplexes is unlikely.

Comment 8: The Amendment must specify AMs that will be triggered when ACLs are reached.

Response: The NS1 guidelines (74 FR 3178, January 16, 2009) state that FMPs should include AMs, which "are management controls to prevent ACLs, including sector-ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur." NMFS believes that the Groundfish FMP currently provides for robust inseason management measures. Under current practices the Council is presented with inseason updates at each of its meetings. Following an evaluation of the catch to date and catch projections presented by its advisory bodies, the Council makes recommendations to NMFS on regulation changes in order to keep catch within the catch limits. However, NMFS notes that there is a lack of clarity in the amendment with respect to the connection between ACLs and AMs. In its December 27, 2010, letter to the Council, NMFS identified this issue and suggested that it should be addressed through the development and submission of an additional amendment to the FMP.

Comment 9: NMFS should identify and incorporate a specific list of relevant ecological factors into the management of West Coast Groundfish and specify how such factors will be used in the determination of OY, ACLs, or ACTs.

Response: NMFS acknowledges that ecological factors can be an important consideration in setting MSY and OY levels. In the Response to Comment 24 of the NS 1 guidelines NMFS states that "* * * ecological conditions not directly accounted for in the specification of MSY can be among the ecological factors considered when setting OY below MSY" (74 FR at 3187, January 16, 2009). The NS1 Guidelines describe ACT as an accountability measure that accounts for management uncertainty, and does not specifically incorporate ecological concerns.

Under the FMP, as amended by Amendment 23, ecological factors can be a consideration in setting the ACL below the ABC and in setting the OY (FMP Section 2.2). The extent of our knowledge on ecological factors with respect to choosing between the integrated alternatives is considered in the FEIS but our ability to compare these factors with respect to the alternatives is extremely limited. The Council and NMFS have incorporated ecosystem considerations into management of the groundfish fishery in a number of ways (*e.g.* closed areas that protect particularly productive and/or sensitive areas, and consideration of relevant ecological factors in stock assessments). See Agenda Item J.1.c, Attachment 1, PFMC March 2011 (Assessing Ecosystem Policy Principles and Bringing Ecosystem Science into the Pacific Fishery Management Council Process). NMFS is actively engaged in developing ecosystem information about the California Current ecosystem, and the Council is considering development of an Ecosystem Fishery Management Plan and incorporating ecosystem factors into the fishery management process. See Agenda Item J.1, Ecosystem Fishery Management Plan (PFMC March 2011).

While the ecological factors listed in the comments are relevant, at this time the specific elements listed have not been incorporated into the FMP and the Council decisionmaking process. Therefore requiring that information to be reported in a stock assessment or in the determination of OYs, ACLs and ACTs is premature. NMFS agrees that ecological factors are an important consideration in setting harvest levels for groundfish species. The commenters reference two food web models for possible use in considering ecological factors. At this time these models have not been evaluated by the SSC or GMT for use. NMFS suggests that the commenters bring these models forward to the Council's advisory bodies so that they can be evaluated. The groundfish stock assessment and review process, which includes procedures for assessing new models, is laid out in the Terms of Reference for both the groundfish stock assessment and review process and the SSC, which can be found at *http://www.pcouncil.org/groundfish/stock-assessments/safe-documents/2011-safe-document/*.

Even though the FMP does not contain a specific list of ecological factors that must be considered, the FEIS did consider ecological factors. Chapter 4 of the FEIS evaluated the impacts of the alternatives according to the impacts on fishing mortality, rebuilding duration for the overfished species, stock productivity relative to rebuilding success, genetic diversity and prey availability.

Overfished Species and Flatfish

Comment 10: The rebuilding plan for Darkblotched Rockfish is inconsistent with the MSA. A T_{TARGET} of 2025 would maintain the status quo catch limits that were set in 2007–08 that were based on faulty information about darkblotched's resiliency and would extend the 2009–10 harvest specifications that were invalidated by *NRDC* v. *Locke*, Case 3:01-cv-00421–JLI. Review of recent catch levels as well as trends in the economic health of the fishery reveal that it is possible to meet the MSA's conservation priorities by establishing faster rebuilding targets and lower harvest levels while accommodating the needs of the fishing community. NMFS should adopt a target rebuilding date for darkblotched that results in catch levels no higher than 200 metric tons (mt) per year. The catch level for darkblotched was set at 200 mt in 2006 even though economic data from both the commercial trawl sector and the larger groundfish fishery indicate that revenues in 2006 continued to rebound from 2002 lows. Therefore, it is reasonable to assume that the commercial trawl fishery and associated fishing communities can accommodate current catch levels considerably closer of 200 mt for darkblotched.

Response: NMFS disagrees with the commenter. The harvest rate being implemented by this rule is the most conservative harvest rate for darkblotched rockfish since 2005. The T_{TARGET} adopted in this final rule does not maintain the status quo catch limits set based on faulty information in 2007–08, and it does not extend the 2009–10 harvest specifications invalidated by *NRDC* v. *Locke*. The T_{TARGET} being adopted for darkblotched is 2025, which corresponds to an SPR of 64.9 percent and an ACL of 298 mt. The SPR harvest rate associated with the invalidated darkblotched rockfish specifications was 62.1 percent with a T_{TARGET} equal to 2028. The final rule implements a T_{TARGET} of 2025, which is only 9 years longer than $T_{F=0}$, and is three years earlier than under the 2009–10 harvest specifications. Similarly, the SPR harvest rate is more conservative than the harvest rate under the 2009–10 harvest specifications. Although the ACL this rule implements is comparable to the OY during the beginning of the 2009–10 cycle, the rebuilding period is shorter and the harvest rate is reduced based on the 2009 stock assessment update and the revised rebuilding analyses, which are the best scientific information available at this time. In 2005, steepness (productivity) was estimated at 1.0, and was set at 0.95. In 2007, a good deal more age data was included in the assessment, largely as conditional age-at length compositions, and steepness was estimated (using the prior from Dorn's meta-analysis) at 0.6. That value of steepness was then fixed in the 2007 assessment and hence also used in the 2009 update. The SPR chosen following the 2005 rebuilding analysis, and applied in the 2007–08 harvest specifications (the 2007 SPR was 64.1 percent and the 2008 SPR was 60.7 percent), corresponded to a T_{TARGET} (median rebuilding year) of 2011, which was much earlier than for previous rebuilding analyses, due largely to the high value of steepness (and thus high productivity at low stock sizes) assumed in the 2005 assessment. Based on the 2007 rebuilding analysis, the darkblotched rockfish stock was projected to recover 19 years later (2030) than anticipated from the 2005 rebuilding analysis. This then lead to the adoption by the Pacific Council of a new T_{TARGET} equal to 2028 with an SPR of 62.1 percent. Accordingly, as mentioned above, the SPR of 64.9 percent being implemented by this rule is the most conservative harvest rate for darkblotched rockfish since 2005. Moreover, the percent of unfished darkblotched rockfish biomass continues to increase toward rebuilding.

Due to the complexity and interconnectivity of the Pacific groundfish fishery, the Council and NMFS follow an integrated or holistic approach to rebuilding because it would not be appropriate to develop rebuilding plans for each of the overfished species independent from the rebuilding plans for the others. The rebuilding groundfish species are correlated both biologically and economically. Changes to the OYs for any of the overfished species affect the time to rebuild for that species and the ability of fishermen to harvest other species of groundfish. In addition, changes in OYs for groundfish species have differing economic impacts on West Coast fishing communities. Setting a rebuilding strategy for one species requires the rebuilding strategy for the other rebuilding species be considered simultaneously. Utilizing this approach, it is reasonable to assume that integrated Alternative 1, which considered a T_{TARGET} of 2022 and ACLs of 222 mt in 2011 and 2012, would have similar biological and socio-economic impacts to the ACL of 200 mt suggested by the commenter. NMFS does not agree that fishing communities can accommodate an ACL closer to 200 mt than the ACL in the final rule without suffering severe adverse economic impacts. Darkblotched rockfish is currently taken in research fisheries, Tribal fisheries, limited entry trawl non-whiting fisheries, limited entry trawl whiting fisheries, and limited entry fixed-gear fisheries. Darkblotched rockfish are predominantly caught in bottom trawls operating on the outer continental shelf and slope north of 38° north latitude between 100 and 200 fm. Reductions in the darkblotched rockfish ACLs are highly limiting to the trawl fisheries because darkblotched rockfish co-occur with the most economically important species in the fishery such as slope rockfish, sablefish, Pacific whiting, shortspine and longspine thornyheads, and Dover sole. Under Alternative 1, trawl opportunities on the slope would be limited as the seaward RCA boundaries were moved deeper. The bottom trawl fisheries on the continental slope would be restricted year round to a seaward RCA boundary of 250 fm.

If the ACLs for overfished species are too low, it could undermine the success of the trawl rationalization program. Economic benefits to the IFQ fishery are expected to result from cost reductions and increased access to target species that arise from modifications in fishing behavior (overfished species avoidance). Individual accountability will put pressure on operators to fish in areas with lower encounter rates of constraining overfished species, and the ability to transfer catch privileges allows the fleet to consolidate to fewer, but more profitable vessels as the market directs quota in a manner that is more economically efficient. If the darkblotched rockfish ACL is too low (Alternative 1)—such that trawl fishers perceive slope target fisheries to be risky (high risk of exceeding the individual quota pounds) and the fishers limit their fishing participation for healthy target species—or if fishers hold quota pounds of constraining overfished for sale to other fishers who incur overages, they would not be able to develop new methods or strategies to avoid catching overfished species.

The recruitment pattern for darkblotched rockfish is similar to that of many rockfish species, with highly variable recruitment from year to year adding to the variability in catch accounting between years. In addition, the available ACL to the groundfish fishery is reduced by the projected catch of darkblotched in incidental open access fisheries and non-groundfish fisheries. As another commenter pointed out, the incidental catch in non-groundfish fisheries such as pink shrimp would be expected to increase as the darkblotched rockfish biomass increases, further constraining the groundfish fishery unless the ACL allowed for such a rebuilding paradox. NMFS believes that setting a T_{TARGET} that would result in a catch level no higher than 200 mt has the potential to result in short-term disastrous effects on already vulnerable communities.

As the darkblotched rockfish biomass increases, it will become increasingly more difficult to avoid as the stock rebuilds. Unlike the constant catch strategy suggested by the commenter, which increasingly restricts the fishery as rebuilding occurs and requires ever increasing management restrictions to avoid exceeding the ACL, the constant SPR strategy allows rebuilding to occur at an increasing rate without changing the T_{TARGET} and without drastic swings in management measures, which provides management stability to fisheries and communities and contributes to economic stability. The 2009 stock assessment indicates that darkblotched rockfish was at 18.1 percent of its unfished biomass in 2006 as compared to 27.5 percent in 2009, showing an increasing trend. The recruitment pattern for darkblotched rockfish is similar to that of many rockfish species, with highly variable recruitment from year to year. The most recent year of 2008 shows recruitment closer to those seen in 2003–2005 after very low recruitment in 2006 and 2007. Large year to year swings in recruitment affect the accuracy of catch projections. As discussed in the FEIS, catch models used for the trawl fishery, a catch model based on data from the fishery managed under a trip limit structure was used to project catch. Although it is the best available information, because the trawl fishery is now being managed as a rationalized fishery with IFQs for the non-whiting fisheries, catch projections based on fishing distribution under a trip limit structure affect the utility of the catch model for making projections. In sum, the shorter rebuilding period and more conservative harvest rate adopted in this final rule rebuild darkblotched rockfish in a time period as short as possible, taking into account the statutory factors of the MSA.

Comment 11: The rebuilding plan for Cowcod is inconsistent with the MSA. The estimated cowcod depletion rate in 2009 is 4.5 percent, slightly lower than the 4.6 percent rate estimated in the 2007 assessment, indicating that the cowcod population is failing to rebuild as projected, and may actually be in decline. It is possible to rebuild cowcod more quickly than the 2071 target proposed by Amendment 16–5, and NMFS does not address why a target rebuilding year 11 years later than the shortest possible is "as short as possible" pursuant to the requirements of the MSA. Overall groundfish fishery revenues have rebounded substantially since 2002. The updated community vulnerability analysis did not rate any fishing communities off the Southern U.S. west coast as vulnerable. Historic mortality data for cowcod (which are admittedly subject to high levels of uncertainty) indicate that actual total catch has varied between as low as .32 mt in 2003, 2.18 mt in 2004, 1.27 mt in 2005, and 1.18 mt in 2006. Therefore, it is reasonable to assume that a catch level of 3 mt for cowcod, which is projected to rebuild the species by 2068, would promote the conservation goals of the MSA and could be reasonably accommodated by affected fisheries and fishing communities. NMFS should adopt a target rebuilding date for cowcod that results in catch levels no higher than 3 mt per year.

Response: NMFS fully considered all public comment and other relevant information, and has determined that modifying the proposed rule to implement a shorter rebuilding period will not cause severe short-term economic consequences to communities. Therefore, a shorter rebuilding period for cowcod is more consistent with the requirements of the MSA. This final rule implements a rebuilding plan for cowcod with a T_{TARGET} of 2068, which corresponds to an SPR of 82.7 percent and an ACL of 3 mt. The T_{TARGET} of 2068 implemented by this rule is only 8 years longer than $T_{F=0}$. In contrast, the proposed rule included a cowcod rebuilding plan with a T_{TARGET} of 2071, which corresponds to an SPR of 79 percent and an ACL of 4 mt. The T_{TARGET} of 2071 in the proposed rule was eleven years longer than $T_{F=0}$.

The commentor is incorrect in stating that the cowcod population may be in decline. The cowcod stock shows a slow but increasing trend in stock biomass. Table ES–6 of the 2009 stock assessment presents a summary of recent trends in cowcod exploitation and stock levels from the base case model. The commenter is correct that the depletion level projected by the 2009 stock assessment is 4.5 percent, however, the 2009 stock assessment, which is the best available scientific information, revises the 2007 stock assessment results and indicates that the 2007 biomass was at 4 percent not 4.6 percent as the commenter indicated. Therefore, the best available scientific information available at this time indicates that Cowcod depletion rate is improving and the cowcod population is rebuilding.

Comment 12: The rebuilding plan for yelloweye is inconsistent with the MSA. NMFS' conclusion that rebuilding progress on yelloweye has been "moderate" is too optimistic. The 2009 rebuilding analysis indicates that yelloweye rebuilding is three years behind schedule under the status quo harvest rate. This is three years beyond the target year of 2084, which was invalidated in *NRDC* v. *Locke.* There is a wide range of possible harvest limits in the 37 year time span between $T_{F=0}$ and the proposed target year of 2084 that would rebuild yelloweye more quickly and still allow for bycatch. NMFS should adopt a target rebuilding date for yelloweye that results in catch levels between 14–17 mt per year.

Response: NMFS fully considered all public comment and other relevant information, and has determined that modifying the proposed rule to implement a shorter rebuilding period will not cause severe short-term economic consequences to communities. Therefore, a shorter rebuilding period for yelloweye rockfish is more consistent with the requirements of the MSA. The range of alternatives considered in the EIS for yelloweye was reasonable as further explained in the response to comments in the FEIS. This final rule implements a rebuilding plan for yelloweye rockfish with a T_{TARGET} of 2074, which corresponds to an SPR of 76 percent and an ACL of 17 mt. The T_{TARGET} of 2074 implemented by this rule is 10 years before the current T_{TARGET} and 27 years longer than TF=0. In contrast, the proposed rule included a yelloweye rockfish rebuilding plan with a T_{TARGET} of 2084, which corresponds to an SPR of 72.8 percent and an ACL of 20 mt. The T_{TARGET} of 2084 in the proposed rule was 37 years longer than TF=0. As discussed below, NMFS determined that an ACL lower than 17 mt would have a disastrous short-term effect on fishing communities.

NMFS disagrees with the commenter regarding the rebuilding progress of yelloweye rockfish. The 2009 stock assessment shows that yelloweye rockfish stock has shown an increasing trend in stock biomass during the rebuilding period, increasing from the estimated depletion level of 16.3 percent of the unfished biomass in 2002 to 20.3 percent in 2009. The median year of recovery in the absence of fishing (TF=0) was calculated by setting fishing mortality to zero in 2011, and is equal to 2047. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration (2000) is 2044 (revised downward slightly from 2046 in the 2007 analysis). Because T_{MIN} is only three years shorter than $T_{F=0}$ in 2011, it indicates that harvest rates during this eight-year period have been low enough to have had little effect on the stocks rebuilding trajectory.

Although $T_{TARGETS}$ corresponding to ACLs lower than 17 mt were considered, the impacts on the fisheries and communities were significantly greater. Small changes to yelloweye rockfish ACLs can have disproportionately large effects on the ability of fishers to harvest healthy stocks of groundfish, both when considered as part of the integrated approach, and when considered in isolation. For the recreational fisheries, a yelloweye ACL lower than 17 mt would result in northern California recreational seasons that are even shorter than the already extremely limited lengths (*e.g.*, three months in the Mendocino Management Area). This would include a one and a half month season in the Mendocino Management Area if the ACL were at 14 mt. Imposing further restrictions due to a lower ACL would cause the greatest negative economic impacts to communities north of Point Arena, particularly Fort Bragg and Shelter Cove. Under a 14 mt ACL the loss to California communities is equivalent to 170,000 fishing trips with an estimated revenue of 20 million dollars in expenditures associated with these trips (March 2011, Agenda Item H.2.c, CDFG Letter). Those dependent on the recreational fishery for their incomes would be the most affected, though the coastal community as a whole would suffer from the loss of expenditures by anglers. In the Oregon recreational fishery, an ACL (ACT) less than 17 mt would require shallower depth restrictions, decreased bag limits or full fishery closure, on the part of the state to prevent adjusted harvest guidelines from being exceeded. This would likely cause severe economic impacts to coastal Oregon communities, particularly Garibaldi and Gold Beach, which rely heavily on the recreational bottomfish and halibut fisheries. With an ACL under 17 mt, the Washington recreational management measures may need to be more restrictive. More restrictive management measures would negatively impact local communities that are dependent on sport fishing. Washington's recreational yelloweye impacts are also tied very closely to the halibut fishery. The affected communities are mostly remote areas that rely on the economic benefits created by recreational harvest opportunities.

In the commercial fisheries, yelloweye rockfish bycatch is also a concern for fixed gear longline vessels targeting sablefish north of 40°10′. The nearshore fishery in many communities serves primarily specialty "live-fish" markets. For example, the Brookings port group (southern Oregon) provides more live-fish landings than any other port group along the U.S. west coast. Because the fish buyers are different for this fishery than those for other commercial fisheries, severely restricting the fishery could influence the primary live-fish buyers in some of these specialized ports to leave, which could put an end to live-fish deliveries for these specialized fishing communities. Many of the affected ports lack the infrastructure to compensate for fish buyers leaving the area. The T_{TARGET} of 2074 and ACL of 17 mt implemented by this rule are projected to rebuild yelloweye rockfish a full decade sooner than the previous rebuilding time period, while avoiding severe short-term adverse economic impacts to fishing communities.

Comment 13: NMFS received 5 comments in support of the Council's final preferred yelloweye rockfish ACL of 20 mt and ACT of 17 mt. The comments in support were from the Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), California Department of Fish and Game (CDFG) and two comments from the public. These commenters also stated that setting a yelloweye ACL lower than 17 mt would add risk to communities that were unjustified by the conservation benefits associated with a lower ACL.

Response: For a detailed description of the basis for the final ACL value of 17 mt implemented in this rule refer to the previous comment above. The Council recommended a 20 mt ACL with an ACT of 17 mt for yelloweye. The Council recommended using an ACT to address the uncertainty in accurately monitoring recreational fishery catch inseason, and increase the likelihood that the total catch would be lower than the ACL. An ACL of 17 mt is specified in this rule. NMFS chose not to specify an ACT for yelloweye. This final rule implements an ACL for yelloweye that is 2.2 mt above the projected catch. The ACL value is based on the high end estimates of projected set aside amounts. Therefore NMFS believes that the 2.2 mt difference between the ACL and the projected catch means that an ACT is not necessary for yelloweye. Further, with the implementation of the Trawl Rationalization program NMFS will have better inseason monitoring and will be able to track catches relative to set aside allocations and close fisheries or take other appropriate action if fisheries are projected to attain their allocations. By specifying an ACL of 17 mt rather than an ACT, it is predicted that rebuilding will occur in 2074, ten years earlier than under the Council's FPA.

Comment 14: The rebuilding plan for canary rockfish is inconsistent with the MSA. The rebuilding plan for canary rockfish is six years behind schedule, according to the 2009 stock assessment. The new assessment shows a biomass depletion percentage of 23.7 percent instead of 32.4 percent seen just two years before. In addition, the cumulative OY from 2000–2007 (years with reliable catch data since rebuilding began) was exceeded by 14 percent. Rather than responding to new information that a species is doing worse than expected by lowering catch rates, NMFS again has indicated that it is willing to extend target rebuilding dates in order to maintain status quo catch levels. Therefore, maintenance of the status quo catch levels at the expense of a longer rebuilding period for canary is inconsistent with the MSA's mandate to rebuild in a period as short as possible. NMFS should adopt a target rebuilding date for canary rockfish that results in catch levels no higher than 44 mt per year.

Response: NFMS disagrees with the commenter. The T_{ARGET} being implemented by this rule is within 3 years of the shortest time possible ($T_{F=0}$ = 2024). NMFS believes that the rebuilding plan being adopted by this action is consistent with the MSA.

The latest assessment for canary rockfish demonstrates that the stock has been rebuilding since 2000. The commenter mischaracterizes the projected biomass depletion level from the 2009 stock assessment, which is the best available scientific information, relative to biomass depletion levels from the 2007 stock assessment. The reduction from 2007 is largely due to a revised historical catch time series for California. The new data resulted in the entire rebuilding trajectory (2000 forward) being slightly lower than previously projected. The commenter indicated that canary rockfish rebuilding is six years behind schedule. The change in our understanding of the rebuilding trajectory should not be interpreted as rebuilding having slowed, as this is not the case. Throughout the rebuilding period, the stock has continued to progress towards rebuilding. The overall lowering of the rebuilding trajectory throughout the entire rebuilding period means that it would take more time to reach the B40% (biomass level of 40 percent, which is used as a proxy for B_{MSY}) than was understood in 2007. The new assessment estimated the 2007 depletion level for canary rockfish to have been 21.7 percent (below the estimate of 32.4 percent for 2007 from the 2007 assessment with 95 percent confidence bounds of 24–41 percent) and the 2009 depletion level to have been 23.7 percent (95 percent confidence bounds of 17–30 percent). This action maintains the same SPR harvest rate that is in place under the No Action Alternative. Maintaining the same SPR harvest rate results in an ACL for 2011 that is lower than the than the 2010 OY because applying the same SPR harvest rate responds to changes in our understanding of the status of the stock. Because the rebuilding trajectory was modified, maintaining the current target year had to be modified despite the fact that the stock has continued to progress towards rebuilding.

As explained in the proposed rule and disclosed to the public in stock assessment documents, following the 1999 declaration that the canary rockfish stock was overfished the canary OY was reduced by over 70 percent in 2000 (to 200 mt) and by the same margin again from 2001 to 2003 (to 44 mt). In retrospect, revised catch data indicate that from 2003 to 2008, when the rebuilding OY was between 47 and 44 mt, the OY was exceeded 5 out of 6 years, although catches were well below the ABC. These catch estimates were done in retrospect using data that were not available during the season. Due to the methods used to derive the total mortality estimates, the catches made in retrospect were higher than estimates made during the season.

Canary rockfish are caught in all the major fishery sectors, including: Research fisheries, Washington, Oregon and California recreational fisheries, Tribal fisheries, limited entry non-whiting trawl fisheries, limited entry whiting trawl fisheries, limited entry fixed gear fisheries, open access directed groundfish fisheries, open access directed fisheries with incidental groundfish catch (California halibut, pink shrimp and salmon troll).

Due to the complexity and interconnectivity of the Pacific groundfish fishery, the Council and NMFS follow an integrated or holistic approach to rebuilding because it would not be appropriate to develop rebuilding plans for each of the overfished species independent from the rebuilding plans for the others. The rebuilding groundfish species are correlated both biologically and economically. Changes to the OYs for any of the overfished species affect the time to rebuild for that species and the ability of fishermen to harvest other species of groundfish. In addition, changes in OYs for groundfish species have differing economic impacts on West Coast fishing communities. Setting a rebuilding strategy for one species requires the rebuilding strategy for the other rebuilding species be considered simultaneously. Utilizing this approach, it is reasonable to assume that a 44 mt catch level would have similar biological and socio-economic impacts as considered under Alternative 1 in the FEIS. Alternative 1 considered a T_{TARGET} of 2025, which is one year longer than T_{MIN} and has an ACL of 49 mt in 2011 and 51 mt in 2012. Under Alternative 1, the canary rockfish ACL and associated apportionment to the non-nearshore fisheries is so low that the sablefish allocations would have to be reduced by as much as 42 percent. The California nearshore fishery would also be severely constrained, requiring statewide 20 fm (37 m) Shoreward RCA lines and large trip limit reductions or total closures for some species would be necessary. This is in contrast to status quo where the non-trawl RCAs are 20 fm (37 m) in most northern areas and 60 fm (110 m) south of 34°27′ north latitude. All recreational fisheries would experience reduced season lengths and restrictive depth restrictions. An ACL of 49 mt (Alternative 1) equates to a trawl allocation of 13.3 mt—62 percent less then what is available in 2010. This will affect both the non-whiting and whiting sectors negatively. The whiting sectors would likely have lower bycatch caps which could preclude them from attaining their whiting allocations. In addition, the trawl IFQ fishery is intended to provide long-term benefits to the fishery in the form of bycatch reduction and economic stability. Given the full catch accounting proposed under trawl IFQ program and that all catch, discarded and retained, will count towards the individuals IFQ shares, the risk of the fishery exceeding the ACL is reduced compared to 2010 and prior years. In the short term, fishers will need to learn how to avoid canary rather than simply discarding them at-sea. Economic benefits to the IFQ fishery are expected to result from cost reductions and increased access to target species that arise from modifications in fishing behavior (overfished species avoidance). Individual accountability will put pressure on operators to fish in areas with lower encounter rates of constraining overfished species, and the ability to transfer catch privileges allows the fleet to consolidate to fewer, but more profitable, vessels as the market directs quota in a manner that is more economically efficient. Lower ACLs for canary rockfish could result in trawl fishers perceiving target fisheries for healthy stocks to be risky (high risk of exceeding the individual quota pounds) and result in fishers limiting their fishing participation for healthy target species; or if fishers hold quota pounds of constraining overfished for sale to other fishers who incur overages, they would not be able to develop new methods or strategies to avoid catching overfished species. Reduced fishing time may result in fishers being unable to develop new methods or strategies to avoid overfished species. The long-term success of the trawl rationalization program to maintain low incidental catch of overfished species in conjunction with profitable harvest of healthy stocks is consistent with the needs of communities specified in section 4.5.3.2 of the PCGFMP.

Comment 15: Economic indicators show improvements in the economic health of the fishery, thus it should be possible to meet the MSA's conservation priorities by establishing shorter rebuilding periods and lower catch levels while accommodating the needs of fishing communities. Historic revenue data indicate that average ex-vessel revenues in the groundfish hook-and-line fishery have rebounded since hitting a low of just over $13 million in 2002. Annual ex-vessel revenues for the fishery averaged nearly $18 million between 2005–2009, reaching a new high of $22.8 million in 2009, which is almost 50% greater than average revenue in 1998 adjusted for inflation. After overall groundfish fishery revenues hit a low of $63.9 million in 2002 (concurrent with the disaster declaration in the fishery), they rebounded to significantly higher levels: After adjusting for inflation, average revenues for the groundfish fishery between 2005 and 2009 were slightly over $85 million. In 2008, revenues in the fishery exceeded $113 million dollars. Per-vessel revenues have rebounded as well. Due in part to the reduction in the trawl fleet resulting from the buyback program, per-vessel revenues are roughly 40% higher than they were in 1998 after adjusted for inflation.

Response: NMFS does not believe that restricting harvests to maintain revenues at or below historically low levels takes into account the needs of fishing communities. Communities may still be "surviving" but they are not thriving, and many fishing communities remain vulnerable to short-term adverse economic impacts associated with rebuilding periods shorter than those adopted by this rule. Small increases in revenues of some sectors will help prevent some of the more vulnerable communities from even further losses. Except for the open access sectors, all other sectors show a decline under NMFS' preferred alternative compared to the No-Action Alternative: Non-whiting trawl (−1.6%), limited entry fixed gear (−10.4%); and Tribal (−1.9%—including Tribal shoreside whiting). To provide different perspectives, revenues are analyzed at several levels. First, the total level groundfish of revenues, including those from non-whiting groundfish, shoreside whiting, and at-sea whiting, are provided to give the perspective of the total fishery. Second, groundfish revenues excluding estimates of at-sea whiting are analyzed to better focus the analysis on impacts to coastal communities, as most at-sea whiting revenues are associated with large Seattle-based companies. Finally, shoreside non-whiting groundfish revenues are analyzed alone because the shoreside non-whiting fishery is crucial to communities for its ability to provide a year-round supply of fish and "keep the lights on" so community processing facilities can take advantage of the income provided from sporadic pulse fisheries such as whiting, salmon, crab, and shrimp (Note that San Francisco is a "coastal community" that receives non-whiting groundfish).

According to the Regulatory Impact Review Analysis, the total groundfish fishery is projected to reach a level of $91 million compared to the No-Action Alternative of $82 million. All of this increase is due to the increase in whiting harvests. Under the no-action alternative, the whiting fishery (shoreside and at-sea) account for $22 million in ex-vessel revenues. With the increase in the whiting OY from 193,000 mt in 2010 to the 290,000 mt OY in 2011, whiting revenues in 2011 are projected to be $33 million. For the shoreside fisheries, including whiting, and coastal communities, shoreside ex-vessel revenues are expected to increase by 2.6%. If whiting is excluded, 2011 ex-vessel revenues flowing from shoreside fisheries to coastal communities are expected to decrease by 3.3%. Most of this decrease is associated with projected decreases in sablefish and petrale sole harvests.

Relative to the needs of communities, the commenter indicates that average (annual) ex-vessel revenues in the groundfish hook-and-line fishery (includes limited entry fixed gear, open access fixed gear, and Tribal fixed gear fisheries) have rebounded since hitting a low of just over $13 million in 2002. In 2011 and 2012 the sablefish ACL will decline from the 2010 level of approximately 7,700 mt to approximately 6,800 mt. Therefore, the annual ex-vessel revenues in the groundfish hook-and-line fishery are projected to decline. Revenues from hook and line gear fishing are just one source of revenue to a community. The major source of groundfish revenues to communities are those from trawlers. Over the years, hook and line revenues have been a growing source of revenue in light of declines in other groundfish fisheries, including trawl fisheries. During the 1998 to 2009 period, the commercial revenue from trawl gear (includes commercial and Tribal, at sea and shoreside trawlers) has varied from a low of $46 million (2009) to a high of $91 million (2008). In 1998, total groundfish revenues flowing to communities from all gear types was about $80 million, in 2002 $63 million, and in 2009, $74 million. The hook and line share of total revenues has increased from 18% in 1998, to 21% in 2002, and 31% in 2009, the lowest year for trawl revenues.

In light of conservation, management, and economic issues associated with overcapacity, three capacity reduction programs have been instituted since 2000. In 2001, Amendment 14 to the FMP added a fixed gear permit stacking program which has resulted in the consolidation of currently 164 sablefish endorsed permits on about 90 vessels. In 2003, a trawl vessel buyback program was implemented, resulting in the retirement of 91 vessels and associated groundfish limited entry permits in order to stabilize what had been declining per-vessel revenues and to reduce bycatch by the remaining vessels. Industry is currently paying back the $36 million loan associated with this program. In early 2011, implementation of a catch share program under Amendment 20 to the FMP began, changing management of portions of the trawl fishery from 2-month cumulative trip limits to individual fishing quota (IFQ) management. In addition to improving the profitability of the fishery while reducing capacity, the IFQ program is expected to reduce bycatch because of the increase in observer coverage to 100%, and placement of catch monitors at landing locations (typically at processing plants), and the use of electronic reporting will lead to better catch accounting and overall quota management of the fishery. Fishermen and processors are paying for these observers and catch monitors (although for the first three years these costs are being partially subsidized by NMFS based on available appropriations). The Council and NMFS are now developing a cost-recovery program where up to 3 percent of the trawl revenues may be assessed on the industry to partially recover the costs of administering the program.

All of these capacity reduction programs have yielded increased average revenues per vessel. However, even if average revenues per vessel or total revenues have increased, total industry and sector profit levels are likely to be declining especially in light of increases in fuel prices. For the Trawl Rationalization Program analysis, a shorebased non-whiting model was constructed based on the 2004 fishery. In 2004, the shorebased non-whiting trawl fishery generated about $21 million in groundfish ex-vessel revenues. But according to cost estimates, this fishery was at best breaking even or perhaps suffering a loss of up to $2 million. Since 2004, shorebased non-whiting trawl fisheries have increased their revenues to about $30 million in 2009 and estimated $27 million in 2010. The increase in shorebased revenues have come from increased landings of flatfish and sablefish and significant increases in sablefish ex-vessel prices. Sablefish now accounts for almost 40 percent of the trawl fleet's revenues.

Increases in revenues must be considered together with significant increases in fuel costs. Fuel costs now account for approximately 30 to 40 percent of the vessels' revenues. The average 2005–2009 revenues were about $27 million, or 29 percent greater than 2004. The average 2005–2009 fuel price was about $2.81 per gallon, 70% greater than that of 2004. Therefore, it appears that the profitability of the 2009 fishery may not be that much improved over that of 2004. In July of 2009, in Newport Oregon fuel prices were about $2.20 a gallon, in July of 2010, $2.50 a gallon and as of April 2011, about $3.75 per gallon.

While NMFS preferred alternative does result in projected shoreside revenue increases over status quo, these are increases from historically low levels of revenue. Healthy communities require profitable sectors. Profits concern revenues and costs. NMFS and the Council have received public comment that low levels of revenue since 1999 have resulted in numerous negative impacts to community infrastructure. Many communities have lost important infrastructure such as ice houses, fuel docks, and processing facilities during the last decade. Continued low levels of revenue will likely result in further losses of infrastructure. Although it is difficult to predict, at some point the losses of infrastructure and fishing opportunity result in a "tipping point" in which a community shifts from a fishing community to a non-fishing community. In addition, with decreased revenues, fishermen are not making needed repairs or improvements to fishing gear, resulting in potential safety issues and potentially reducing innovation in the fleet to reduce bycatch or impacts to habitat.

Several other non-groundfish factors also affect fishing communities. From a fisheries perspective, for the period from 2006 to 2010, except for 2007, the Secretary of Commerce has determined that a disaster under the MSA exists for a major portion of the coastal salmon fishery. From a macro-economic perspective, in 2009 and 2010, communities have been affected by the overall downturn in the economy and now in 2011 and beyond will be affected by the further consequences of the economy.

Comment 16: NMFS should reject changes to the reference points and 25–5 control rule for petrale sole and other assessed flatfish species, as the proposed changes are not adequately precautionary, fail to account for the ecological services rendered by these species, and are premature without a comprehensive management strategy evaluation.

Response: The specifications for flatfish in the proposed rule and in this final rule are based on a new proxy for Fmsy (F30%) recommended by the SSC and adopted by the Council. NMFS believes that the new flatfish proxy is based on the best available science and is consistent with the NS1 guidelines and the MSA. Following the 2009 scientific peer review of the petrale sole assessment by the Council's stock assessment review panel (STAR panel), the STAR panel prepared a report which recommended that the SSC review the estimates of FMSY produced by the petrale sole assessment and investigate alternatives to the proxies of F40%. The SSCs groundfish sub-committee further considered the proxies produced by the petrale sole assessment and recommended that a proxy for FMSY of F30% be established for all west coast flatfish (PFMC E.2.c Supplemental SSC Report September 2009; Agenda Item E.2.c Supplemental SSC PowerPoint, September 2009). The full SSC endorsed the groundfish subcommittee's recommendation to establish a new proxy of F30% for FMSY for flatfish (PFMC G.2.b Supplemental SSC Report, November 2009). This value was based on a number of considerations, including evaluation of information on flatfish productivity (steepness) for assessed west coast flatfish, published meta-analyses of other flatfish stocks, and recommendations on appropriate proxies for FMSY and BMSY in the scientific literature. The SSC however did not endorse the use of a species-specific estimate of FMSY for petrale sole because of high variability in the estimates between repeat assessments for other stocks and the sensitivity of the estimates to assumptions concerning stock structure.

The SSC also recommended and the Council adopted a new Bmsy proxy for flatfish—B25%. This recommendation was developed through the same process and with the same considerations described above (PFMC E.2.c Supplemental SSC Report September 2009). The commenters point to SSC comments recommending a more comprehensive analysis of the control rule proxies. However, this long-term recommendation did not change the SSC's ultimate recommendation that the new proxies be used for the 2011–2012 specifications cycle. The SSC's recommendations are the best available science at this time.

The SSC noted that the overfished threshold, or MSST, and default precautionary reduction policy, are policy decisions for the Council. However, the SSC suggested the options that the Council ultimately chose for both of these policy choices. The Council chose to set the MSST to 50 percent of B25% (B12.5%), based on advice of the SSC that this was the "lowest value recommended by the NS1 guidelines." (PFMC G.2.b, Supplemental SSC Report, November 2009). The 25–5 harvest control rule is intended to be the flatfish corollary to the 40–10 harvest control rule used for other groundfish species. The SSC's groundfish subcommittee suggested the 25–5 rule provided the same benefits as the 40–10 harvest control rule, but took into account the higher productivity of flatfish as compared to rockfish. (PFMC E.4.b, Supplemental SSC Report 2, March 2010).

The commenters suggest that these changes to the reference points and precautionary reduction policy for flatfish are not supported by sufficient analysis of their environmental consequences. They specifically identify the services rendered by flatfish in the California Current marine ecosystem. Ecosystem impacts of the integrated alternatives are described in the FEIS in section 4.1.5. However, available data and models limit NMFS' ability to assess the impacts of the alternatives in detail. The SSCs groundfish subcommittee recognized the need for a management strategy evaluation on harvest control rule proxies (PFMC E.2.c, Supplemental SSC report, September 2009) however, at this time an evaluation has not yet been conducted.

Comment 17: The rebuilding plans in the proposed rule implicitly adopt a Council-designed paradigm to set catch levels for overfished species that are inconsistent with the mandates of the MSA to rebuild overfished species "as quickly as possible" and with the Ninth Circuit's directive on how to do that while "taking into account the needs of fishing communities." NMFS and the Council appear to have substituted this legal directive with a rebuilding paradigm that continues to favor long-term economic yields at the expense of rebuilding as quickly as possible. The white paper submitted to NMFS at the September 2010 Council meeting articulates a rebuilding policy that prioritizes the economic goal of long-term cumulative yield over conservation, a view that is inconsistent with the MSA.

Response: The rebuilding plans implemented by this final rule are designed to rebuild overfished or depleted species as quickly as possible while taking into account the statutory factors of the MSA. Although NMFS considered all relevant factors, NMFS did not rely upon the white paper or any other rebuilding paradigm that prioritizes the economic goal of long-term cumulative yields over conservation as a basis for its final decision.

Comment 18: The rebuilding plan for petrale sole is inconsistent with the MSA. The 2011–2012 specifications allow for catch levels that exceed the 25–5 control rule and do not result in the quickest rebuilding time for this species.

Response: NMFS disagrees with commenters' assertion that the rebuilding plan for petrale sole is inconsistent with the MSA. All of the alternatives considered in the FEIS rebuild the stock within 10 years, as required by the MSA when the stock is biologically capable of doing so. The rebuilding plan adopted in this final rule is estimated to rebuild the stock by 2016, which is only 2 years longer than the estimated minimum time to rebuild (which in this case is equal to $T_{F=0}$). The Council's rebuilding strategy is to set the ACL equal to the ABC in 2011 and apply the 25–5 harvest control rule starting in 2012. This rebuilding strategy results in a rebuilding time period that is as short as possible while taking into consideration the important role of petrale sole in the groundfish fishery and the relatively high productivity of the stock.

Petrale sole is one of the primary target stocks in the non-whiting trawl fishery and is predominantly caught by that sector. No other sector currently targets petrale sole, although other sectors do incidentally catch petrale sole in relatively small amounts. For this reason, the Council chose to rebuild the petrale sole stock by constraining fishing opportunities for the non-whiting trawl sector. Specifications in this final rule rebuild the stock in as short a time as possible.

Comment 19: The harvest specifications for POP and widow rockfish appear inconsistent with the MSA mandate to rebuild overfished species in as short of a time as possible. NMFS chose to maintain the status quo harvest rate and catch limits for POP despite POP rebuilding being behind schedule according to the 2009 stock assessment. In addition, although widow rockfish appears close to being rebuilt, previous assessments predicted the stock would be rebuilt by 2009, indicating the stock is also behind schedule. Nonetheless, the proposed SPR harvest rate for widow rockfish is substantially increased.

Response: NMFS disagrees with the commenters. The T_{TARGET} for widow is 2010; the commenters incorrectly state that the species was to be rebuilt in

2009. Because of the delay in final catch impacts data, which will enable NMFS to declare the stock not overfished, the change in widow rockfish to a healthy stock can not officially occur until a later date. This ensures that NMFS uses the best available science in making its final determination that a stock is no longer overfished. This final rule implements an ACL of 600 mt, which is a modest increase from the No Action OY of 509 but is unlikely to result in targeting of the stock.

For POP, the ACL alternatives analyzed in the FEIS were based on the new stock assessment. Our current understanding of POP stock status and productivity shows that $T_{F=0}$ is longer than the current T_{TARGET}. Therefore, all the ACL alternatives analyzed in the FEIS contemplate a change in the median time to rebuild that is greater than the current T_{TARGET}. Because the current harvest policy will not rebuild the species by T_{TARGET} even in the absence of fishing, the rebuilding plan is modified through this final rule. The SSC did recommend modifying the rebuilding plan out of the necessity to extend the current T_{TARGET} based on our changed understanding of stock status and productivity. For the FPA, the Council proposed changing T_{TARGET} from 2017 to 2020 while maintaining the F86.4 percent SPR harvest rate. Although the same SPR harvest rate is being maintained for POP, the new T_{TARGET} of 2020 is only two years longer than $T_{F=0}$. In addition, maintaining the same SPR harvest rate results in an ACL for 2011 that is lower than the former 2010 OY because applying the same SPR harvest rate responds to changes in our understanding of the status of the stock. The Council also recommended specifying an ACT of 157 mt for POP in 2011 and 2012 under the FPA to further reduce fishing-related mortality. This revised rebuilding time is based on the best available science and rebuilds the stock in as short a time as possible. This rule implements an ACL and an ACT for POP. The ACT is discussed in detail in Comment 5 above.

Comment 20: The leeway NMFS has to extend T_{TARGET} beyond T_{MIN} is limited to the amount of fish necessary to prevent severe short-term hardship to fishing communities. Therefore, any T_{TARGET} longer than T_{MIN} must be specifically demonstrated as necessary to prevent this hardship. The rebuilding plans continue to place undue reliance on T_{MAX}. The Ninth Circuit decision in *NRDC* v. *NMFS* makes it clear that rebuilding plans can no longer be based on T_{MAX} but instead must be oriented around T_{MIN} in order to comply with the mandate to rebuild as quickly as possible.

Response: NMFS notes that the MSA requires that overfished stocks be rebuilt as quickly as possible, taking into account the status and biology of the overfished stock, the needs of fishing communities and the interaction of the overfished stock of fish within the marine ecosystem. NMFS believes that T_{MIN} is the starting point, and that it is important to assess the impacts on fishing communities of T_{MIN} (or $T_{F=0}$), and alternative levels above that amount in order to determine the appropriate rebuilding time period. The FMP, as amended by Amendment 16–4, is clear that the time to rebuild may be adjusted upward from T_{MIN} (the minimum time in which an overfished stock can rebuild to its target biomass) under certain circumstances, and as such, T_{MIN} is the starting point for considering appropriate time periods for rebuilding. See FMP section 4.5.2. Procedures for Calculating Rebuilding Parameters. T_{TARGET} is established based on the factors specified in MSA section 304(e)(4) with T_{MIN} and T_{MAX} serving as a starting point and reference point, respectively. The use of T_{MAX} as one rebuilding reference point is consistent with the NS1 Guidelines. However, the rebuilding plans implemented by the final rule are not "based on" T_{MAX}.

Bycatch Accounting, CCAs, Processing at Sea, EFP and Other Comments

Comment 21: The PFMC requested the yellowtail rockfish set aside for exempted fishing permit (EFP) activities be 10 mt for 2011, rather than the proposed 2 mt. This is because the EFP was approved in 2010, but all of the catch of yellowtail rockfish would occur in 2011.

Response: NMFS has made the appropriate changes to the EFP set aside amounts and addresses this issue in the Changes from the proposed rule section of this rule.

Comment 22: Bycatch accounting methods are insufficient to meet the MSA mandate to prevent overfishing, and 2011–2012 specifications and management measures do not include new measures to make bycatch accounting more timely and more accurate.

Response: The commenter does not specify additional management measures that might make bycatch accounting methods more timely and accurate, therefore it is difficult to respond to this comment. In the trawl fishery, new management measures being implemented as part of the trawl catch shares program are expected to improve bycatch accounting and include increased observation and monitoring as follows: One observer on every IFQ vessel and mothership catcher vessel; two observers on every at-sea processing vessel 125 ft and over; one observer on at-sea processing vessels under 125 ft; catch monitors at all IFQ first receivers; full catch accounting of retained and discarded catch; and real-time catch reporting through observer reports and electronic fish tickets. Together these monitoring measures are expected to result in significant improvements to the timeliness and accuracy of catch accounting in the trawl fisheries.

IFQs are expected to constrain the total catch mortality to a level within the trawl allocations. Full catch accounting and real time reporting in the shoreside IFQ program is expected to reduce management uncertainty relative to inseason catch accounting in the trawl fishery. Under an IFQ program there is a greater likelihood that the trawl fishery will stay within the trawl allocations. Given the full catch accounting under trawl IFQ program and that all catch, discarded and retained counts towards the individuals' IFQ shares, the risk of the fishery exceeding an ACL is further reduced compared to 2010 and prior years. Management of the bottom trawl fishery under the IFQ program is expected to reduce bycatch. This is because the pace of the fishery under IFQ is expected to slow such that fishers have time to use innovative techniques to avoid non-target species or reduce bycatch by increasing the utilization of non-target species.

Bycatch accounting in the non-trawl fisheries has significantly improved since implementation of the West Coast Groundfish Observer Program (WCGOP) in 2003. Total catch is modeled using the best available WGCOP data (see model descriptions in Appendix A of the FEIS). Unlike the trawl fisheries where every vessel in the fleet will be monitored in 2011 and 2012, vessels in the non-trawl fisheries are sub-sampled meaning that observers collect data from a portion of the vessels in the various non-trawl fisheries. The data collected by observers, in combination with data from state landing receipts (fish tickets), is used together to estimate bycatch. Although the availability of data to inform the understanding of discards in the non-trawl fisheries has significantly improved since 2003; neither the WCGOP observer data on catch discarded at sea nor the landed catch data reported on fish ticket data submitted to the states are available in realtime. The WCGOP for the non-trawl fisheries is a developing program that is continually being refined. Even as a developing program, NMFS believes that the bycatch accounting methods meet the MSA requirements.

Comment 23: NMFS received 13 letters from private citizens and fishing associations in support of provisions for allowing fishing within the CCA out to 30 fm and allowing the retention of shelf rockfish within the CCA. Many of the comments indicated that the analysis submitted by CDFG represented the best available science and indicates that when the CCAs were first established more area was closed than is necessary, as evidenced by the California commercial passenger fishing vessels (CPFV or California recreational charter) data showing one cowcod caught in 20–30 fm in the last 10 years. CDFG also supported these changes in its comment letter.

Response: Because cowcod are significantly depleted and the stock's productivity is extremely low, an extremely low incidental harvest rate is necessary to achieve rebuilding progress. Tenets of the cowcod rebuilding plan are to prohibit harvest in all fisheries and to close the primary habitats where cowcod are known to occur. Closure of the CCAs in the southern California Bight in 2001 effectively reduced harvest to very low levels; a strategy anticipated to work well for reducing adult cowcod mortality given their sedentary nature. Using the CCA closures to reduce fishing pressure in significant portions of known cowcod habitat addresses management uncertainty by reducing the likelihood that a management mistake would compromise rebuilding, even under data-poor management conditions. The FMP states that as new information become available on cowcod behavior and fisheries interactions with cowcod, the boundaries or related regulations concerning the current CCAs may change, and additional CCAs may be established by regulation. Recent submersible surveys have provided some information on cowcod distribution and indicate that juvenile cowcod occur over a wide range of habitat types, at depths between 28 and 180 fathoms and typically avoid soft sediment substrate, favoring hard substrate such as cobble and boulder fields or rock ridges (Love and Yoklavich, 2008). However, Love and Yaklovich (2008) also indicated that characterizing nursery habitat is important when evaluating survival and recruitment strength of juvenile cowcod and the subsequent persistence of local cowcod populations and that careful delineation of essential nursery habitats for young cowcod is especially critical when considering effective management strategies. There is little data currently available to understand fishery interactions and the distribution of cowcod as the stock rebuilds.

While the CDFG analysis indicated that modifying the depth restriction in the CCA is not projected to result in increased catch of adult cowcod, changes in the encounters of juvenile cowcod are unknown (recreational data does not currently report maturity status). The main conservation considerations pertain to how the proposed changes to depth restrictions will change fishing effort distribution such that changes in effort would result in increased encounters with cowcod (adult and juvenile) such that there is a risk of exceeding the ACL, or rebuilding being delayed (*i.e.,* reproductive potential affected by disturbing or losing nursery habitat). The CDFG analysis indicated that an increase in the depth restriction from 20 fm to 30 fm or 40 fm may not result in a significant increase in bycatch of adult (greater than 45 cm) cowcod in recreational fishery or appreciably increase the risk of the ACL being exceeded. However, NMFS believes that the uncertainty with the cowcod stock assessment and the general lack of information on fishery interactions warrant precaution. Because limited data are available and given the potential disturbance and loss of nursery areas that could have long-lasting effects on rebuilding, NMFS believes that new information on cowcod behavior and fishery interaction must be analyzed and considered in cooperation with the NMFS scientists and SSC prior to making changes in the existing CCAs. In addition, NMFS believes that the risks to the stock and further management measures to improve catch accounting relative to changes in the CCAs must be considered. This final rule does not include changes to the No Action CCA boundaries or retention allowances.

Comment 24: NMFS received a comment from a member of the public who participates in the limited entry trawl fishery requesting that the current regulations prohibiting processing at sea be changed to allow the commenter an exemption. This exemption was supported by ODFW in one of its comment letters on this action.

Response: NMFS understands the considerable expense of modifying a fishing vessel to process at sea, however, this issue was not considered within the EIS for the 2011–2012 management measures. Because modification of the regulations could result in changes in fishing practices, it is not appropriate to modify the regulations without an analysis that specifically considers the effects of allowing the expansion of processing at sea. Further, regulations prohibiting processing at sea were approved by the Council during its development of the Trawl Rationalization program. NMFS suggests that the commenter consider submitting a request for consideration by the Council for the 2013–2014 biennial management cycle.

Comment 26: There were several inaccuracies in the preamble of the proposed rule noted by CDFG and ODFW in their comment letters. They pertained to sector allocations in the preamble.

Response: NMFS has corrected these errors for the final rule.

Comment 27: NMFS received letters that did not contain statements that require a response but instead contained information that provided NMFS with more background information regarding the impacts of the alternatives considered.

Response: NMFS considered all the relevant information and comments received during the comment period and took that information into account when making its final decision.

Comment 28: NMFS should conduct stock assessments and set stock-specific catch limits for china, quillback and rougheye rockfish, which appear to be subject to overfishing according to recent analyses.

Response: The selection of species for stock assessment purposes is conducted through the Council's planning of the 2013–2014 Harvest Specifications. This process will begin at the September 2011 Council meeting. Comments regarding species that should have stock assessments are most appropriately submitted at that time.

Comment 29: NMFS received one comment from WDFW in support of NMFS decision not to remove dusky and dwarf red rockfish from the FMP at this time.

Response: NMFS agrees with the commenter and has disapproved the portion of Amendment 23 that would have removed dusky and dwarf red rockfish from the FMP.

Changes From the Proposed Rule

The November 3, 2010 (75 FR 67850) proposed rule contained incorrect amendatory instructions for the proposed changes to the harvest specification tables. The biennial harvest specifications, including OFLs, ACLs, HGs, allocations *etc.* are published in 50 CFR part 660, subpart C in tables 1a through 2d. Instruction 14a contained amendatory instructions that described the proposed changes, incorrectly, as "Tables 1a through 1c, subpart C, are proposed to be revised * * *." The instruction was incorrect and incomplete. This final rule includes all eight of the harvest specification tables, including: Table 1a, Table 1b, Table 1c, Table 1d, Table 2a, Table 2b, Table 2c and Table 2d to subpart C. The tables that are revised in this final rule are unchanged from the tables that published in the proposed rule, unless otherwise noted in the Changes from the Proposed Rule section. This final rule also adds Table 1.e., to subpart C, as depicted in the proposed rule.

In § 660.131 NMFS proposed to revise the term "end" and replace it with the term "closed" as a housekeeping measure. The proposed rule contained a mistake in the amendatory language, and listed the paragraphs to be revised as § 660.131(b)(4)(ii). The paragraph that was intended to be amended is actually § 660.131(b)(3)(ii). This final rule corrects that mistake in the amendatory language and makes the changes that were proposed, but in the correct paragraph.

CDFG informed NMFS that there was a mistake in a Council motion and the new boundary line that approximates the 40 fm depth contour inside the CCAs (around Santa Barbara Island, San Nicolas Island, Tanner Bank, and Cortes Bank) should not have been recommended to NMFS for implementation. CDFG requested that the latitude and longitude coordinates that were part of the proposed changes at § 660.71 paragraphs (s) through (v) be removed from the final rule, as they were not intended to be used for management of groundfish fisheries that occur within the CCA. Therefore, NMFS has removed the proposed additions at § 660.71 paragraphs (s) through (v), so that boundary lines approximating the 40 fm depth contour around Santa Barbara Island, San Nicolas Island, Tanner Bank, and Cortes Bank will not be defined in regulations at this time.

The November 3, 2010 proposed rule included changes for consistency with the new annual catch limit (ACL) framework that was added to the PCGFMP under Amendment 23. In § 660.140, two paragraphs were proposed to be revised to either replace or augment the term "OY" with the new terminology that has been added to the PCGFMP and in other sections of the groundfish regulations. The paragraphs at § 660.140 were revised in a December 15, 2010 final rule (75 FR 78344) that implemented the final program components for the IFQ fishery. This final rule modifies the revised paragraphs (a)(3) and (c)(1), as they appear in the codified regulations, by adding language that is consistent with what was in the proposed rule to reflect the new ACL and ACT terminology.

The proposed rule included a 499 mt set-aside deduction from the proposed 2011 yellowtail rockfish ACL of 4,364 mt. This resulted in a proposed harvest guideline of 3,865 mt for 2011. The Council sent a letter to NMFS on December 1, 2010 recommending that NMFS increase the set-aside for EFP catch from 2 mt to 10 mt to allow the Oregon Recreational Fishing Alliance (RFA) to prosecute their EFP in 2011. The Oregon RFA will be fishing under an EFP to catch underutilized yellowtail rockfish while keeping bycatch of overfished species low. A 2 mt set aside for EFPs in 2011 was initially recommended when the Oregon RFA project was anticipated to be concluded before the start of 2011. However, issuance of the EFP by NMFS later in 2010 than was anticipated resulted in a continuation in EFP activities into 2011. Therefore, NMFS is increasing the set-aside for yellowtail rockfish from 499 mt to 507 mt to allow the Oregon RFA EFP for yellowtail rockfish to be prosecuted in 2011. The slightly lower 2011 fishery harvest guideline of 3,857 mt for yellowtail rockfish is shown in Table 1.a and Table 1.b, to subpart C.

This final rule also refines the fishery harvest guidelines that are shown in Table 1a and Table 1b, subpart C, for POP and petrale sole. The calculation and deductions from the ACL are unchanged, but the fishery harvest guideline is modified to show one decimal place. As a result, the fishery harvest guideline in these tables for petrale sole is 910.6 mt instead of 911 mt, and the fishery harvest guideline for POP is 144.2 mt instead of 144 mt.

Footnote "n/" to Table 1a, subpart C was corrected so that the coastwide OFL of 1,802 mt for starry flounder was correctly referenced to be for the year 2011 and not for 2010. Changes to footnote "o/" to Table 1a, subpart C and footnote "o/" to Table 2a, subpart C were added to clarify that all species within the "other flatfish" complex are all category 3 stocks and that the 2011 ACL and 2012 ACL are both equivalent to the 2010 OY for that species complex. Clarifying text is added to footnote "hh/" of Table 1a, subpart C to state that the 2011 ACL is equivalent to the 2010 OY for longnose skate. Edits are also made to footnote "ii/" of Table 1a, subpart C and to footnote "ii/" of Table 2a, subpart C, to clarify that the ABC for the "other fish" complex is a 31 percent reduction from the OFL (σ=1.44/ P^*=0.40) because all of the stocks in the complex are category 3 species.

Clarifying text is also added to footnote "ii/" of Table 1a, subpart C and to footnote "ii/" of Table 2a, subpart C, to state that 2011 ACL and 2012 ACL are both equivalent to the 2010 OY for the "other fish" complex, and that the fishery HG is equal to the ACL. Clarifying language is added in footnotes "b/" through "e/" to Table 1b, subpart C, such that the descriptions of the allocations to the three sectors of the whiting fisheries are clearly articulated and contain cross-references to pertinent shorebased IFQ fishery regulations at § 660.140, subpart D.

Table 1d and Table 2d, subpart C, are corrected to specify that there is a formal allocation of Pacific whiting to the at-sea whiting fishery. References are added to Table 1d and Table 2d, subpart C, to the pertinent regulations in Table 1b, subpart C and Table 2b, subpart C, respectively.

This rule publishes boundaries for the non-trawl commercial fisheries as well as cumulative limits for the limited entry fixed gear and opens access fisheries. Table 2 (North) and 2 (South), to subpart E and Table 3 (North) and 3 (South), to subpart F in this final rule are identical to those tables that published in the proposed rule, except for the trip limits for sablefish. Since the trip limits for sablefish that were published in the proposed rule were developed, the most recent fishery information indicates that changes to sablefish trip limits are warranted. On March 1, 2011, NMFS reduced sablefish trip limits in the open access fishery coastwide and increased or restructured trip limits for sablefish in the limited entry fixed gear fishery coastwide, through the remainder of the year. This action was consistent with the Council's recommendations from its November 2010 meeting, and was based on the most recently available fishery information. At its March 2011 meeting, the Council considered the most recent fishery information and recommended a reduction in the bi-monthly cumulative limits for sablefish in the limited entry fixed gear fishery in the area north of 36° N. latitude. The recommended reduction was in response to an error in the calculation of sablefish landings discovered over the winter. The error affected the landings estimates that the Council has been using for establishing the cumulative limits in the limited entry sablefish daily trip limit fishery. This resulted in cumulative limits in this fishery that were too high, because catch of sablefish was being underestimated. Therefore, NMFS is reducing the bi-monthly cumulative limits for sablefish in the limited entry fixed gear fishery in the area north of 36° N. latitude. in this rule.

There are many instances throughout 50 CFR part 660, subparts C through G where the tables in the regulations at 50 CFR part 660, subpart C that contain the biennial harvest specifications are referred to as "tables 1a through 2d". Generally, Tables 1a through 1d, subpart C, would contain harvest specifications for the first year of the biennium. In this case, those tables would contain the 2011 harvest specifications. Generally, Table 2a through 2d, subpart C, would contain the harvest specifications for the second year of the biennium and beyond. In this case those tables would contain the 2012 and beyond harvest specifications. Two of the harvest specification tables that published in the proposed rule collapsed each year's harvest specifications into a single table. By doing this, it left no content for the 2012 tables, at Table 2c and 2d, to subpart C. This created an inconsistency with the cross-references that are systemic throughout the groundfish regulations at 50 CFR part 660, subparts C through G. To maintain the integrity of the cross-references, and to maintain the split of annual harvest specifications into two sets of tables (one set for the first year of the biennium, and one set for the second year of the biennium, and beyond) this final rule removes the 2012 harvest specifications from Table 1c and Table 1d, subpart C, and re-publishes those 2012 harvest specifications, unchanged, in Tables 2c and 2d, subpart C.

As described in the preamble to the proposed rule, this final rule does not implement a single value for harvest specifications for Pacific whiting, but describes a range of harvest levels that were considered for 2011 and 2012. In Tables 1a and 1b, and Tables 2a and 2b, subpart C, the proposed rule announced Pacific whiting harvest specifications as "TBA" or "to be announced". To clarify that the range of harvest specifications is what are implemented in this final rule, "TBA" has been removed from these tables and has been replaced with a reference to the range of harvest specifications.

In the preamble of the proposed rule, NMFS described how two options for the trawl RCA and trawl trip limits were proposed. One option was proposed in the event that rationalization was delayed and the fishery was managed with trip limits (proposed Table 1a (North) and Table 1a (South) to subpart D). The other option was proposed for the rationalized fishery (proposed Table 1b (North) and Table 1b (South) to subpart D). Due to the delay in final implementation of the biennial specifications and management measures, the tables that included the RCA boundaries and trip limits during 2010 would remain in place until superseded. So, on December 30, 2010 Table 1b (North) and Table 1b (South) to subpart D from the proposed rule were redesignated as Table 1 (North) and Table 1 (South) to subpart D and were implemented in an emergency rule. NMFS implemented these tables (Table 1b (North) and Table 1b (South) to subpart D from the proposed rule) so that fishing in the rationalized groundfish fishery could begin in January 2011 under appropriate RCA structures and with appropriate landing allowances for non-IFQ species that are set forth in those tables. This final rule supersedes the tables set forth in that December 30, 2010 emergency rule with very similar tables, which will be in effect for 2011 and beyond (see Table 1 (North) and Table 1 (South) to subpart D).

This rule publishes Table 1 (North) and Table 1 (South) to subpart D, which has identical trawl RCA boundaries and landing allowances for non-IFQ species as Table 1b (North) and Table 1b (South) to subpart D that published in the proposed rule. However, a grammatical correction is made to the introductory text of each table to clarify that these tables describe the RCA boundaries that apply to vessels that are using groundfish trawl gear. A further clarification is also made to both tables by adding language to the introductory text to cite regulations regarding gear switching and which RCA applies to vessels operating under gear switching provisions at § 660.140, subpart D. Technical corrections to the numbering of footnotes to these tables are also made.

Related to the redesignation of Table 1 (North) and Table 1 (South) to subpart D, regulatory text at § 660.60(g) and (h)(1) do not need to be revised as proposed. This is because the current regulatory text correctly references Table 1 (North) and Table 1 (South) to subpart D. This rule keeps those tables with their current designations, and therefore the proposed changes to cross-references at § 660.60(g) and (h)(1) are no longer necessary.

The Tribal sablefish allocations for the area north of 36° N. latitude. that were proposed for 2011 and 2012 were 552 mt and 535 mt per year, respectively (§ 660.50(f)(2)(ii)). These were calculated by taking 10 percent of the ACL, for 2011 and 2012, respectively, for the area North of 36° N. latitude. and then reducing that amount by 1.5 percent for estimated discard mortality. The December 30, 2010 emergency rule (75 FR 82296) implemented an interim sablefish Tribal allocation of 543 mt. That amount was calculated by taking 10 percent of the 2011 ACL for the area North of 36° N. latitude. and then reducing that amount by 1.6 percent for estimated discard mortality. The 1.6 percent was the amount deducted for discard mortality in regulations for 2010, and therefore that is what was used in the emergency rule. This final rule implements the Tribal allocations that were announced in the November 3, 2010 (75 FR 67850) proposed rule, and were calculated using the proposed 1.5 percent deduction for discard mortality. This final rule also makes a grammatical correction by adding the acronym "ACL" in the description that was in the proposed rule. This grammatical correction is needed so that the allocation is correctly described as 10 percent of the Monterey through Vancouver area ACL.

The proposed changes to § 660.140(c)(1) removed the term "OYs" and replaced it with "ACLs or ACTs" and made additional clarifying changes to surrounding text. The proposed clarifications to surrounding text were confusing. Therefore, the final rule simply removes the term "OYs" and replaces it with "ACLs or ACTs" with no further changes to the existing regulatory text at § 660.140(c)(1).

The December 30, 2010 emergency rule (75 FR 82296) implemented interim changes to §§ 660.60 and 660.130 to remove obsolete language about trip limits in the trawl fishery because that emergency rule removed trip limits for IFQ species. This final rule makes the removal of trip limits for IFQ species permanent, consistent with the proposed rule (see above regarding Table 1 (North) and Table 1 (South)). This final rule makes additional regulatory changes to what was in the proposed rule, which are a natural extension of the removal of trip limits in the proposed rule. This final rule keeps the obsolete language out of the regulations at §§ 660.60 and 660.130, consistent with the emergency rule. NMFS acknowledges that some obsolete language regarding trip limits, crossover provisions, and varying trip limits based on the gear type that is used will remain in regulations. NMFS intends to issue a follow-up rulemaking that will remove or revise outdated language.

The December 30, 2010 emergency rule (75 FR 82296) implemented interim shorebased trawl allocations for the start of the 2011 trawl fishery at § 660.140. The interim allocations allowed quota pounds for IFQ species to be available at the start of the 2011 fishery, but before the final 2011 harvest specifications were implemented. This final rule adds new regulations, from what was in the proposed rule. The new regulations implement the allocation structure that is articulated in § 660.55 and are, therefore, a natural extension of the trawl allocations that published in the proposed rule. This final rule updates the initial shorebased trawl allocations that published in the emergency rule, with the final 2011 shorebased trawl allocations. The final shorebased trawl allocations are increasing for the following species: sablefish south of 36° N. latitude.; splitnose rockfish south of 40°10′ N. latitude.; Dover sole; english sole; arrowtooth flounder; starry flounder; petrale sole; cowcod south of 40°10′ N. latitude.; yelloweye rockfish; POP and widow rockfish. Specifically, the yelloweye rockfish shorebased trawl allocation is increasing from 0.3 mt to 0.6 mt consistent with the Council's recommendations associated with a 17 mt harvest level, and the cowcod shorebased trawl allocation is increasing from 1.3 mt to 1.8 mt consistent with the Council's recommendations regarding the trawl and non-trawl allocations for cowcod south of 40°10′ N. latitude.

This final rule publishes 2011 harvest specifications for overfished groundfish species in Tables 1a, 1b, 1c and 1e that are identical to the proposed harvest specifications for all of the groundfish species except cowcod and yelloweye rockfish. Therefore, the cowcod and yelloweye rockfish ACLs in Table 1a to subpart C are lower in this final rule than those from the proposed rule. Footnotes z/for cowcod and bb/for yelloweye rockfish to Table 1a and have also been modified for consistency with the changes in Table 1a. Also, the cowcod fishery HG in Table 1b has been modified for consistency with the changes in Table 1a.

NMFS is implementing changes to the overfished species rebuilding plans. However, final 2012 ACLs, ACTs, and fishery HGs in for the overfished species will be contingent upon potential changes to the FMP with regard to the rebuilding plans for the overfished species. Therefore, the proposed 2012 harvest specifications for overfished species are not implemented in this final rule. ACLs, ACTs and fishery HGs for overfished species, in Table 2a and Table 2b, subpart C, are equal to the 2011 values.

NMFS is implementing changes to the status determination criteria and harvest control rules for flatfish. However, final 2012 OFLs, ABCs, ACLs, ACTs and fishery HGs, for flatfish species will be contingent upon potential changes to the FMP with regard to status determination criteria and harvest control rules for flatfish. Therefore, the proposed 2012 harvest specifications for flatfish are not implemented in this final rule. Assessed flatfish, OFLs, ABCs, ACLs, ACTs and fishery HGs, in Table 2a and Table 2b, subpart C, are equal to the 2011 values.

NMFS is disapproving the Council-recommended changes to depth restrictions and groundfish retention regulations for vessels fishing within the CCAs. Therefore, this final rule does not implement the proposed changes to recreational fishing restrictions that modified the depth restrictions within the CCAs or that allowed retention of shelf rockfish within the fishing areas that are open in the CCAs. Regulations at § 660.360(c)(3)(i)(A)(*5*) and (c)(3)(i)(B) keep the depth restrictions and species retention regulations within the CCAs for the California recreational fishery the same as those that were in place in 2009 and 2010: Fishing for minor nearshore rockfish, cabezon, kelp greenling, lingcod, California scorpionfish and "other flatfish" is permitted within the CCAs, shoreward of the 20 fm (37 m) depth contour when the season for those species is open south of 34°27′ N. latitude. Also, as part of NMFS' disapproval of changes to the depth restrictions for vessels fishing within the CCAs, the latitude and longitude points that were proposed to define the 30 fm depth contour inside the CCAs (around Santa Barbara Island, San Nicolas Island, Tanner Bank, and Cortes Bank) are not included in this final rule. Therefore, NMFS has removed the proposed additions at § 660.71, paragraphs (k) through (n), so that boundary lines approximating the 30 fm depth contour around Santa Barbara Island, San Nicolas Island, Tanner Bank, and Cortes Bank will not be defined in regulations at this time.

NMFS is disapproving the Council's recommendation to remove dusky rockfish (*Sebastes ciliatus*) and dwarf-red rockfish (*Sebastes rufianus*) from the FMP as discussed above in the response to Comment 29. As a result of this disapproval, this final rule does not implement the proposed changes to the definition of "Groundfish" in paragraphs (7), (7)(ii)(A) and (7)(ii)(B) to § 660.11, subpart C.

Classification

The Administrator, Northwest Region, NMFS, determined that FMP Amendment 23 and the 2011 groundfish harvest specifications and management measures, which this final rule implements, are necessary for the conservation and management of the pacific coast groundfish fishery and that it is consistent with the Magnuson-Stevens Fishery Conservation and Management Act and other applicable laws.

As described in the preamble to the December 30, 2010 emergency rule and as discussed above in Background, there was not adequate time, given the complexity of the rulemaking and associated documentation and other work, to have this final rule effective by January 1, 2011. Therefore, most of the 2010 specifications and management measures remained in place for the January-April cumulative limit periods, except that an emergency rule made interim changes to allow the start of the rationalized trawl fishery and routine adjustments to fishery management measures, within the scope of the 2009–2010 regulations, were made. At the time NMFS anticipated that this final rule would implement the 2011–2012 biennial specifications and management measures beginning on April 29, 2011. NMFS is under court order to establish rebuilding plans by April 29, 2011 for the overfished species. The 2011–2012 groundfish harvest specifications and management measures are intended to rebuild overfished stocks as quickly as possible, taking into account the appropriate factors. NMFS utilizes the most recently available fishery information, scientific information, and stock assessments, to implement specifications and management measures biennially. Generally these management measures are implemented on January 1 of odd numbered years. The 2011–2012 specifications and management measures were developed using the most recently available information and therefore reflect the current status of the stock being managed.

NMFS finds good cause to waive the 30-day delay in effectiveness pursuant to 5 U.S.C. 553(d)(3), so that this final rule may become effective on May 11, 2011. Leaving the 2010 harvest specifications and management measures in place could cause harm to some stocks because those management measures are not based on the most current scientific information, or they could cause drastic management changes later in the year to prevent exceeding some lower 2011 harvest specifications once they are implemented. For example, the cowcod rockfish ACL is lower in 2011 than it was in 2010 and is taken in commercial and recreational fisheries north of Cape Mendocino, California. Therefore, if higher than anticipated catch of cowcod occurs, changes to management measures that could reduce incidental catch of cowcod could be delayed because of the higher harvest level that is in place. This could increase the risk of exceeding the lower 2011 ACL or causing more severe closures later in the year for fisheries that take cowcod incidentally. Also, for some species, leaving 2010 harvest specifications in place could unnecessarily delay fishing opportunities until later in the year, as this final rule will increase the catch limits for several species for 2011. Thus, a delay in effectiveness could ultimately cause economic harm to the fishing industry and associated fishing communities. These reasons constitute good cause under authority contained in 5 U.S.C. 553(d)(3), to establish an effective date less than 30 days after date of publication.

NMFS prepared a final environmental impact statement for Amendments 16–5 and 23 and the 2011–2012 harvest specifications and management measures. A notice of availability was published on March 11, 2011 (76 FR 13401). FMP amendment 23 was approved on December 23, 2010. NMFS issued a ROD identifying the selected alternative. A copy of the ROD is available from NMFS (see **ADDRESSES**).

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

A final regulatory flexibility analysis (FRFA) was prepared. The FRFA incorporates the IRFA, a summary of the significant issues raised by the public comments in response to the IRFA, and NMFS responses to those comments, and a summary of the analyses completed to support the action. A copy of the FRFA is available from NMFS (see **ADDRESSES**) and a summary of the FRFA, per the requirements of 5 U.S.C. 604(a), follows: Amendment 23 and the biennial harvest specifications and management measures are intended to respond to court orders in *NRDC* v. *Locke* and to implement a groundfish management scheme for the 2011–2012 groundfish fisheries. During the comment period on the proposed rule, NMFS received 35 letters of comment, but none of the comments received addressed the IRFA, although one letter directly or indirectly addressed the economic effects of the rule, as discussed above in the response to Comment 10, Comment 12 Comment 15 and Comment 17. The FRFA compares all the alternatives by discussing the impacts of each alternative on commercial vessels, buyers and processors, recreational charter vessels, seafood consumers, recreational anglers, non-consumptive users, non-users, and enforcement. Based on analyses discussed in Chapter 4 of the FEIS, the following summary is based on the Council's RIR/IRFA with the focus on the NMFS preferred alternative that will be implemented by this action. In terms of expected harvests, ex-vessel values, and recreational trips, there are no differences between the Council's FPA and the NMFS preferred alternative, relative to the IRFA/FRFA.

The overall economic impact of NMFS' preferred alternative is that many sectors are expected to achieve social and economic benefits similar to those under the current regulations, or the No Action alternative. The combined total ex-vessel revenues associated with the NMFS preferred alternative including at sea whiting is $90 million, compared with the No-Action level of $82 million. On a coastwide basis, excluding at-sea whiting, commercial ex-vessel revenues for the non-Tribal and Tribal groundfish sectors are estimated to be approximately $70 million per year under NMFS' preferred alternative compared with approximately $68 million under No Action, and the number of recreational bottom fish trips is estimated to be 646 thousand under NMFS' preferred alternative compared with 609 thousand under No Action. However, there are differences in the distribution of ex-vessel revenue and angler trips on a regional basis and on a sector-by-sector basis. These changes are driven by changes in the forecast abundance for target species and overfished species. The major changes to major commercial species target species are associated with Pacific whiting, Dover Sole, petrale sole and sablefish. Compared to the No-Action Alternative, Pacific whiting harvests are expected to increase by 50 percent and Dover sole by 25 percent while sablefish harvests are expected to decrease by 10 percent and petrale sole harvests by 23 percent. With the exception of the Pacific whiting and nearshore open access sectors, all other non-Tribal commercial fisheries sectors are expected to achieve lower levels of ex-vessel revenues than under No Action. The limited entry fixed gear sector shows the greatest projected decline (−10 percent) in revenue as a result of the sablefish ACL decrease. The Pacific whiting fishery at-sea sector (including Tribal) revenues are expected to increase by 51 percent and the shoreside whiting trawl (excluding Tribal) revenues are expected to increase by 33 percent. Ex-vessel revenues in both the non-whiting trawl (excluding Tribal) and the Tribal shoreside fisheries (trawl and fixed, including whiting) are both expected to decrease by about 2 percent.

A variety of time/area closures applicable to commercial vessels have been implemented in recent years. The most extensive of these are the RCAs, which have been in place since 2002 to prohibit vessels from fishing in depths where overfished groundfish species are more abundant. Different RCA configurations apply to the limited entry trawl sector and the limited entry fixed gear and open access sectors. In addition, the depth ranges covered can vary by latitudinal zone and time period. The alternatives vary somewhat in terms of the extent of RCAs. In addition to the RCAs, two CCAs have been in place since 1999 in the Southern California Bight to reduce bycatch of the overfished cowcod stock and yelloweye conservation areas have been established off the Washington Coast to reduce bycatch of the overfished yelloweye rockfish stock. The NMFS preferred alternative for the limited entry non-whiting trawl fleet generates slightly lower ex-vessel revenue on a coastwide basis when compared to revenues under the current regulations or No Action alternative. This is primarily driven by a decrease in the abundance of sablefish and petrale sole as opposed to changes in status of constraining species. Area-based management for the limited entry non-whiting trawl fleet under the NMFS preferred alternative will be comparable to what was in place in 2009 and 2010—the area north of Cape Alava, Washington and shoreward of the trawl RCA will remain closed in order to protect overfished rockfish species. Given the decreased amount of fishable area in northern Washington since 2009, higher costs for fishery participants from increases in fuel required to travel to and fish at those deeper depths would remain.

The fixed gear sablefish sector will generate lower revenue under NMFS' preferred alternative than No Action because the sablefish ACL has decreased. However, the fixed gear fleet will have somewhat more area available than under No Action, because fishing will be open at depths deeper than 100 fm (183 m) north of 40°10′ north latitude whereas under No Action, depths between 100 fm (183 m) and 125 fm (229 m) were only open on days when the Pacific halibut fishery was open. Fixed gear fisheries south of 36° north latitude will see sablefish harvest close to status quo levels. There are no recommended changes to area management relative to status quo.

Under NMFS' preferred alternative, the nearshore groundfish fishery is expected to have a moderate increase in ex-vessel revenues compared with No Action due to increased targeting opportunities for black rockfish (between 42° north latitude and 40°10′ north latitude) and cabezon south (south of 42° north latitude). Fishing areas open to the nearshore fleets will be roughly the same as under No Action. Fishing opportunity and economic impacts to the nearshore groundfish sector are largely driven by the need to protect canary and especially yelloweye rockfish.

Excluding whiting, the NMFS preferred alternative is projected to provide the west coast economy with slightly lower ex-vessel revenues than was generated by the fishery under No Action—a 3 percent decrease. However, effects on buyers and processors along the coast will vary depending on location. In addition, NMFS' preferred alternative attempts to take into account the desire expressed by buyers and processors to have a year round groundfish fishery. Individual quota management for trawl fisheries should help accommodate this preference; however in practice in the absence of trip limits it is somewhat uncertain how trawl landings will be distributed in time and space.

In terms of recreational angler effort, the number of angler trips under NMFS preferred alternative is slightly higher compared to No Action, but somewhat less than in 2009. However, an increase in angler effort under NMFS preferred alternative is occurring primarily in south and central California, while northern Washington shows a slight increase and Oregon shows no change compared with No Action. It is expected that under the proposed 2011–2012 management measures, Tribal groundfish fisheries will generate less revenue and personal income than under No Action due to a reduction in sablefish harvest.

The 2011–2012 period will be the first groundfish management cycle in which the shoreside trawl sector fisheries would be conducted under the Amendment 20 trawl rationalization program, including issuance and tracking of individual fishing quotas (IFQ) for most trawl-caught groundfish species. IFQ management is designed to provide opportunities for fisherman and processors to maximize the value of their fishery by creating incentives to make the optimum use of available target and bycatch species. Since all trawl trips will be observed, catch of constraining overfished species will be monitored in real time, and individuals will be held directly responsible for "covering" all catch of groundfish species with IFQ. Since IFQ for constraining, overfished species represents a real cost in terms of money and/or fishing opportunity, it is expected that fishers will take extraordinary steps to avoid unnecessary catch of these species. At the same time there is uncertainty about how individuals will be able to manage the individual risk inherent in a system based on personal responsibility. This issue may present a considerable challenge, especially to small businesses that have access to only a single limited entry trawl permit. Exhausting all readily available supplies of IFQ for a particularly constraining species, such as yelloweye, may result in the business being effectively shut down for the remainder of the season. Partly for this reason it is expected that over time the number of vessels and permits engaging in the limited entry trawl fishery will decline as fishers strive to consolidate available IFQ onto a smaller number of vessels in order to reduce the costs of harvesting the quotas. A smaller number of active vessels will mean reductions in the number of crew hired and in expenditures made in local ports for materials, equipment, supplies and vessel maintenance. As such, while wages and profits for those crew and vessel owners that do remain in the fishery should increase, the amount and distribution of ex-vessel revenues and community income will change in ways that are not yet foreseeable, but probably to the detriment of some businesses and communities currently involved in the groundfish trawl fishery. Due to these types of countervailing uncertainties, impacts on trawl fisheries under the 2011–2012 management measures used in this analysis were estimated using a model designed to project overfished species bycatch levels under a status quo cumulative trip limit management regime. Likewise, the model used to estimate community income impacts was calibrated based on recently estimated spending patterns for regional vessels and processors. While providing a useful starting point for comparing gross-level effects under the alternatives, the true range of economic impacts achievable under the rationalized, IFQ-managed fishery may reflect a considerable departure from these estimates.

The FRFA analysis includes a discussion of small businesses. This final rule will regulate businesses that harvest groundfish. According to the Small Business Administration, a small commercial harvesting business is one that has annual receipts under $4.0 million and a small charter boat business is one that has annual receipts under $7 million. The FRFA estimates that implementation of NMFS preferred alternative will affect about 2,600 small entities. These small entities are those that are directly regulated by this final rule that is being promulgated to support implementation of NMFS preferred alternative. These entities are associated with those vessels that either target groundfish or harvest groundfish as bycatch. Consequently, these are the vessels, other than catcher-processors, that participate in the limited entry portion of the fishery, the open access fishery, the charter boat fleet, and the Tribal fleets. Catcher/processors also operate in the Alaska pollock fishery, and all are associated with larger companies such as Trident and American Seafoods. Therefore, it is assumed that all catcher/processors are "large" entities. Best estimates of the limited entry groundfish fleet are taken from the NMFS Limited Entry Permits Office. As of June 2010, there are 399 limited entry permits including 177 endorsed for trawl (172 trawl only, 4 trawl and longline, and 1 trawl and trap-pot); 199 endorsed for longline (191 longline only, 4 longline and trap-pot, and 4 trawl and longline); 32 endorsed for trap-pot (27 trap-pot only, 4 longline and trap-pot, and 1 trawl and trap-pot). Of the longline and trap-pot permits, 164 are sablefish endorsed. Of these endorsements 130 are "stacked" (*e.g.* more than one permit registered to a single vessel) on 50 vessels. Ten of the limited entry trawl endorsed permits are used or owned by catcher/processor companies associated with the whiting fishery. The remaining 389 entities are assumed to be small businesses based on a review of sector revenues and average revenues per entity. The open access or nearshore fleet, depending on the year and level of participation, is estimated to be about 1,300 to 1,600 vessels. Again, these are assumed to be "small entities." The Tribal fleet includes about 53 vessels, and the charter boat fleet includes 525 vessels that are also assumed to be "small entities."

NMFS preferred alternative represents efforts to address the directions provided by the Ninth Circuit Court of Appeals, which emphasizes the need to rebuild stocks in as short a time as possible, taking into account: (1) The status and biology of the stocks, (2) the needs of fishing communities, and (3) interactions of depleted stocks within the marine ecosystem. By taking into account the "needs of fishing communities" NMFS was also simultaneously taking into account the "needs of small businesses" as fishing communities rely on small businesses as a source of economic activity and income. Therefore, it may be useful to review whether the Council's three-meeting process for selecting the FPA can be seen as means of trying to mitigate impacts of the proposed rule on small entities. The FEIS and RIR/IRFA include analysis of a range of alternatives that were considered by the Council, including analysis of the effects of setting allowable harvest levels necessary to rebuild the seven groundfish species that were previously declared overfished. An eighth species, petrale sole, was declared overfished in 2010 and the final action includes a new rebuilding plan for this species along with the ACLs and management measures consistent with the adopted rebuilding plan. Associated rebuilding analyses for all eight species estimate the time to rebuild under various levels of harvest.

The Council initially considered a wider range of alternatives, but ultimately rejected from further analysis alternatives allowing harvest levels higher than what is generally consistent with current policies for rebuilding overfished stocks and a "no fishing" scenario (F=0). Section 2.4 of the FEIS describes six integrated alternatives including No Action, the Council's FPA, the NMFS preferred alternative, and three other alternatives (including the Council's Preliminary Preferred Alternative, which is similar to the Council's FPA). NMFS finds that the F=0 and Alternatives 1A, 1B, and 2, while resulting in shorter rebuilding times for most of the overfished species, lead to projected major decreases in commercial revenues and recreational activity. Allowing too many communities to suffer commercial or recreational losses greater than 10 percent fails to take into account the needs of fishing communities. Alternative 3, the Council FPA, and NMFS preferred alternative all reduce the impacts to communities to less than 10 percent, but they differ in their impacts on rebuilding times. Alternative 3 reduces rebuilding times from status quo for many of the overfished species, but does not reduce the rebuilding time for yelloweye rockfish, and results in only minor reductions for cowcod and darkblotched and rockfish. The Council's FPA improves upon Alternative 3 by reducing the rebuilding time for darkblotched rockfish by two years while maintaining Alternative 3's small positive increases in commercial revenues and recreational activity. The NMFS preferred alternative improves over the Council FPA by further reducing the rebuilding times of cowcod and yelloweye by three years and ten years, respectively. Comparison of the action alternatives with the No Action alternative allows an evaluation of the economic implications to groundfish sectors, ports, and fishing communities; and the interaction of depleted species within the marine ecosystem of reducing ACLs for overfished species to rebuild stocks faster than they would under the rebuilding strategies that NMFS adopted and has modified consistent with new, scientific information on the status and biology of these stocks.

Alternative 2011–2012 groundfish management measures are designed to provide opportunities to harvest healthy, target species within the constraints of alternative ACLs for overfished species. The integrated alternatives allow estimation of target species catch under the suite of ACLs for overfished species both to demonstrate if target species ACLs are projected to be exceeded and to estimate related socioeconomic impacts.

The Council reviewed these analyses and read and heard testimony from Council advisors, fishing industry representatives, representatives from non-governmental organizations, and the general public before deciding the Council's FPA in June 2010. The Council's final preferred management measures are intended to stay within all the final recommended harvest levels for groundfish species decided by the Council at their April and June 2010 meetings. NMFS reviewed these analyses, read and heard testimony from Council advisors, fishing industry representatives, representatives from non-governmental organizations, the general public, and considered legal obligations to comply with a court order (*NRDC* v. *Locke*) before deciding NMFS' preferred alternative in February 2011. The NMFS preferred management measures are intended to stay within all the final recommended harvest levels for groundfish species that were part of the NMFS preferred alternative.

There are no additional projected reporting, record-keeping, and other compliance requirements of this rule not already envisioned within the scope of current requirements. References to collections-of-information made in this action are intended to properly cite those collections in Federal regulations, and not to alter their effect in any way.

No Federal rules have been identified that duplicate, overlap, or conflict with this action.

NMFS issued Biological Opinions under the Endangered Species Act (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 Pacific Coast groundfish FMP fisheries 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). These biological opinions concluded that implementation of the FMP for the Pacific Coast groundfish fishery was 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.

NMFS reinitiated a formal section 7 consultation under the ESA in 2005 for both the Pacific whiting midwater trawl fishery and the groundfish bottom trawl fishery. The December 19, 1999, Biological Opinion had defined an 11,000 Chinook incidental take threshold for the Pacific whiting fishery. During the 2005 Pacific whiting season, the 11,000 fish Chinook incidental take threshold was exceeded, triggering reinitiation. Also in 2005, new data from the West Coast Groundfish Observer Program became available, allowing NMFS to complete an analysis of salmon take in the bottom trawl fishery.

NMFS prepared a Supplemental Biological Opinion dated March 11, 2006, which addressed salmon take in both the Pacific whiting midwater trawl and groundfish bottom trawl fisheries. In its 2006 Supplemental Biological Opinion, NMFS concluded that catch rates of salmon in the 2005 whiting fishery were consistent with expectations considered during prior consultations. Chinook bycatch has averaged about 7,300 fish over the last 15 years and has only occasionally exceeded the reinitiation trigger of 11,000 fish.

Since 1999, annual Chinook bycatch has averaged about 8,450 fish. The Chinook ESUs most likely affected by the whiting fishery have generally improved in status since the 1999 section 7 consultation. Although these species remain at risk, as indicated by their ESA listing, NMFS concluded that the higher observed bycatch in 2005 does not require a reconsideration of its prior "no jeopardy" conclusion with respect to the fishery. For the groundfish bottom trawl fishery, NMFS concluded that incidental take in the groundfish fisheries is within the overall limits articulated in the Incidental Take Statement of the 1999 Biological Opinion. The groundfish bottom trawl limit from that opinion was 9,000 fish annually. NMFS will continue to monitor and collect data to analyze take levels. NMFS also reaffirmed its prior determination that implementation of the Groundfish FMP is not likely to jeopardize the continued existence of any of the affected ESUs.

Lower Columbia River coho (70 FR 37160, June 28, 2005) were recently listed and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead.

The Southern Distinct Population Segment (DPS) of green sturgeon was listed as threatened under the ESA (71 FR 17757, April 7, 2006). The southern DPS of Pacific eulachon was listed as threatened on March 18, 2010, under the ESA (75 FR 13012). NMFS has reinitiated consultation on the fishery, including impacts on green sturgeon, eulachon, marine mammals, and turtles. After reviewing the available information, NMFS has concluded that, consistent with Sections 7(a)(2) and 7(d) of the ESA, the action would not jeopardize any listed species, would not adversely modify any designated critical habitat, and would not result in any irreversible or irretrievable commitment of resources that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures.

Pursuant to Executive Order 13175, this final rule was developed after meaningful consultation and collaboration with Tribal officials from the area covered by the FMP. Under the Magnuson-Stevens Act at 16 U.S.C. 1852(b)(5), one of the voting members of the Pacific Council must be a representative of an Indian Tribe with Federally recognized fishing rights from the area of the Council's jurisdiction. In addition, regulations implementing the FMP establish a procedure by which the Tribes with treaty fishing rights in the area covered by the FMP request new allocations or regulations specific to the Tribes, in writing, before the first of the two meetings at which the Council considers groundfish management measures. The regulations at 50 CFR 660.50(d)(2) further state "the Secretary will develop Tribal allocations and regulations under this paragraph in consultation with the affected Tribe(s) and, insofar as possible, with Tribal consensus." The Tribal management measures in this final rule have been developed following these procedures.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, and Indian Fisheries.

Dated: April 28, 2011.

Samuel D. Rauch III,

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

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

PART 660—FISHERIES OFF WEST COAST STATES

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

Authority: 16 U.S.C. 1801 *et seq.*, 16 U.S.C. 773 *et seq.*, and 16 U.S.C. 7001 *et seq.*

Subpart C—West Coast Groundfish Fisheries

■ 2. In § 660.11,
■ a. Add definitions of "Acceptable Biological Catch", "Annual Catch Limit", "Annual Catch Target", and "Overfishing limit" in alphabetical order.
■ b. Revise the definition of "Fishery harvest guideline".
■ c. In the definition for "Groundfish", revise paragraph (9).
■ d. In the definition of "North-South management area" redesignate paragraphs (2)(xvii) through (xxii) as (2)(xviii) through (xxiii).
■ e. In the definition of "North-South management area", add paragraph (2)(xvii).

§ 660.11 General definitions.

* * * * *

Acceptable Biological Catch (ABC) means a harvest specification that is set below the overfishing limit to account for scientific uncertainty in the estimate of OFL, and other scientific uncertainty.

* * * * *

Annual Catch Limit (ACL) is a harvest specification set equal to or below the ABC threshold in consideration of conservation objectives, socioeconomic concerns, management uncertainty and other factors. The ACL is a harvest limit that includes all sources of fishing-related mortality including landings, discard mortality, research catches, and catches in exempted fishing permit activities. Sector-specific annual catch limits can be specified, especially in cases where a sector has a formal, long-term allocation of the harvestable surplus of a stock or stock complex.

Annual Catch Target (ACT) is a management target set below the annual catch limit and may be used as an accountability measure in cases where there is great uncertainty in inseason catch monitoring to ensure against exceeding an annual catch limit. Since the annual catch target is a target and not a limit it can be used in lieu of harvest guidelines or strategically to accomplish other management objectives. Sector-specific annual catch targets can also be specified to accomplish management objectives.

* * * * *

Fishery harvest guideline means the harvest guideline or quota after subtracting from the ACL or ACT when specified, any allocation for the Pacific Coast treaty Indian Tribes, projected research catch, deductions for fishing mortality in non-groundfish fisheries, as necessary, and set-asides for EFPs.

* * * * *

Groundfish * * *

(9) "Other fish": Where regulations of subparts C through G of this part refer to landings limits for "other fish," those limits apply to all groundfish listed here in paragraphs (1) through (8) of this definition except for the following: Those groundfish species specifically listed in Tables 1a and 2a of this subpart with an OFL for that area (generally north and/or south of 40°10′ N. lat.); spiny dogfish coastwide. "Other fish" may include all sharks (except spiny dogfish), skates (except longnose skate), ratfish, morids, grenadiers, and kelp greenling listed in this section, as well as cabezon in waters off Washington.

* * * * *

North-South management area * * *

(2) * * *

(xvii) Cape Vizcaino, CA—39°44.00′ N. lat.

* * * * *

Overfishing limit (OFL) is the MSY harvest level or the annual abundance of exploitable biomass of a stock or stock complex multiplied by the maximum fishing mortality threshold or proxy thereof and is an estimate of the catch level above which overfishing is occurring.

* * * * *

■ 3. In § 660.12 revise paragraph (a)(8) to read as follows:

§ 660.12 General groundfish prohibitions.

* * * * *

(a) * * *

(8) Fail to sort, prior to the first weighing after offloading, those groundfish species or species groups for which there is a trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACT, ACL or OY, if the vessel fished or landed in an area during a time when such trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACT, ACL or OY applied; except as specified at § 660.131, subpart C for vessels participating in the Pacific whiting at-sea sectors.

* * * * *

■ 4. In § 660.30, paragraphs (a)(2)(iv) and (a)(6) are revised to read as follows:

§ 660.30 Compensation with fish for collecting resource information—EFPs.

* * * * *

(a) * * *

(2) * * *

(iv) The year in which the compensation fish would be deducted from the ACL or ACT before determining the fishery harvest guideline or commercial harvest guideline.

* * * * *

(6) *Accounting for the compensation catch.* As part of the harvest specifications process, as described at § 660.60, subpart C, NMFS will advise the Council of the amount of fish authorized to be retained under a compensation EFP, which then will be deducted from the next harvest specifications (ACLs or ACTs) set by the Council. Fish authorized in an EFP too late in the year to be deducted from the following year's ACLs or ACTs will be accounted for in the next management cycle where it is practicable to do so.

* * * * *

■ 5. Revise § 660.40 to read as follows:

§ 660.40 Overfished species rebuilding plans.

For each overfished groundfish stock with an approved rebuilding plan, this section contains the standards to be used to establish annual or biennial ACLs, specifically the target date for rebuilding the stock to its MSY level and the harvest control rule to be used to rebuild the stock. The harvest control rule is expressed as a "Spawning Potential Ratio" or "SPR" harvest rate.

(a) *Bocaccio.* The target year for rebuilding the bocaccio stock south of 40°10′ N. latitude to B_{MSY} is 2022. The harvest control rule to be used to rebuild the southern bocaccio stock is an annual SPR harvest rate of 77.7 percent.

(b) *Canary rockfish.* The target year for rebuilding the canary rockfish stock to B_{MSY} is 2027. The harvest control rule to be used to rebuild the canary rockfish stock is an annual SPR harvest rate of 88.7 percent.

(c) *Cowcod.* The target year for rebuilding the cowcod stock south of 40°10′ N. latitude to B_{MSY} is 2068. The harvest control rule to be used to rebuild the cowcod stock is an annual SPR harvest rate of 82.7 percent.

(d) *Darkblotched rockfish.* The target year for rebuilding the darkblotched rockfish stock to B_{MSY} is 2025. The harvest control rule to be used to rebuild the darkblotched rockfish stock is an annual SPR harvest rate of 64.9 percent.

(e) *Pacific Ocean Perch (POP).* The target year for rebuilding the POP stock to B_{MSY} is 2020. The harvest control rule to be used to rebuild the POP stock is an annual SPR harvest rate of 86.4 percent.

(f) *Petrale Sole.* The target year for rebuilding the petrale sole stock to B_{MSY} is 2016. The harvest control rule is to set the ACL equal to the ABC, which corresponds to an annual SPR harvest rate of 31 percent in 2011.

(g) *Widow rockfish.* The target year for rebuilding the widow rockfish stock to B_{MSY} is 2010. The harvest control rule is a constant catch of 600 mt, which corresponds to an annual SPR harvest rate of 91.7 percent in 2011.

(h) *Yelloweye rockfish.* The target year for rebuilding the yelloweye rockfish stock to BMSY is 2074. The harvest control rule to be used to rebuild the yelloweye rockfish stock is an annual SPR harvest rate of 76.0 percent.

■ 6. In § 660.50, paragraphs (f)(2)(i) and (ii), (f)(4), (g)(2), and (g)(7) are revised to read as follows:

§ 660.50 Pacific Coast treaty Indian fisheries.

* * * * *

(f) * * *

(2) * * *

(i) The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

(ii) The Tribal allocation is 552 mt in 2011 and 535 in 2012 per year. This allocation is, for each year, 10 percent of the Monterey through Vancouver area (North of 36° N. lat.) ACL. The Tribal allocation is reduced by 1.5 percent for estimated discard mortality.

* * * * *

(4) *Pacific whiting.* The Tribal allocation for 2010 is 49,939 mt. The Tribal allocations for will be announced each year following the Council's March meeting when the final specifications for Pacific whiting are announced.

* * * * *

(g) * * *

(2) *Thornyheads.* The Tribes will manage their fisheries to the following limits for shortspine and longspine thornyheads. The limits would be accumulated across vessels into a cumulative fleetwide harvest target for the year. The limits available to individual fishermen will then be adjusted inseason to stay within the overall harvest target as well as estimated impacts to overfished species. The annual following limits apply:

(i) Shortspine thornyhead cumulative trip limits are 17,000-lb (7,711-kg) per 2 months.

(ii) Longspine thornyhead cumulative trip limits are 22,000-lb (9,979-kg) per 2 months.

* * * * *

(7) *Flatfish and other fish.* Treaty fishing vessels using bottom trawl gear are subject to the following limits: For Dover sole, English sole, other flatfish 110,000 lbs (49,895 kg) per 2 months; and for arrowtooth flounder 150,000 lbs (68,039 kg) per 2 months. The Dover sole and arrowtooth limits in place at the beginning of the season will be combined across periods and the fleet to create a cumulative harvest target. The limits available to individual vessels will then be adjusted inseason to stay within the overall harvest target as well as estimated impacts to overfished species. For petrale sole, treaty fishing vessels are restricted to a 50,000 lb (22,680 kg) per 2 months limit for the entire year. Trawl vessels are restricted to using small footrope trawl gear.

* * * * *

■ 7. In § 660.55, paragraphs (a), (b) introductory text, (f)(1)(ii), and (k) are revised to read as follows:

§ 660.55 Allocations.

* * * * *

(a) *General.* An allocation is the apportionment of a harvest privilege for a specific purpose, to a particular person, group of persons, or fishery sector. The opportunity to harvest Pacific Coast groundfish is allocated among participants in the fishery when the ACLs for a given year are established in the biennial harvest specifications. For any stock that has been declared overfished, any formal allocation may be temporarily revised for the duration of the rebuilding period. For certain species, primarily trawl-dominant species, beginning with the 2011–2012 biennial specifications process, separate allocations for the trawl and nontrawl fishery (which for this purpose includes limited entry fixed gear, directed open access, and recreational fisheries) will be established biennially or annually using the standards and procedures described in Chapter 6 of the PCGFMP. Chapter 6 of the PCGFMP provides the allocation structure and percentages for species allocated between the trawl and nontrawl fisheries. Also, separate allocations for the limited entry and open access fisheries may be established using the procedures described in Chapters 6 and 11 of the PCGFMP and this subpart. Allocation of sablefish north of 36° N. lat. is described in paragraph (h) of this section and in the PCGFMP. Allocation of Pacific whiting is described in paragraph (i) of this section and in the PCGFMP. Allocation of black rockfish is described in paragraph (l) of this section. Allocation of Pacific halibut bycatch is described in paragraph (m) of this section. Allocations not specified in the PCGFMP are established in regulation through the biennial harvest specifications and are listed in Tables 1 a through d and Tables 2 a through d of this subpart.

(b) *Fishery harvest guidelines and reductions made prior to fishery allocations.* Beginning with the 2011–2012 biennial specifications process and prior to the setting of fishery allocations, the ACL or ACT when specified is reduced by the Pacific Coast treaty Indian Tribal harvest (allocations, set-asides, and estimated harvest under regulations at § 660.50); projected scientific research catch of all groundfish species, estimates of fishing mortality in non-groundfish fisheries and, as necessary, set-asides for EFPs. The remaining amount after these deductions is the fishery harvest guideline or quota. (note: recreational estimates are not deducted here).

* * * * *

(f) * * *

(1) * * *

(ii) *Catch accounting for the nontrawl allocation.* All groundfish caught by a vessel not registered to a limited entry permit and not fishing in the non-groundfish fishery will be counted against the nontrawl allocation. All groundfish caught by a vessel registered to a limited entry permit when the fishery for a vessel's limited entry permit has closed or they are not declared in to a limited entry fishery, will be counted against the nontrawl allocation, unless they are declared in to a non-groundfish fishery. Catch by vessels fishing in the non-groundfish fishery, as defined at § 660.11, will be accounted for in the estimated mortality in the non-groundfish fishery that is deducted from the ACL or ACT when specified.

* * * * *

(k) *Exempted fishing permit set-asides.* Annual set-asides for EFPs described at § 660.60(f), will be deducted from the ACL or ACT when specified. Set-aside amounts will be adjusted through the biennial harvest specifications and management measures process.

* * * * *

■ 8. In § 660.60 paragraph (c)(1)(i) introductory text is revised to read as follows:

§ 660.60 Specifications and management measures.

* * * * *

(c) * * *

(1) * * *

(i) Trip landing and frequency limits, size limits, all gear. Trip landing and frequency limits have been designated as routine for the following species or species groups: widow rockfish, canary rockfish, yellowtail rockfish, Pacific ocean perch, yelloweye rockfish, black rockfish, blue rockfish, splitnose rockfish, chilipepper rockfish, bocaccio, cowcod, 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, longspine thornyheads; petrale sole, rex sole, arrowtooth flounder, Pacific sanddabs, and the other flatfish complex, which is composed of those species plus any other flatfish species listed at § 660.11, subpart C; Pacific whiting; lingcod; Pacific cod; spiny dogfish; cabezon in Oregon and California and "other fish" as a complex consisting of all groundfish species listed at § 660.11, subpart C and not otherwise listed as a distinct species or species group. Specific to the IFQ fishery, sub-limits or aggregate limits may be specified for the following species: longnose skate, big skate, California skate, California scorpionfish, leopard shark, soupfin shark, finescale codling, Pacific rattail (grenadier), ratfish, kelp greenling, shortbelly, and cabezon in Washington. Size limits have been designated as routine for sablefish and lingcod. Trip landing and frequency limits and size limits for species with those limits designated as routine may be imposed or adjusted on a biennial or more frequent basis for the purpose of keeping landings within the harvest levels announced by NMFS, and for the other purposes given in paragraphs (c)(1)(i)(A) and (B) of this section.

* * * * *

■ 9. Section 660.65 is revised to read as follows:

§ 660.65 Groundfish harvest specifications.

Harvest specifications include OFLs, ABCs, and the designation of OYs and ACLs. Management measures necessary to keep catch within the ACL include ACTs, harvest guidelines (HGs), or quotas for species that need individual management, and the allocation of fishery HGs between the trawl and nontrawl segments of the fishery, and the allocation of commercial HGs between the open access and limited entry segments of the fishery. These specifications include fish caught in state ocean waters (0–3 nm offshore) as well as fish caught in the EEZ (3–200 nm offshore). Harvest specifications are provided in Tables 1a through 2d of this subpart.

■ 10. Section 660.71 is amended as follows:

■ a. Remove paragraph (e)(78),

■ b. Redesignate paragraphs (e)(79) through (e)(333) as (e)(78) through (e)(332) respectively.

■ c. Revise paragraphs (k)(149) and (150), redesignate paragraphs (k)(151) through (212) as (k)(153) through (214), add new paragraphs (k)(151) and (152) to read as follows:

§ 660.71 Latitude/longitude coordinates defining the 10 fm (18 m) through 40 fm (73 m) depth contours.

* * * * *

(k) * * *

* * * * *

(149) 36°18.40′ N. lat., 121°57.93′ W. long.;

(150) 36°16.80′ N. lat., 121°59.97′ W. long.;

(151) 36°15.00′ N. lat., 121°55.95′ W. long.;

(152) 36°15.00′ N. lat., 121°54.41′ W. long.;

* * * * *

■ 11. Section 660.72 is amended as follows:

■ a. Remove and reserve paragraphs (f)(143) through (f)(144), and remove paragraph (f)(198),

■ b. Redesignate paragraphs (a)(122) through (a)(195) as (a)(127) through (a)(200), paragraphs (f)(145) through (f)(197) as (f)(146) through (f)(198), paragraphs (j)(16) through (j)(254) as (j)(18) through (j)(256), and paragraphs (j)(4) through (j)(15) as (j)(5) through (j)(16),

■ c. Revise paragraphs (a)(121), newly designated (a)(193), (b), (f)(140) through (f)(142), and newly designated (j)(183) through (j)(185).

■ d. Add paragraphs (a)(122) to (a)(126), add and reserve paragraph (a)(145), and add paragraphs (j)(4), and (j)(17), to read as follows:

§ 660.72 Latitude/longitude coordinates defining the 50 fm (91 m) through 75 fm (137 m) depth contours.

* * * * *

(a) * * *

(121) 36°18.40′ N. lat., 121°58.97′ W. long.;

(122) 36°18.40′ N. lat., 122°00.35′ W. long.;

(123) 36°16.02′ N. lat., 122°00.35′ W. long.;

(124) 36°15.00′ N. lat., 121°58.53′ W. long.;

(125) 36°15.00′ N. lat., 121°56.53′ W. long.;

(126) 36°14.79′ N. lat., 121°54.41′ W. long.;

* * * * *

(193) 32°55.35′ N. lat., 117°18.65′ W. long.;

* * * * *

(b) The 50-fm (91-m) depth contour around the Swiftsure Bank and along the U.S. border with Canada is defined by straight lines connecting all of the following points in the order stated:

(1) 48°30.15′ N. lat., 124°56.12′ W. long.;

(2) 48°28.29′ N. lat., 124°56.30′ W. long.;

(3) 48°29.23′ N. lat., 124°53.63′ W. long.;

(4) 48°30.31′ N. lat., 124°51.73′ W. long.;

and connecting back to 48°30.15′ N. lat., 124°56.12′ W. long.

* * * * *

(f) * * *

(140) 36°16.80′ N. lat., 122°01.76′ W. long.;

(141) 36°14.33′ N. lat., 121°57.80′ W. long.;

(142) 36°14.67′ N. lat., 121°54.41′ W. long.;

* * * * *

(j) * * *

(4) 48°10.00′ N. lat., 125°27.99′ W. long.;

* * * * *

(17) 48°10.00′ N. lat., 125°20.19′ W. long.;

* * * * *

(183) 36°17.49′ N. lat., 122°03.08′ W. long.;

(184) 36°14.21′ N. lat., 121°57.80′ W. long.;

(185) 36°14.53′ N. lat., 121°54.99′ W. long.;

* * * * *

■ 12. Section 660.73 is amended as follows:

■ a. Remove paragraphs (a)(118) through (a)(120), (a)(156), (d)(134), (d)(180), (h)(157) and (h)(158),

■ b. Redesignate paragraphs (a)(3) through (a)(16) as (a)(4) through (a)(17), paragraphs (a)(17) through (a)(117) as (a)(19) through (a)(119), paragraphs (a)(121) through (a)(155) as (a)(128) through (a)(162), paragraphs (a)(157) through (a)(307) as (a)(165) through (a)(315), paragraphs (d)(135) through (d)(179) as (d)(138) through (d)(182), paragraphs (d)(181) through (d)(350) as (d)(185) through (d)(354), and paragraphs (h)(159) through (h)(302) as (h)(158) through (h)(301),

■ c. Add paragraphs (a)(3), (a)(18), (a)(120) through (a)(127), (a)(163) and (a)(164), (d)(134) through (d)(137), (d)(183), (d)(184), and (h)(157) to read as follows:

§ 660.73 Latitude/longitude coordinates defining the 100 fm (183 m) through 150 fm (274 m) depth contours.

* * * * *

(a) * * *

(3) 48°10.00′ N. lat., 125°40.00′ W. long.;

* * * * *

(18) 48°10.00′ N. lat., 125°17.81′ W. long.;

* * * * *

(120) 44°02.34′ N. lat., 124°55.46′ W. long.;

(121) 43°59.18′ N. lat., 124°56.94′ W. long.;

(122) 43°56.74′ N. lat., 124°56.74′ W. long.;

(123) 43°55.76′ N. lat., 124°55.76′ W. long.;

(124) 43°55.41′ N. lat., 124°52.21′ W. long.;

(125) 43°54.62′ N. lat., 124°48.23′ W. long.;

(126) 43°55.90′ N. lat., 124°41.11′ W. long.;

(127) 43°57.36′ N. lat., 124°38.68′ W. long.;

* * * * *

(163) 40°30.37′ N. lat., 124°37.30′ W. long.;

(164) 40°28.48′ N. lat., 124°36.95′ W. long.;

* * * * *

(d) * * *

(134) 43°59.43′ N. lat., 124°57.22′ W. long.;

(135) 43°57.49′ N. lat., 124°57.31′ W. long.;

(136) 44°55.73′ N. lat., 124°55.41′ W. long.;

(137) 44°54.74′ N. lat., 124°53.15′ W. long.;

* * * * *

(183) 40°30.35′ N. lat., 124°37.52′ W. long.;

(184) 40°28.39′ N. lat., 124°37.16′ W. long.;

* * * * *

(h) * * *

(157) 40°30.30′ N. lat., 124°37.63′ W. long.;

* * * * *

■ 13. Section 660.74 is amended as follows:

■ a. Remove paragraphs (a)(159), (g)(136),

■ b. Redesignate paragraphs (a)(160) through (a)(284) as (a)(161) through (a)(285), (g)(137) through (g)(256) as (g)(138) through (g)(257),

■ c. Revise paragraphs (g)(133), (l)(84) and (l)(85),

■ d. Add paragraphs (a)(159) and (a)(160), (g)(136) and (g)(137), to read as follows:

§ 660.74 Latitude/longitude coordinates defining the 180 fm (329 m) through 250 fm (457 m) depth contours.

* * * * *

(a) * * *

(159) 40°30.22′ N. lat., 124°37.80′ W. long.;

(160) 40°27.29′ N. lat., 124°37.10′ W. long.;

* * * * *

(g) * * *

(133) 40°30.16′ N. lat., 124°37.91′ W. long.;

* * * * *

(136) 40°22.34′ N. lat., 124°31.22′ W. long.;

(137) 40°14.40′ N. lat., 124°35.82′ W. long.;

* * * * *

(l) * * *

(84) 43°57.88′ N. lat., 124°58.25′ W. long.;

(85) 43°56.89′ N. lat., 124°57.33′ W. long.;

* * * * *

■ 14. Tables to Part 660, Subpart C are amended as follows:

■ a. Revise Tables 1a through 1d and 2a through 2c, Subpart C,

■ b. Add Table 1.e. and Table 2d, Subpart C, to read as follows:

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Table 1a. To Part 660, Subpart C - 2011, Specifications of OFL, ABC, ACL, ACT and Fishery Harvest guidelines(weights in metric tons).

Species	OFL	ABC	ACL a/	ACT	Fishery HG a/
ROUNDFISH:					
Lingcod	2,438	2,330	2,330		2,059
	2,523	2,102	2,102		2,095
Pacific Cod d/	3,200	2,222	1,600		1,200
Pacific Whiting e/	e/	e/	e/		e/
Sablefish	8,808	8,418	5,515	See Table 1c	
			1,298		1,264
Cabezon	52	50	50		50
	187	179	179		179
FLATFISH:					
Dover sole j/	44,400	42,436	25,000		23,410
English sole k/	20,675	19,761	19,761		19,661
Petrale sole l/	1,021	976	976		910.6
Arrowtooth flounder m/	18,211	15,174	15,174		13,096
Starry Flounder n/	1,802	1,502	1,352		1,345
Other flatfish o/	10,146	7,044	4,884		4,686
ROCKFISH:					
Pacific Ocean Perch p/	1,026	981	180	157	144.2
Shortbelly q/	6,950	5,789	50		49
Widow r/	5,097	4,872	600		539.1
Canary s/	614	586	102		82
Chilipepper t/	2,073	1,981	1,981		1,966
Bocaccio u/	737	704	263		249.6
Splitnose v/	1,529	1,461	1,461		1,454
Yellowtail w/	4,566	4,364	4,364		3857
Shortspine thornyhead x/	2,384	2,279	1,573		1,528
			405		363
Longspine thornyhead y/	3,577	2,981	2,119		2,075
			376		373
Cowcod z/	13	10	3		2.7
Darkblotched aa/	508	485	298		279.3
Yelloweye bb/	48	46	17		11.1
California Scorpionfish cc/	141	135	135		133
Black North of 40 10' N. lat.	445	426	426		412
	1,217	1,163	1,000		1,000
Minor Rockfish North ff/	3,767	3,363	2,227		2,116
Nearshore	116	99	99		99
Shelf	2,188	1,940	968		925
Slope	1,462	1,324	1,160		1,092
Minor Rockfish South gg/	4,302	3,723	2,341		2,301
Nearshore	1,156	1,001	1,001		1,001
Shelf	2,238	1,885	714		701
Slope	907	836	626		599
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate hh/	3,128	2,990	1,349		1,220
Other fish ii/	11,150	7,742	5,575		5,575

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a/ACLs and HGs are specified as total catch values. Fishery harvest guidelines (HGs) means the harvest guideline or quota after subtracting from the ACL or ACT any allocation for the Pacific Coast treaty Indian Tribes, projected research catch, deductions for fishing mortality in non-groundfish fisheries, as necessary, and set-asides for EFPs.

b/Lingcod north (Oregon and Washington). A new lingcod stock assessment was prepared in 2009. The lingcod north biomass was estimated to be at 62 percent of its unfished biomass in 2009. The OFL of 2,438 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,330 mt was based on a 4 percent reduction from the OFL (σ=0.36/

P^*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. ACL is further reduced for the Tribal fishery (250 mt), incidental open access fishery (16 mt) and research catch (5 mt), resulting in a fishery HG of 2,059 mt.

c/Lingcod south (California). A new lingcod stock assessment was prepared in 2009. The lingcod south biomass was estimated to be at 74 percent of its unfished biomass in 2009. The OFL of 2,523 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,102 mt was based on a 17 percent reduction from the OFL (σ=0.72/P^*=0.40) as it's a category 2 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. An incidental open access set-aside of 7 mt is deducted from the ACL, resulting in a fishery HG of 2,095 mt.

d/Pacific Cod. The 3,200 mt OFL is based on the maximum level of historic landings. The ABC of 2,222 mt is a 31 percent reduction from the OFL (σ=1.44/P^*=0.40) as it's a category 3 species. The 1,600 mt ACL is the OFL reduced by 50 percent as a precautionary adjustment. A set-aside of 400 mt is deducted from the ACL for the Tribal fishery resulting in a fishery HG of 1,200 mt.

e/Pacific whiting. A range of ACLs were considered in the EIS (96,968 mt-290,903 mt). A new stock assessment will be prepared prior to the Council's March 2011 meeting. Final adoption of the Pacific whiting specifications have been deferred until the Council's March 2011 meeting.

f/Sablefish north. A coastwide sablefish stock assessment was prepared in 2007. The coastwide sablefish biomass was estimated to be at 38.3 percent of its unfished biomass in 2007. The coastwide OFL of 8,808 mt was based on the 2007 stock assessment with a F_{MSY} proxy of $F_{45\%}$. The ABC of 8,418 mt is a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. The 40–10 harvest policy was applied to the ABC to derive the coastwide ACL and then the ACL was apportioned north and south of 36° N. lat, using the average of annual swept area biomass (2003–2008) from the NMFS NWFSC trawl survey, between the northern and southern areas with 68 percent going to the area north of 36° N. lat. and 32 percent going to the area south of 36° N. lat. The northern portion of the ACL is 5,515 mt and is reduced by 552 mt for the Tribal allocation (10 percent of the ACL north of 36° N. lat.) The 552 mt Tribal allocation is reduced by 1.5 percent to account for discard mortality. Detailed sablefish allocations are shown in Table 1c.

g/Sablefish South. That portion of the coastwide ACL apportioned to the area south of 36° N. lat. is 2,595 mt (32 percent). An additional 50 percent reduction was made for uncertainty resulting in an ACL of 1,298 mt. A set-aside of 34 mt is deducted from the ACL for EFP catch (26 mt), the incidental open access fishery (6 mt) and research catch (2 mt), resulting in a fishery HG of 1,264 mt.

h/Cabezon (Oregon). A new cabezon stock assessment was prepared in 2009. The cabezon biomass in Oregon was estimated to be at 51 percent of its unfished biomass in 2009. The OFL of 52 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 50 mt was based on a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 50 mt. Cabezon in waters off Oregon were removed from the "other fish" complex, while cabezon of Washington will continue to be managed within the "other fish" complex.

i/Cabezon (California). A new cabezon stock assessment was prepared in 2009. The cabezon south biomass was estimated to be at 48 percent of its unfished biomass in 2009. The OFL of 187 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 179 mt was based on a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 179 mt.

j/Dover sole. A 2005 Dover sole assessment estimated the stock to be at 63 percent of its unfished biomass in 2005. The OFL of 44,400 mt is based on the results of the 2005 stock assessment with an F_{MSY} proxy of $F_{30\%}$. The ABC of 42,436 mt is a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. Because the stock is above $B_{25\%}$ coastwide, the ACL could be set equal to the ABC. However, the ACL of 25,000 mt is set at a level below the ABC and higher than the maximum historical landed catch. A set-aside of 1,590 mt is deducted from the ACL for the Tribal fishery (1,497 mt), the incidental open access fishery (55 mt) and research catch (38 mt), resulting in a fishery HG of 23,410 mt.

k/English sole. A stock assessment update was prepared in 2007 based on the full assessment in 2005. The stock was estimated to be at 116 percent of its unfished biomass in 2007. The OFL of 20,675 mt is based on the results of the 2007 assessment update with an F_{MSY} proxy of $F_{30\%}$. The ABC of 19,761 mt is a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. Because the stock is above $B_{25\%}$, the ACL was set equal to the ABC. A set-aside of 100 mt is deducted from the ACL for the Tribal fishery (91 mt), the incidental open access fishery (4 mt) and research catch (5 mt), resulting in a fishery HG of 19,661 mt.

l/Petrale sole. A petrale sole stock assessment was prepared for 2009. In 2009 the petrale sole stock was estimated to be at 12 percent of its unfished biomass coastwide, resulting in the stock being declared as overfished. The OFL of 1,021 mt is based on the 2009 assessment with a $F_{30\%}$ F_{MSY} proxy. The ABC of 976 mt is a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. The ACL is set equal to the ABC and corresponds to an SPR harvest rate of 31 percent. A set-aside of 65.4 mt is deducted from the ACL for the Tribal fishery (45.4 mt), the incidental open access fishery (1 mt), EFP catch (2 mt) and research catch (17 mt), resulting in a fishery HG of 911 mt.

m/Arrowtooth flounder. The stock was last assessed in 2007 and was estimated to be at 79 percent of its unfished biomass in 2007. The OFL of 18,211 mt is based on the 2007 assessment with a $F_{30\%}$ F_{MSY} proxy. The ABC of 15,174 mt is a 17 percent reduction from the OFL (σ=0.72/P^*=0.40) as it's a category 2 species. Because the stock is above $B_{25\%}$, the ACL is set equal to the ABC. A set-aside of 2,078 mt is deducted from the ACL for the Tribal fishery (2,041 mt), the incidental open access fishery (30 mt), and research catch (7 mt), resulting in a fishery HG of 13,096 mt.

n/Starry Flounder. The stock was assessed for the first time in 2005 and was estimated to be above 40 percent of its unfished biomass in 2005. For 2011, the coastwide OFL of 1,802 mt is based on the 2005 assessment with a F_{MSY} proxy of $F_{30\%}$. The ABC of 1,502 mt is a 17 percent reduction from the OFL (σ=0.72/P^*=0.40) as it's a category 2 species. Because the stock is above $B_{25\%}$, the ACL could have been set equal to the ABC. As a precautionary measure, the ACL of 1,352 mt is a 25 percent reduction from the OFL, which is a 10 percent reduction from the ABC. A set-aside of 7 mt is deducted from the ACL for the Tribal fishery (2 mt), the incidental open access fishery (5 mt), resulting in a fishery HG of 1,345 mt.

o/"Other flatfish" are the unassessed flatfish species that do not have individual OFLs/ABC/ACLs and include butter sole, curlfin sole, flathead sole, Pacific sand dab, rex sole, rock sole, and sand sole. The other flatfish OFL of 10,146 mt is based on the summed contribution of the OFLs determined for the component stocks. The ABC of 7,044 mt is a 31 percent reduction from the OFL (σ=1.44/P^*=0.40) as all species in this complex are category 3 species. The ACL of 4,884 mt is equivalent to the 2010 OY, because there have been no significant changes in the status or management of stocks within the complex. A set-aside of 198 mt is deducted from the ACL for the Tribal fishery (60 mt), the incidental open access fishery (125 mt), and research catch (13 mt), resulting in a fishery HG of 4,686 mt.

p/POP. A POP stock assessment update was prepared in 2009, based on the 2003 full assessment, and the stock was estimated to be at 29 percent of its unfished biomass in 2009. The OFL of 1,026 mt for the Vancouver and Columbia areas is based on the 2009 stock assessment update with an $F_{50\%}$ F_{MSY} proxy. The ABC of 981 mt is a 4 percent reduction from the OFL (σ=0.36/P^*=0.45) as it's a category 1 species. The ACL of 180 mt is based on a rebuilding plan with a target year to rebuild of 2020 and an SPR harvest rate of 86.4 percent. An ACT of 157 mt is being established to address management uncertainty and increase the likelihood that total catch remains within the ACL. A set-aside of 12.8 mt is deducted from the ACT for the Tribal fishery (10.9 mt), EFP catch (0.1 mt) and research catch (1.8 mt), resulting in a fishery HG of 144.2 mt.

q/Shortbelly rockfish. A non quantitative assessment was conducted in 2007. The spawning stock biomass of shortbelly rockfish was estimated at 67 percent of its unfished biomass in 2005. The OFL of 6,950 mt was recommended for the stock in 2011 with an ABC of 5,789 mt (σ=0.72 with a P^* of 0.40). The 50 mt ACL is slightly higher than recent landings, but much lower than previous OYs in recognition of the stock's importance as a forage species in the California Current ecosystem. A set-aside of

1 mt for research catch results in a fishery HG of 49 mt.

r/Widow rockfish. The stock was assessed in 2009 and was estimated to be at 39 percent of its unfished biomass in 2009. The OFL of 5,097 mt is based on the 2009 stock assessment with an $F_{50\%}$ F_{MSY} proxy. The ABC of 4,872 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. A constant catch strategy of 600 mt, which corresponds to an SPR harvest rate of 91.7 percent, will be used to rebuild the widow rockfish stock consistent with the rebuilding plan and a T_{TARGET} of 2010. A set-aside of 61 mt is deducted from the ACL for the Tribal fishery (45 mt), the incidental open access fishery (3.3 mt), EFP catch (11 mt) and research catch (1.6 mt), resulting in a fishery HG of 539.1 mt.

s/Canary rockfish. A canary rockfish stock assessment update, based on the full assessment in 2007, was completed in 2009 and the stock was estimated to be at 23.7 percent of its unfished biomass coastwide in 2009. The coastwide OFL of 614 mt is based on the new assessment with a F_{MSY} proxy of $F_{50\%}$. The ABC of 586 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 102 mt is based on a rebuilding plan with a target year to rebuild of 2027 and a SPR harvest rate of 88.7 percent. A set-aside of 20 mt is deducted from the ACL for the Tribal fishery (9.5 mt), the incidental open access fishery (2 mt), EFP catch (1.3 mt) and research catch (7.2 mt) resulting in a fishery HG of 82 mt. Recreational HGs are being specified as follows: Washington recreational, 2.0; Oregon recreational 7.0 mt; and California recreational 14.5 mt.

t/Chilipepper rockfish. The coastwide chilipepper stock was assessed in 2007 and estimated to be at 71 percent of its unfished biomass coastwide in 2006. Given that chilipepper rockfish are predominantly a southern species, the stock is managed with stock-specific harvest specifications south of 40°10 N. lat. and within minor shelf rockfish north of 40°10 N. lat. South of 40°10 N. lat., the OFL of 2,073 mt is based on the 2007 assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 1,981 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the biomass is estimated to be above 40 percent of the unfished biomass, the ACL was set equal to the ABC. The ACL is reduced by the incidental open access fishery (5 mt), and research catch (9 mt), resulting in a fishery HG of 1,966 mt.

u/Bocaccio. A bocaccio stock assessment was prepared in 2009 from Cape Mendocino to Cape Blanco (43° N. lat.) Given that bocaccio rockfish are predominantly a southern species, the stock is managed with stock-specific harvest specifications south of 40°10 N. lat. and within minor shelf rockfish north of 40°10 N. lat. The bocaccio stock was estimated to be at 28 percent of its unfished biomass in 2009. The OFL of 737 mt is based on the 2009 stock assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 704 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The 263 mt ACL is based on a rebuilding plan with a target year to rebuild of 2022 and a SPR harvest rate of 77.7 percent. A set-aside of 13.4 mt is deducted from the ACL for the incidental open access fishery (0.7 mt), EFP catch (11 mt) and research catch (1.7 mt), resulting in a fishery HG of 249.6 mt.

v/Splitnose rockfish. A new coastwide assessment was prepared in 2009 that estimated the stock to be at 66 percent of its unfished biomass in 2009. Splitnose in the north is managed under the minor slope rockfish complex and south of 40°10′ N. lat. with species-specific harvest specifications. South of 40°10 N. lat. the OFL of 1,529 mt is based on the 2009 assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 1,461 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the unfished biomass is estimated to be above 40 percent of the unfished biomass, the ACL is set equal to the ABC. A set-aside of 7 mt is deducted from the ACL for research catch, resulting in a fishery HG of 1,454 mt.

w/Yellowtail rockfish. A yellowtail rockfish stock assessment was last prepared in 2005 for the Vancouver, Columbia, and Eureka areas. Yellowtail rockfish was estimated to be at 55 percent of its unfished biomass in 2005. The OFL of 4,566 mt is based on the 2005 stock assessment with the F_{MSY} proxy of $F_{50\%}$. The ABC of 4,364 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, because the stock is above $B_{40\%}$. A set-aside of 507 mt is deducted from the ACL for the Tribal fishery (490 mt), the incidental open access fishery (3 mt), EFP catch (10 mt) and research catch (4 mt), resulting in a fishery HG of 3,857 mt.

x/Shortspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 63 percent of its unfished biomass in 2005. A coastwide OFL of 2,384 mt is based on the 2005 stock assessment with a $F_{50\%}$ F_{MSY} proxy. The coastwide ABC of 2,279 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 1,573 mt, 66 percent of the coastwide OFL. A set-aside of 45 mt is deducted from the ACL for the Tribal fishery (38 mt), the incidental open access fishery (2 mt), and research catch (5 mt) resulting in a fishery HG of 1,528 mt for the area north of 34°27′ N. lat. For that portion of the stock south of 34°27′ N. lat. the ACL is 405 mt which is 34 percent of the coastwide OFL, reduced by 50 percent as a precautionary adjustment. A set-aside of 42 mt is deducted from the ACL for the incidental open access fishery (41 mt), and research catch (1 mt) resulting in a fishery HG of 363 mt for the area south of 34°27′ N. lat. The sum of the northern and southern area ACLs (1,978 mt) is a 13 percent reduction from the coastwide ABC.

y/Longspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 71 percent of its unfished biomass in 2005. A coastwide OFL of 3,577 mt is based on the 2005 stock assessment with a $F_{50\%}$ F_{MSY} proxy. The ABC of 2,981 mt is a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 2,119 mt, and is 79 percent of the coastwide OFL for the biomass found in that area reduced by an additional 25 percent as a precautionary adjustment. A set-aside of 44 mt is deducted from the ACL for the Tribal fishery (30 mt), the incidental open access fishery (1 mt), and research catch (13 mt) resulting in a fishery HG of 2,075 mt. For that portion of the stock south of 34°27′ N. lat. the ACL is 376 mt and is 21 percent of the coastwide ABC reduced by 50 percent as a precautionary adjustment. A set-aside of 3 mt is deducted from the ACL for the incidental open access fishery (2 mt), and research catch (1 mt) resulting in a fishery HG of 373 mt. The sum of the northern and southern area ACLs (2,495 mt) is a 16 percent reduction from the coastwide ABC.

z/Cowcod. A stock assessment update was prepared in 2009 and the stock was estimated to be 5 percent (bounded between 4 and 21 percent) of its unfished biomass in 2009. The OFLs for the Monterey and Conception areas were summed to derive the south of 40°10 N. lat. OFL of 13 mt. The ABC for the area south of 40°10′ N. lat. is 10 mt. The assessed portion of the stock in the Conception Area was considered category 2, with a Conception Area contribution to the ABC of 5 mt, which is a 17 percent reduction from the OFL (σ=0.72/P*=0.35). The unassessed portion of the stock in the Monterrey area was considered a category 3 stock, with a contribution to the ABC of 5 mt, which is a 29 percent reduction from the OFL (σ=1.44/P*=0.40). A single ACL of 3 mt is being set for both areas combined. The ACL of 3 mt is based on a rebuilding plan with a target year to rebuild of 2068 and an SPR rate of 82.7 percent. The amount anticipated to be taken during research activity is 0.1 mt and the amount expected to be taken during EFP activity is 0.2 mt, which results in a fishery HG of 2.7 mt.

aa/Darkblotched rockfish. A stock assessment update was prepared in 2009, based on the 2007 full assessment, and the stock was estimated to be at 27.5 percent of its unfished biomass in 2009. The OFL is projected to be 508 mt and is based on the 2009 stock assessment with an F_{MSY} proxy of $F50_{\%}$. The ABC of 485 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 298 mt is based on a rebuilding plan with a target year to rebuild of 2025 and an SPR harvest rate of 64.9 percent. A set-aside of 18.7 mt is deducted from the ACL for the Tribal fishery (0.1 mt), the incidental open access fishery (15 mt), EFP catch (1.5 mt) and research catch (2.1 mt), resulting in a fishery HG of 279.3 mt.

bb/Yelloweye rockfish. The stock was assessed in 2009 and was estimated to be at 20.3 percent of its unfished biomass in 2009. The 48 mt coastwide OFL was derived from the base model in the new stock assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 46 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The 17 mt ACL is based on a rebuilding plan with a target year to rebuild of 2074 and an SPR harvest rate of 76 percent. A set-aside of 5.9 mt is deducted from the ACT for the Tribal fishery (2.3 mt), the incidental open access fishery (0.2 mt), EFP catch (0.1 mt) and research catch (3.3 mt) resulting in a fishery HG of 11.1 mt. Recreational HGs are being established as follows: Washington recreational, 2.6; Oregon recreational 2.4 mt; and California recreational 3.1 mt.

cc/California Scorpionfish was assessed in 2005 and was estimated to be at 80 percent of its unfished biomass in 2005. The OFL of 141 mt is based on the new assessment with a harvest rate proxy of $F_{50\%}$. The ABC of 135 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$, the ACL is set equal to the ABC. A set-aside of 2 mt is deducted from the ACL for the incidental open access fishery, resulting in a fishery HG of 133 mt.

dd/Black rockfish north (Washington). A stock assessment was prepared for black rockfish north of 45°56′ N. lat. (Cape Falcon, Oregon) in 2007. The biomass in the north was estimated to be at 53 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of $F_{50\%}$. The resulting OFL for the area north of 46°16′ N. lat. (the Washington/Oregon Border) is 445 mt and is 97 percent of the OFL from the assessed area. The ABC of 426 mt for the north of 46° 16' N. Lat. is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, since the stock is above $B_{40\%}$. A set-aside of 14 mt for the Tribal fishery results in a fishery HG of 412 mt.

ee/Black rockfish south (Oregon and California). A 2007 stock assessment was prepared for black rockfish south of 45°56′ N. lat. (Cape Falcon, Oregon) to the southern limit of the stock's distribution in Central California in 2007. The biomass in this area was estimated to be at 70 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of $F_{50\%}$. Three percent of the OFL from the stock assessment prepared for black rockfish north of 45°56′ N. lat. is added to the OFL from the assessed area south of 45° 56′ N. lat. The resulting OFL for the area south of 46°16′ N. lat. is 1,217 mt. The ABC of 1,163 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set at 1,000 mt, which is a constant catch strategy designed to keep the stock biomass above $B_{40\%}$. There are no set-asides thus the fishery HG is equal to the ACL. The black rockfish ACL in the area south of 46°16′ N. lat., is subdivided with separate HGs being set for the area north of 42° N. lat. (580 mt/58 percent) and for the area south of 42° N. lat. (420 mt/42 percent).

ff/Minor rockfish north is comprised of three minor rockfish sub-complexes: nearshore, shelf, and slope rockfish. The OFL of 3,767 mt is the sum of OFLs for nearshore (116 mt), shelf (2,188 mt) and slope (1,462 mt) north sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (splitnose and chilipepper rockfish), 0.72 for category 2 stocks (greenstriped rockfish and blue rockfish in California) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish north ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex (nearshore, shelf, and slope) is 3,363 mt. The ACL of 2,227 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 99 mt. The set-aside for the shelf sub-complex is 43 mt—Tribal fishery (9 mt), the incidental open access fishery (26 mt), EFP catch (4 mt) and research catch (4 mt) resulting in a shelf fishery HG of 925 mt. The set-aside for the slope sub-complex is 68 mt—Tribal fishery (36 mt), the incidental open access fishery (19 mt), EFP catch (2 mt) and research catch (11 mt), resulting in a slope fishery HG of 1,092 mt.

gg/Minor rockfish south is comprised of three minor rockfish sub-complexes: nearshore, shelf, and slope. The OFL of 4,302 mt is the sum of OFLs for nearshore (1,156 mt), shelf (2,238 mt) and slope (907 mt) south sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (gopher rockfish north of 34°27′ N. lat., blackgill), 0.72 for category 2 stocks (blue rockfish in the assessed area, greenstriped rockfish, and bank rockfish) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish south ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex, is 3,723 mt (1,001 mt nearshore, 1,885 mt shelf, and 836 mt slope). The ACL of 2,341 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 1,001 mt. The set-aside for the shelf sub-complex is 13 mt for the incidental open access fishery (9 mt), EFP catch (2 mt) and research catch (2 mt), resulting in a shelf fishery HG of 701 mt. The set-aside for the slope sub-complex is 27 mt for the incidental open access fishery (17 mt), EFP catch (2 mt) and research catch (8 mt), resulting in a slope fishery HG of 599 mt.

hh/Longnose skate. A stock assessment was prepared in 2007 and the stock was estimated to be at 66 percent of its unfished biomass. The OFL of 3,128 mt is based on the 2007 stock assessment with an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,990 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 1,349 is equivalent to the 2010 OY and represents a 50 percent increase in the average 2004–2006 mortality (landings and discard mortality). The set-aside for longnose skate is 129 mt for the Tribal fishery (56 mt), incidental open access fishery (65 mt), and research catch (8 mt), resulting in a fishery HG of 1,220 mt.

ii/"Other fish" contains all unassessed groundfish FMP species that are neither rockfish (family Scorpaenidae) nor flatfish. These species include big skate, California skate, leopard shark, soupfin shark, spiny dogfish, finescale codling, Pacific rattail, ratfish, cabezon off Washington, and kelp greenling. The OFL of 11,150 mt is equivalent to the 2010 MSY harvest level minus the 50 mt contribution made for cabezon off Oregon, which is a newly assessed stock to be managed with stock-specific specifications. The ABC of 7,742 mt is a 31 percent reduction from the OFL (σ=1.44/P*=0.40) as all of the stocks in the "other fish" complex are category 3 species. The ACL of 5,575 mt is equivalent to the 2010 OY, minus half of the OFL contribution for Cabezon off of Oregon (25 mt). The fishery HG is equal to the ACL.

Table 1b. To Part 660, Subpart C - 2011, Allocations by Species or Species Group. (Weights in Metric Tons)

Species	Fishery HG	Allocations			
		Trawl		Non-trawl	
		%	Mt	%	Mt
ROUNDFISH:					
Lingcod					
N of 42° N. lat.	2,059	45%	927	55%	1,132
S of 42° N. lat.	2,095	45%	943	55%	1,152
Pacific cod	1,200	95%	1,140	5%	60
Pacific whiting	See Table 1a	100%	See Table 1a	0%	0
Sablefish					
N of 36° N. lat.	See Table 1c of this subpart				
S of 36° N. lat.	1,264	42%	531	58%	733
FLATFISH:					
Dover sole	23,410	95%	22,240	5%	1,170
English sole	19,661	95%	18,678	5%	983
Petrale sole a/	910.6		876		35
Arrowtooth flounder	13,096	95%	12,441	5%	655
Starry Flounder	1,345	50%	673	50%	672
Other flatfish	4,686	90%	4,217	10%	469
ROCKFISH:					
Pacific Ocean Perch b/	144.2	95%	137	5%	7
Widow e/	539.1	91%	491	9%	49
Canary a/ c/	82		34.1		29.8
Chilipepper - S of 40°10 N. Lat.	1,966	75%	1,475	25%	492
Bocaccio - S of 40°10 N. Lat. a/	249.6		60		189.6
Splitnose - S of 40°10 N. Lat.	1,454	95%	1,381	5%	73
Yellowtail - N of 40°10 N. Lat.	3857	88%	3394	12%	463
Shortspine thornyhead					
N of 34°27' N. lat.	1,528	95%	1,452	5%	76
S of 34°27' N. lat.	363	NA	50	NA	313
Longspine thornyhead					
N of 34°27' N. lat.	2,075	95%	1,971	5%	104
Cowcod - S of 40°10 N. Lat. a/	2.7		1.8		0.9
Darkblotched d/	279.3	95%	265	5%	14
Yelloweye a/	11.1		0.6		10.5
Minor Rockfish North					
Shelf a/	925	60.2%	557	39.8%	368
Slope	1,092	81%	885	19%	207
Minor Rockfish South					
Shelf a/	701	12.2%	86	87.8%	615
Slope	599	63%	377	37%	222
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate a/	1,220	95%	1,159	5%	61

a/ Allocations decided through the biennial specification process.

b/ 30 mt of the total trawl allocation for POP is allocated to the whiting fisheries, as follows: 12.6 mt for the shorebased IFQ fishery, 7.2 mt for the mothership fishery, and 10.2 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

c/ 14.1 mt of the total trawl allocation of canary rockfish is allocated to the whiting fisheries, as follows: 5.9 mt for the shorebased IFQ fishery, 3.4 mt for the mothership fishery, and 4.8 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

d/ 25 mt of the total trawl allocation for darkblotched rockfish is allocated to the whiting fisheries, as follows: 10.5 mt for the shorebased IFQ fishery, 6.0 mt for the mothership fishery, and 8.5 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

e/ 52 percent (255 mt) of the total trawl allocation for widow rockfish is allocated to the whiting fisheries, as follows: 107.1 mt for the shorebased IFQ fishery, 61.2 mt for the mothership fishery, and 86.7 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

Table 1c. To Part 660, Subpart C - Sablefish North of 36° N. lat. Allocations, 2011

Year	ACL	Set-asides		Recreational Estimate	Commercial HG	Limited Entry HG		Open Access HG	
		Tribal a/	Research			%	Mt	%	MT b/
2011	5,515	552	16	6.1	4,941	90.6%	4,477	9.4%	464

Year	LE All	Limited Entry Trawl c/			Limited Entry Fixed Gear d/		
		ALL Trawl	At-sea Whiting	Shorebased IFQ	ALL FG	Primary	DTL
2011	4,477	2,597	50	2,547	1,880	1,598	282

a/ The tribal allocation is further reduced by 1.5 percent for discard mortality resulting in 544 mt in 2011

b/ Of the Open access HG the annual amount estimated to be taken in the incidental OA fishery is 17.2 mt.

c/ The trawl allocation is 58% of the limited entry HG

d/ The limited entry fixed gear allocation is 42% of the limited entry HG

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TABLE 1d. TO PART 660, SUBPART C—AT-SEA WHITING FISHERY ANNUAL SET-ASIDES 2011

Species of species complex	Set-aside (mt)
Lingcod	6
Pacific Cod	5
Pacific Whiting	Allocation [a]
Sablefish N. of 36°	50
Sablefish S. of 36°	NA
PACIFIC OCEAN PERCH	Allocation [a]
WIDOW ROCKFISH	Allocation [a]
Chilipepper S. of 40°10′	NA
Splitnose S. of 40°10′	NA
Yellowtail N. of 40°10′	300
Shortspine Thornyhead N. of 34°27′.	20
Shortspine Thornyhead S. of 34°27′.	NA
Longspine Thornyhead N. of 34°27′.	5
Longspine Thornyhead S. of 34°27′.	NA
DARKBLOTCHED	Allocation [a]
Minor Slope RF N.	55
Minor Slope RF S.	NA
Dover Sole	5
English Sole	5
Petrale Sole—coastwide	5
Arrowtooth Flounder	10
Starry Flounder	5
Other Flatfish	20
CANARY ROCKFISH	Allocation [a]
BOCACCIO	NA
COWCOD	NA
YELLOWEYE	0
Black Rockfish	NA
Blue Rockfish (CA)	NA
Minor Nearshore RF N.	NA
Minor Nearshore RF S.	NA
Minor Shelf RF N.	35
Minor Shelf RF S.	NA
California scorpionfish	NA
Cabezon (off CA only)	NA
Other Fish	520
Longnose Skate	5
Pacific Halibut	10 [b]

a See Table 1.b., to Subpart C, for the at-sea whiting allocations for these species.

b As stated in § 660.55(m), the Pacific halibut set-aside is 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10′ N lat. (estimated to be approximately 5 mt each).

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Table 1e. To Part 660, Subpart C - Whiting and non-whiting initial issuance allocation percentage for IFQ decided through the harvest specifications, 2011

Species/Species Group/Area	Trawl Allocation (mt)	At-sea Whiting set asides	Shorebased IFQ			
			Non-Whiting		Whiting	
			percent	mt	percent	mt
Pacific Ocean Perch	137	17.4 (10.2 catcher/processor + 7.2 mothership)	89.5% [Remaining]	107	10.5% (Greater of 17% or 30 mt to shorebased + at-sea whiting)	12.6
Widow rockfish	491	147.9 (86.7 catcher/processor + 61.2 mothership)	68.7% (Remaining)	235	31.3% (52% to shorebased + at-sea whiting)	107.1
Yellowtail rockfish North of 40°10' N. lat.	3,401	300	90.3% (Remaining)	2,801	9.7% (300 mt)	300
Darkblotched rockfish	265	14.5 (8.5 catcher/ processors + 6 mothership)	95.8% (Remaining)	240	4.20% (Greater of 9% or 25 mt to shorebased + at-sea whiting)	10.5
Minor slope rockfish	377	na	100%	377	0.0%	0
South of 40°10' N. lat.						
Minor shelf rockfish North of 40°10' N. lat.	557	35	82.6%	431.2	17.4%	90.8
South of 40°10' N. lat.	86	na	100%	86	0.0%	0
Canary Rockfish	34.1	8.2 (4.8 catcher/processor + 3.4 mothership)	77.2%	20	22.8%	5.9
Bocaccio	60	na	100%	60	0.0%	0
Cowcod	1.8	na	100%	1.8	0.0%	0
Yelloweye Rockfish	0.6	0	100%	0.6	0.0%	0

Table 2a. To Part 660, Subpart C - 2012, and beyond, Specifications of OFL, ABC, ACL, ACT and Fishery Harvest guidelines (weights in metric tons).

Species	OFL	ABC	ACL a/	ACT	Fishery HG
ROUNDFISH:					
Lingcod	2,251	2,151	2,151		1,880
	2,597	2,164	2,164		2,157
Pacific Cod d/	3,200	2,222	1,600		1,200
Pacific Whiting e/	e/	e/	e/		e/
Sablefish	8,623	8,242	5,347	See Table 2c	
			1,258		1,224
Cabezon	50	48	48		48
	176	168	168		168
FLATFISH:					
Dover sole j/	44,400	42,436	25,000		23,410
English sole k/	20,675	19,761	19,761		19,661
Petrale sole l/	1,021	976	976		910.6
Arrowtooth flounder m/	18,211	15,174	15,174		13,096
Starry Flounder n/	1,802	1,502	1,352		1,345
Other flatfish o/	10,146	7,044	4,884		4,686
ROCKFISH:					
Pacific Ocean Perch p/	1,007	962	180	157	144.2
Shortbelly q/	6,950	5,789	50		49
Widow r/	4,923	4,705	600		539.1
Canary s/	622	594	102		82
Chilipepper t/	1,872	1,789	1,789		1,774
Bocaccio u/	732	700	263		249.6
Splitnose v/	1,610	1,538	1,538		1,531
Yellowtail w/	4,573	4,371	4,371		3,872
Shortspine thornyhead x/	2,358	2,254	1,556		1,511
			401		359
Longspine thornyhead y/	3,483	2,902	2,064		2,020
			366		363
Cowcod z/	13	10	3		2.7
Darkblotched aa/	497	475	298		279.3
Yelloweye bb/	48	46	17		11.1
California Scorpionfish cc/	132	126	126		124
Black	435	415	415		401
	1,169	1,117	1,000		1,000
Minor Rockfish North ff/	3,821	3,414	2,227		2,116
Nearshore	116	99	99		99
Shelf	2,197	1,948	968		925
Slope	1,507	1,367	1,160		1,092
Minor Rockfish South gg/	4,291	3,712	2,341		2,290
Nearshore	1,145	990	990		990
Shelf	2,243	1,890	714		701
Slope	903	832	626		599
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate hh/	3,006	2,873	1,349		1,220
Other fish ii/	11,150	7,742	5,575		5,575

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a/ ACLs and HGs are specified as total catch values. Fishery harvest guideline (HG) means the harvest guideline or quota after subtracting from the ACL of ACT any allocation for the Pacific Coast treaty Indian Tribes, projected research catch, deductions for fishing mortality in non-groundfish fisheries, as necessary, and set-asides for EFPs.

b/ Lingcod north (Oregon and Washington). A new lingcod stock assessment was prepared in 2009. The lingcod north biomass was estimated to be at 62 percent of its unfished biomass in 2009. The OFL of 2,251 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,151 mt was based on a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. ACL is further reduced for the Tribal fishery (250 mt), incidental open access fishery (16 mt) and research catch (5 mt), resulting in a fishery HG of 1,880 mt.

c/ Lingcod south (California). A new lingcod stock assessment was prepared in 2009. The lingcod south biomass was estimated to be at 74 percent of its unfished biomass in 2009. The OFL of 2,597 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,164 mt was based on a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. An incidental open access set-aside of 7 mt is deducted from the ACL, resulting in a fishery HG of 2,157 mt.

d/ Pacific Cod. The 3,200 mt OFL is based on the maximum level of historic landings. The ABC of 2,222 mt is a 31 percent reduction from the OFL (σ=1.44/P*=0.40) as it's a category 3 species. The 1,600 mt ACL is the OFL reduced by 50 percent as a precautionary adjustment. A set-aside of 400 mt is deducted from the ACL for the Tribal fishery, resulting in a fishery HG of 1,200 mt.

e/ Pacific whiting. A range of ACLs were considered in the EIS (96,968 mt-290,903 mt). A new stock assessment will be prepared prior to the Council's March 2012 meeting. Final adoption of the Pacific whiting specifications have been deferred until the Council's March 2012 meeting.

f/ Sablefish north. A coastwide sablefish stock assessment was prepared in 2007. The coastwide sablefish biomass was estimated to be at 38.3 percent of its unfished biomass in 2007. The coastwide OFL of 8,623 mt was based on the 2007 stock assessment with a F_{MSY} proxy of $F_{45\%}$. The ABC of 8,242 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The 40–10 harvest policy was applied to the ABC to derive the coastwide ACL and then the ACL was apportioned north and south of 36° N. lat, using the average of annual swept area biomass (2003–2008) from the NMFS NWFSC trawl survey, between the northern and southern areas with 68 percent going to the area north of 36° N. lat. and 32 percent going to the area south of 36° N. lat. The northern portion of the ACL is 5,347 mt and is reduced by 535 mt for the Tribal allocation (10 percent of the ACL north of 36° N. lat.) The 535 mt Tribal allocation is reduced by 1.5 percent to account for discard mortality. Detailed sablefish allocations are shown in Table 1c.

g/ Sablefish South. That portion of the coastwide ACL (32 percent) apportioned to the area south of 36° N. lat. is 2,516 mt. An additional 50 percent reduction for uncertainty was made, resulting in an ACL of 1,258 mt. A set-aside of 34 mt is deducted from the ACL for EFP catch (26 mt), the incidental open access fishery (6 mt) and research catch (2 mt), resulting in a fishery HG of 1,224 mt.

h/ Cabezon (Oregon). A new cabezon stock assessment was prepared in 2009. The cabezon biomass in Oregon was estimated to be at 51 percent of its unfished biomass in 2009. The OFL of 50 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 48 mt was based on a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 48 mt. Cabezon in waters off Oregon were removed from the "other fish" complex, while cabezon of Washington will continue to be managed within the "other fish" complex.

i/ Cabezon (California)—A new cabezon stock assessment was prepared in 2009. The cabezon south biomass was estimated to be at 48 percent of its unfished biomass in 2009. The OFL of 176 mt was calculated using an F_{MSY} proxy of $F_{45\%}$. The ABC of 168 mt was based on a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$ coastwide, the ACL is set equal to the ABC. No set-asides were removed so the fishery HG is also equal to the ACL at 168 mt.

j/ Dover sole. Final 2012 OFLs, ABCs, ACLs, ACTs and fishery HGs for assessed flatfish species are contingent upon potential changes to the flatfish status determination criteria and harvest control rule.

k/ English sole. Final 2012 OFLs, ABCs, ACLs, ACTs and fishery HGs for assessed flatfish species are contingent upon potential changes to the flatfish status determination criteria and harvest control rule.

l/ Petrale sole. Final 2012 petrale sole OFL, ABC, ACL, ACT and fishery HG are contingent upon potential changes to the flatfish status determination criteria and harvest control rule, and potential changes to rebuilding plans.

n/ Starry Flounder. Final 2012 OFLs, ABCs, ACLs, ACTs and fishery HGs, for assessed flatfish species are contingent upon potential changes to the flatfish status determination criteria and harvest control rule.

o/ "Other flatfish" are the unassessed flatfish species that do not have individual OFLs/ABC/ACLs and include butter sole, curlfin sole, flathead sole, Pacific sand dab, rex sole, rock sole, and sand sole. The other flatfish OFL of 10,146 mt is based on the summed contribution of the OFLs determined for the component stocks. The ABC of 7,044 mt is a 31 percent reduction from the OFL (σ=1.44/P*=0.40) as all species in this complex are category 3 species. The ACL of 4,884 mt is equivalent to the 2010 OY, because there have been no significant changes in the status or management of stocks within the complex. A set-aside of 198 mt is deducted from the ACL for the Tribal fishery (60 mt), the incidental open access fishery (125 mt), and research catch (13 mt), resulting in a fishery HG of 4,686 mt.

p/ POP. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

q/ Shortbelly rockfish. A non quantitative assessment was conducted in 2007. The spawning stock biomass of shortbelly rockfish was estimated at 67 percent of its unfished biomass in 2005. The OFL of 6,950 mt was recommended for the stock in 2011 with an ABC of 5,789 mt (σ=0.72 with a P* of 0.40). The 50 mt ACL is slightly higher than recent landings, but much lower than previous OYs in recognition of the stock's importance as a forage species in the California Current ecosystem. A set-aside of 1 mt for research catch, resulting in a fishery HG of 49 mt.

r/ Widow rockfish. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

s/ Canary rockfish. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

t/ Chilipepper rockfish. The coastwide chilipepper stock was assessed in 2007 and estimated to be at 71 percent of its unfished biomass coastwide in 2006. Given that chilipepper rockfish are predominantly a southern species, the stock is managed with stock-specific harvest specifications south of 40°10 N. lat. and within minor shelf rockfish north of 40°10 N. lat. South of 40°10 N. lat., the OFL of 1,872 mt is based on the 2007 assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 1,789 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the biomass is estimated to be above 40 percent the unfished biomass, the ACL was set equal to the ABC. The ACL is reduced by the incidental open access fishery (5 mt), and research catch (9 mt), resulting in a fishery HG of 1,774 mt.

u/ Bocaccio. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

v/ Splitnose rockfish. A new coastwide assessment was prepared in 2009 that estimated the stock to be at 66 percent of its unfished biomass in 2009. Splitnose in the north is managed under the minor slope rockfish complex and in the south (south of 40°10′ N. lat.), with species-specific harvest specifications. The 1,610 mt OFL south of 40°10 N. lat. is based on the 2009 assessment with an F_{MSY} proxy of $F_{50\%}$. The ABC of 1,538 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the unfished biomass is estimated to be above 40 percent of the unfished biomass, the ACL is set equal to the ABC. A set-aside of 7 mt is deducted from the ACL for research catch, resulting in a fishery HG of 1,531 mt.

w/ Yellowtail rockfish. A yellowtail rockfish stock assessment was last prepared in 2005 for the Vancouver, Columbia, Eureka areas. Yellowtail rockfish was estimated to be at 55 percent of its unfished biomass in 2005. The OFL of 4,573 mt is based on the 2005 stock assessment with the F_{MSY} proxy of $F_{50\%}$. The ABC of 4,371 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, because the stock is above $B_{40\%}$. A set-aside of 499 mt is deducted from the ACL for the Tribal fishery (490 mt), the incidental open access fishery (3 mt), EFP catch (2 mt) and research catch (4 mt), resulting in a fishery HG of 3,872 mt.

x/ Shortspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 63 percent of its unfished biomass in 2005. A coastwide OFL of 2,358 mt is based on the 2005 stock assessment with a $F_{50\%}$ F_{MSY} proxy. The coastwide ABC of 2,254 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 1,556 mt, 66 percent of the coastwide

OFL. A set-aside of 45 mt is deducted from the ACL for the Tribal fishery (38 mt), the incidental open access fishery (2 mt), and research catch (5 mt), resulting in a fishery HG of 1,511 mt for the area north of 34°27′ N. lat. For that portion of the stock south of north of 34°27′ N. lat. the ACL is 401 mt which is 34 percent of the coastwide OFL for the portion of the biomass found south of 34°27′ N. lat reduced by 50 percent as a precautionary adjustment. A set-aside of 42 mt is deducted from the ACL for the incidental open access fishery (41 mt), and research catch (1 mt), resulting in a fishery HG of 359 mt for the area south of 34°27′ N. lat. The sum of the northern and southern area ACLs (1,957 mt) is a 13 percent reduction from the coastwide ABC.

y/ Longspine thornyhead. A coastwide stock assessment was conducted in 2005 and the stock was estimated to be at 71 percent of its unfished biomass in 2005. A coastwide OFL of 3,483 mt is based on the 2005 stock assessment with a $F_{50\%}$ F_{MSY} proxy. The ABC of 2,902 mt is a 17 percent reduction from the OFL (σ=0.72/P*=0.40) as it's a category 2 species. For the portion of the stock that is north of 34°27′ N. lat., the ACL is 2,064 mt, and is 79 percent of the coastwide OFL for the biomass in that area. A set-aside of 44 mt is deducted from the ACL for the Tribal fishery (30 mt), the incidental open access fishery (1 mt), and research catch (13 mt), resulting in a fishery HG of 2,020 mt. For that portion of the stock south of 34°27′ N. lat. the ACL is 366 mt and is 21 percent of the coastwide OFL reduced by 50 percent as a precautionary adjustment. A set-aside of 3 mt is deducted from the ACL for the incidental open access fishery (2 mt), and research catch (1 mt), resulting in a fishery HG of 363 mt. The sum of the northern and southern area ACLs (2,430 mt) is a 16 percent reduction from the coastwide ABC.

z/ Cowcod. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

aa/ Darkblotched rockfish. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

bb/ Yelloweye rockfish. Final 2012 ACLs, ACTs and fishery HGs for overfished species are contingent upon potential changes to rebuilding plans.

cc/ California Scorpionfish south was assessed in 2005 and was estimated to be at 80 percent of its unfished biomass in 2005. The OFL of 132 mt is based on the new assessment with a harvest rate proxy of $F_{50\%}$. The ABC of 126 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. Because the stock is above $B_{40\%}$, the ACL is set equal to the ABC. A set-aside of 2 mt is deducted from the ACL for the incidental open access fishery, resulting in a fishery HG of 124 mt.

dd/ Black rockfish north (Washington). A stock assessment was prepared in 2007 for black rockfish north of 45°56′N. lat. (Cape Falcon, Oregon). The biomass in this area was estimated to be at 53 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of $F_{50\%}$. The resulting OFL for the area north of 46°16′ N. lat. (the Washington/Oregon border) is 435 mt, which is 97 percent of the OFL from the assessed area. The ABC of 415 mt for the area north of 46°16′ N. lat. is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set equal to the ABC, since the stock is above $B_{40\%}$. A set-aside of 14 mt for the Tribal fishery results in a fishery HG of 401 mt.

ee/ Black rockfish south (Oregon and California). A 2007 stock assessment was prepared for black rockfish south of 45°56′ N. lat. (Cape Falcon, Oregon) to the southern limit of the stock's distribution in Central California. The biomass in the south was estimated to be at 70 percent of its unfished biomass in 2007. The OFL from the assessed area is based on the 2007 assessment with a harvest rate proxy of $F_{50\%}$. Three percent of the OFL from the stock assessment prepared for black rockfish north of 45°56′ N. lat. is added to the OFL from the assessed area south of 45°56′. The resulting OFL for the area south of 46°16′ N. lat. is 1,169 mt. The ABC of 1,117 mt for the south is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL was set at 1,000 mt, which is a constant catch strategy designed to keep the stock biomass above $B_{40\%}$. The black rockfish ACL in the area south of 46°16′ N. lat., is subdivided with separate HGs being set for the area north of 42° N. lat. (580 mt/58 percent) and for the area south of 42° N. lat. (420 mt/42 percent).

ff/ Minor rockfish north is comprised of three minor rockfish sub-complexes: Nearshore, shelf, and slope. The OFL of 3,767 mt is the sum of OFLs for nearshore (116 mt), shelf (2,197 mt) and slope (1,507 mt) north sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (splitnose and chilipepper rockfish), 0.72 for category 2 stocks (greenstriped rockfish and blue rockfish in California) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish north ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex (nearshore, shelf, and slope) is 3,414 mt. The ACL of 2,227 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 99 mt. The set-aside for the shelf sub-complex is 43 mt—Tribal fishery (9 mt), the incidental open access fishery (26 mt), EFP catch (4 mt) and research catch (4 mt), resulting in a shelf fishery HG of 925 mt. The set-aside for the slope sub-complex is 68 mt—Tribal fishery (36 mt), the incidental open access fishery (19 mt), EFP catch (2) and research catch (11 mt), resulting in a slope fishery HG of 1,092 mt.

gg/ Minor rockfish south is comprised of three minor rockfish sub-complexes: Nearshore, shelf, and slope. The OFL of 4,291 mt is the sum of OFLs for nearshore (1,145 mt), shelf (2,243 mt) and slope (903 mt) south sub-complexes. Each sub-complex OFL is the sum of the OFLs of the component species within the complex. The ABCs for the minor rockfish complexes and sub-complexes are based on a sigma value of 0.36 for category 1 stocks (gopher rockfish north of Point Conception, blackgill), 0.72 for category 2 stocks (blue rockfish in the assessed area, greenstriped rockfish, and bank rockfish) and 1.44 for category 3 stocks (all others) with a P* of 0.45. The resulting minor rockfish south ABC, which is the summed contribution of the ABCs for the contributing species in each sub-complex, is 3,712 mt. The ACL of 2,341 mt for the complex is the sum of the sub-complex ACLs. The sub-complex ACLs are the sum of the component stock ACLs, which are less than or equal to the ABC contribution of each component stock. There are no set-asides for the nearshore sub-complex, thus the fishery HG is equal to the ACL, which is 990 mt. The set-asides for the shelf sub-complex is 13 mt for the incidental open access fishery (9 mt), EFP catch (2 mt) and research catch (2 mt), resulting in a shelf fishery HG of 701 mt. The set-asides for the slope sub-complex is 27 mt for the incidental open access fishery (17 mt), EFP catch (2 mt) and research catch (8 mt), resulting in a slope fishery HG of 599 mt.

hh/ Longnose skate. A stock assessment update was prepared in 2007 and the stock was estimated to be at 66 percent of its unfished biomass. The OFL of 3,128 mt is based on the 2007 stock assessment with an F_{MSY} proxy of $F_{45\%}$. The ABC of 2,990 mt is a 4 percent reduction from the OFL (σ=0.36/P*=0.45) as it's a category 1 species. The ACL of 1,349 is the 2010 OY and represents a 50 percent increase in the average 2004–2006 catch mortality (landings and discard mortality). The set-asides for longnose skate is 129 mt for the Tribal fishery (56 mt), incidental open access fishery (65 mt), and research catch (8 mt), resulting in a fishery HG of 1,220 mt.

ii/ "Other fish" contains all unassessed groundfish FMP species that are neither rockfish (family Scorpaenidae) nor flatfish. These species include big skate, California skate, leopard shark, soupfin shark, spiny dogfish, finescale codling, Pacific rattail, ratfish, cabezon off Washington, and kelp greenling. The OFL of 11,150 mt is the 2010 MSY harvest level minus the 50 mt contribution made for cabezon off Oregon, which is a newly assessed stock to be managed with stock-specific specifications. The ABC of 7,742 mt is a 31 percent reduction from the OFL (σ=1.44/P*=0.40) as all of the stocks in the "other fish" complex are category 3 species. The ACL of 5,575 mt is equal to the 2010 OY, minus half of the OFL contribution for Cabezon off of Oregon (25 mt). The fishery HG is equal to the ACL.

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Table 2b. To Part 660, Subpart C - 2012, and beyond, Allocations by Species or Species Group (final 2012 allocations for assessed flatfish are contingent upon potential changes to flatfish status determination criteria and the harvest control rule, and, for overfished species, potential changes to rebuilding plans). (Weights in Metric Tons)

Species	Fishery HG	Allocations			
		Trawl		Non-trawl	
		%	Mt	%	Mt
Lingcod					
N of 42° N. lat.	1,880	45%	846	55%	1,034
S of 42° N. lat.	2,157	45%	971	55%	1,186
Pacific cod	1,200	95%	1,140	5%	60
Pacific whiting	See Table 2a	100%	See Table 2a	0%	0
Sablefish					
N of 36° N. lat.	See Table 1c of this subpart				
S of 36° N. lat.	1,224	42%	514	58%	710
FLATFISH:					
Dover sole	23,410	95%	22,240	5%	1,170
English sole	19,661	95%	18,678	5%	983
Petrale sole a/	910.6		876		35
Arrowtooth flounder	13,096	95%	12,441	5%	655
Starry Flounder	1,345	50%	673	50%	672
Other flatfish	4,686	90%	4,217	10%	469
ROCKFISH:					
Pacific Ocean Perch	144.2	95%	137	5%	7
Widow e/	539.1	91%	491	9%	49
Canary a/ c/	82		34.1		29.8
Chilipepper - S of 40°10 N. Lat.	1,774	75%	1,331	25%	443
Bocaccio - S of 40°10 N. Lat. a/	249.6		60		189.6
Splitnose - S of 40°10 N. Lat.	1,531	95%	1,454	5%	77
Yellowtail - N of 40°10 N. Lat.	3,872	88%	3,407	12%	465
Shortspine thornyhead					
N of 34°27' N. lat.	1,511	95%	1,435	5%	76
S of 34°27' N. lat.	359		50		309
Longspine thornyhead					
N of 34°27' N. lat.	2,020	95%	1,919	5%	101
Cowcod - S of 40°10 N. Lat. a/	2.7		1.8		0.9
Darkblotched d/	279.3	95%	265	5%	14
Yelloweye a/	11.1		0.6		10.5
Minor Rockfish North					
Shelf a/	925	60.20%	557	39.80%	368
Slope	1,092	81%	885	19%	207
Minor Rockfish South					
Shelf a/	701	12.2%	86	87.8%	615
Slope	599	63%	377	37%	222
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:					
Longnose Skate a/	1,220	95%	1,159	5%	61

a/ Allocations decided through the biennial specification process.

b/ /30 mt of the total trawl allocation for POP is allocated to the whiting fisheries, as follows: 12.6 mt for the shorebased IFQ fishery, 7.2 mt for the mothership fishery, and 10.2 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

c/ 14.1 mt of the total trawl allocation of canary rockfish is allocated to the whiting fisheries, as follows: 5.9 mt for the shorebased IFQ fishery, 3.4 mt for the mothership fishery, and 4.8 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

d/ 25 mt of the total trawl allocation for darkblotched rockfish is allocated to the whiting fisheries, as follows: 10.5 mt for the shorebased IFQ fishery, 6.0 mt for the mothership fishery, and 8.5 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

e/ 52 percent (255 mt) of the total trawl allocation for widow rockfish is allocated to the whiting fisheries, as follows: 107.1 mt for the shorebased IFQ fishery, 61.2 mt for the mothership fishery, and 86.7 mt for the catcher/processor fishery. The tonnage calculated here for the whiting portion of the shorebased IFQ fishery contributes to the total shorebased trawl allocation, which is found at 660.140 (d)(1)(ii)(D).

Table 2c. To Part 660, Subpart C - Sablefish North of 36° N. lat. Allocations, 2012, and beyond

Year	ACL	Set-asides		Recreational Estimate	Commercial HG	Limited Entry HG		Open Access HG	
		Tribal a/	Research			%	Mt	%	MT b/
2012	5,347	535	16	6.1	4,790	90.6%	4,340	9.4%	450

Year	LE All	Limited Entry Trawl c/			Limited Entry Fixed Gear d/		
		ALL Trawl	At-sea Whiting	Shorebased IFQ	ALL FG	Primary	DTL
2012	4,340	2,517	50	2,467	1,823	1,549	273

a/ The tribal allocation is further reduced by 1.5 percent for discard mortality resulting in 527 mt in 2012

b/ Of the Open access HG the annual amount estimated to be taken in the incidental OA fishery is 17.2 mt.

c/ The trawl allocation is 58% of the limited entry HG

d/ The limited entry fixed gear allocation is 42% of the limited entry HG

TABLE 2D. TO PART 660, SUBPART C—AT-SEA WHITING FISHERY ANNUAL SET-ASIDES, 2012 AND BEYOND

Species or species complex	Set-aside (mt)
Lingcod	6
Pacific Cod	5
Pacific Whiting	Allocation [a]
Sablefish N. of 36°	50
Sablefish S. of 36°	NA
PACIFIC OCEAN PERCH	Allocation [a]
WIDOW ROCKFISH	Allocation [a]
Chilipepper S. of 40°10′	NA
Splitnose S. of 40°10′	NA
Yellowtail N. of 40°10′	300
Shortspine Thornyhead N. of 34°27′.	20
Shortspine Thornyhead S. of 34°27′.	NA
Longspine Thornyhead N. of 34°27′.	5
Longspine Thornyhead S. of 34°27′.	NA
DARKBLOTCHED	Allocation [a]
Minor Slope RF N	55
Minor Slope RF S	NA
Dover Sole	5
English Sole	5
Petrale Sole—coastwide	5
Arrowtooth Flounder	10
Starry Flounder	5
Other Flatfish	20
CANARY ROCKFISH	Allocation [a]
BOCACCIO	NA
COWCOD	NA
YELLOWEYE	0
Black Rockfish	NA
Blue Rockfish (CA)	NA
Minor Nearshore RF N	NA
Minor Nearshore RF S	NA
Minor Shelf RF N	35
Minor Shelf RF S	NA
California scorpionfish	NA
Cabezon (off CA only)	NA
Other Fish	520
Longnose Skate	5
Pacific Halibut	10 [b]

[a] See Table 2.b., to Subpart C, for the at-sea whiting allocations for these species.

[b] As stated in § 660.55(m), the Pacific halibut set-aside is 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10′ N lat. (estimated to be approximately 5 mt each).

* * * * *

Subpart D—West Coast Groundfish—Limited Entry Trawl Fisheries.

■ 15. In § 660.130 paragraph (d) introductory text is revised to read as follows:

§ 660.130 Trawl fishery—management measures.

* * * * *

(d) *Sorting.* Under § 660.12 (a)(8), subpart C, it is unlawful for any person to "fail to sort, prior to the first weighing after offloading, those groundfish species or species groups for which there is a trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY, if the vessel fished or landed in an area during a time when such trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY applied." The States of Washington, Oregon, and California may also require that vessels record their landings as sorted on their state landing receipt.

* * * * *

■ 16. In § 660.131, paragraph (b)(3)(ii) is revised to read as follows:

§ 660.131 Pacific whiting fishery management measures.

* * * * *

(b) * * *

(3) * * *

(ii) If, during a primary whiting season, a whiting vessel harvests a groundfish species other than whiting for which there is a midwater trip limit, then that vessel may also harvest up to another footrope-specific limit for that species during any cumulative limit period that overlaps the start or close of the primary whiting season.

* * * * *

■ 17. In § 660.140, paragraphs (a)(3), (c)(1), and (d)(1)(ii)(D), are revised as follows:

§ 660.140 Shorebased IFQ program.

(a) * * *

(3) The Shorebased IFQ Program may be restricted or closed as a result of projected overages within the Shorebased IFQ Program, the MS Coop Program, or the C/P Coop Program. As determined necessary by the Regional Administrator, area restrictions, season closures, or other measures will be used to prevent the trawl sector in aggregate or the individual trawl sectors (Shorebased IFQ, MS Coop, or C/P Coop) from exceeding an ACL, OY, ACT or formal allocation specified in the PCGFMP or regulation at § 660.55, subpart C, or §§ 660.140, 660.150, or 660.160, subpart D.

* * * * *

(c) * * *

(1) *IFQ species.* IFQ species are those groundfish species and Pacific halibut in the exclusive economic zone or adjacent state waters off Washington, Oregon and California, under the jurisdiction of the Pacific Fishery Management Council, for which QS and IBQ will be issued. Groupings and area subdivisions for IFQ species are those groupings and area subdivisions for which ACLs or ACTs are specified in the Tables 1a through 2d, subpart C, and those for which there is an area-specific precautionary harvest policy. The lists of individual groundfish species included in the minor shelf complex north of 40°10′ N. lat., minor shelf complex south of 40°10′ N. lat., minor slope complex north 40°10′ N. lat., minor slope complex south of 40°10′ N. lat., and in the other flatfish complex are specified under the definition of "groundfish" at § 660.11. The following are the IFQ species:

* * * * *

(d) * * *

(1) * * *

(ii) * * *

(D) For the 2011 trawl fishery, NMFS will issue QP based on the following shorebased trawl allocations:

IFQ Species	Management area	Shorebased trawl allocation (mt)
Lingcod		1,863.30
Pacific cod		1,135.00
Pacific Whiting		92,817.90
Sablefish	North of 36° N. lat.	2,546.34
Sablefish	South of 36° N. lat.	530.88
Dover sole		22,234.50
English sole		18,672.95
PETRALE SOLE		871.00
Arrowtooth flounder		12,431.20
Starry flounder		667.50
Other flatfish		4,197.40
PACIFIC OCEAN PERCH	North of 40°10′ N. lat.	119.36
WIDOW ROCKFISH		342.62

IFQ Species	Management area	Shorebased trawl allocation (mt)
CANARY ROCKFISH		25.90
Chilipepper rockfish	South of 40°10′ N. lat.	1,475.25
BOCACCIO ROCKFISH	South of 40°10′ N. lat.	60.00
Splitnose rockfish	South of 40°10′ N. lat.	1,381.30
Yellowtail rockfish	North of 40°10′ N. lat.	3,094.16
Shortspine thornyhead	North of 34°27′ N. lat.	1,431.60
Shortspine thornyhead	South of 34°27′ N. lat.	50.00
Longspine thornyhead	North of 34°27′ N. lat.	1,966.25
COWCOD	South of 40°10′ N. lat.	1.80
DARKBLOTCHED ROCKFISH		250.84
YELLOWEYE ROCKFISH		0.60
Minor shelf rockfish complex	North of 40°10′ N. lat.	522.00
Minor shelf rockfish complex	South of 40°10′ N. lat.	86.00
Minor slope rockfish complex	North of 40°10′ N. lat.	829.52
Minor slope rockfish complex	South of 40°10′ N. lat.	377.37

* * * * *

■ 18. In § 660.150 paragraph (a)(5) is revised to read as follows:

§ 660.150 Mothership (MS) Coop program.

(a) * * *

(5) The MS Coop Program may be restricted or closed as a result of projected overages within the MS Coop Program, the C/P Coop Program, or the Shorebased IFQ Program. As determined necessary by the Regional Administrator, area restrictions, season closures, or other measures will be used to prevent the trawl sectors in aggregate or the individual trawl sector (Shorebased IFQ, MS Coop, or C/P Coop) from exceeding an ACL, ACT, or formal allocation specified in the PCGFMP or regulation at § 660.55, subpart C, or §§ 660.140, 660.150, or 660.160, subpart D.

* * * * *

■ 19. In § 660.160 paragraph (a)(5) is revised to read as follows:

§ 660.160 Catcher/processor (C/P) Coop Program.

(a) * * *

(5) The C/P Coop Program may be restricted or closed as a result of projected overages within the MS Coop Program, the C/P Coop Program, or the Shorebased IFQ Program. As determined necessary by the Regional Administrator, area restrictions, season closures, or other measures will be used to prevent the trawl sectors in aggregate or the individual trawl sector (Shorebased IFQ, MS Coop, or C/P Coop) from exceeding an ACL, ACT, or formal allocation specified in the PCGFMP or regulation at § 660.55, subpart C, or §§ 660.140, 660.150, or 660.160, subpart D.

* * * * *

■ 20. Table 1 (North), Table 1 (South) to part 660, subpart D are revised to read as follows:

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Table 1 (North) to Part 660, Subpart D -- Limited Entry Trawl Rockfish Conservation Areas and Landing Allowances for non-IFQ Species and Pacific Whiting North of 40°10' N. Lat.

This table describes Rockfish Conservation Areas for vessels using groundfish trawl gear. This table describes incidental landing allowances for vessels registered to a Federal limited entry trawl permit and using groundfish trawl or groundfish non-trawl gears to harvest individual fishing quota (IFQ) species.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table 04292011

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[1/]:						
1	North of 48°10' N. lat.	shore - modified[2/] 200 fm line[1/]	shore - 200 fm line[1/]	shore - 150 fm line[1/]		shore - 200 fm line[1/]	shore - modified[2/] 200 fm line[1/]
2	48°10' N. lat. - 45°46' N. lat.	75 fm line[1/] - modified[2/] 200 fm line[1/]	75 fm line[1/] - 200 fm line[1/]	75 fm line[1/] - 150 fm line[1/]	100 fm line[1/] - 150 fm line[1/]	75 fm line[1/] - 200 fm line[1/]	75 fm line[1/] - modified[2/] 200 fm line[1/]
3	45°46' N. lat. - 40°10' N. lat.			75 fm line[1/] - 200 fm line[1/]	100 fm line[1/] - 200 fm line[1/]		

Selective flatfish trawl gear is required shoreward of the RCA; all bottom trawl gear (large footrope, selective flatfish trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope and small footrope trawl gears (except for selective flatfish trawl gear) are prohibited shoreward of the RCA. Midwater trawl gear is permitted only for vessels participating in the primary whiting season. **Vessels fishing groundfish *trawl quota pounds with groundfish non-trawl gears, under gear switching provisions at § 660.140, are subject to the limited entry* groundfish trawl fishery landing allowances in this table, regardless of the type of fishing gear used. Vessels fishing groundfish trawl quota pounds with groundfish non-trawl gears, under gear switching provisions at § 660.140, are subject to the limited entry fixed gear non-trawl RCA, as described in Tables 1 (North) and 1 (South) to Part 660, Subpart E.**

See § 660.60, § 660.130, and § 660.140 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).

State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.

4	**Minor nearshore rockfish & Black rockfish**	300 lb/ month
5	**Whiting**	
6	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.131 for season and trip limit details. -- After the primary whiting season: CLOSED.
7	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.
8	**Cabezon**	
9	North of 46°16' N. lat.	Unlimited
10	46°16' N. lat. - 40°10' N. lat.	50 lb/ month
11	**Shortbelly**	Unlimited
12	**Spiny dogfish**	60,000 lb/ month
13	**Longnose skate**	Unlimited
14	**Other Fish**[3/]	Unlimited

TABLE 1 (North)

1/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

2/ The "modified" fathom lines are modified to exclude certain petrale sole areas from the RCA.

3/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (except longnose skate), ratfish, morids, grenadiers, and kelp greenling.

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

Table 1 (South) to Part 660, Subpart D -- Limited Entry Trawl Rockfish Conservation Areas and Landing Allowances for non-IFQ Species and Pacific Whiting South of 40°10' N. Lat.

This table describes Rockfish Conservation Areas for vessels using groundfish trawl gear. This table describes incidental landing allowances for vessels registered to a Federal limited entry trawl permit and using groundfish trawl or groundfish non-trawl gears to harvest individual fishing quota (IFQ) species.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table

04292011

TABLE 1 (South)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[1/]:						
1	South of 40°10' N. lat.	100 fm line[1/] - 150 fm line [1/ 2/]					
	Small footrope trawl gear is required shoreward of the RCA; all trawl gear (large footrope, selective flatfish trawl, midwater trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope trawl gear and midwater trawl gear are prohibited shoreward of the RCA. **Vessels fishing groundfish trawl quota pounds with groundfish non-trawl gears, under gear switching provisions at § 660.140, are subject to the limited entry groundfish trawl fishery landing allowances in this table, regardless of the type of fishing gear used. Vessels fishing groundfish trawl quota pounds with groundfish non-trawl gears, under gear switching provisions at § 660.140, are subject to the limited entry fixed gear non-trawl RCA, as described in Tables 1 (North) and 1 (South) to Part 660, Subpart E.**						
	See § 660.60, § 660.130, and § 660.140 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, *Cordell Banks, and EFHCAs*).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
2	**Longspine thornyhead**						
3	South of 34°27' N. lat.	24,000 lb/ 2 months					
4	**Minor nearshore rockfish & Black rockfish**	300 lb/ month					
5	**Whiting**						
6	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.131 for season and trip limit details. -- After the primary whiting season: CLOSED.					
7	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.					
8	**Cabezon**	50 lb/ month					
9	**Shortbelly**	Unlimited					
10	**Spiny dogfish**	60,000 lb/ month					
11	**Longnose skate**	Unlimited					
12	**California scorpionfish**	Unlimited					
13	**Other Fish [3/]**	Unlimited					

1/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

2/ South of 34°27' N. lat., the RCA is 100 fm line - 150 fm line along the mainland coast; shoreline - 150 fm line around islands.

3/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (excluding longnose skate), ratfish, morids, grenadiers, and kelp greenling.

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

BILLING CODE 3510–22–C

Subpart E—West Coast Groundfish—Limited Entry Fixed Gear Fisheries

■ 21. In § 660.230 paragraphs (c)(1), (c)(2)(ii), and (d)(5) through (9) are revised to read as follows:

§ 660.230 Fixed gear fishery—management measures.

* * * * *

(c) * * *

(1) Under § 660.12(a)(8), subpart C, it is unlawful for any person to "fail to sort, prior to the first weighing after offloading, those groundfish species or species groups for which there is a trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY, if the vessel fished or landed in an area during a time when such trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY applied." The States of Washington, Oregon, and California may also require that vessels record their landings as sorted on their state landing receipts.

(2) * * *

(ii) North of 40°10′ N. lat.—POP, yellowtail rockfish, Cabezon (Oregon and California);

* * * * *

(d) * * *

(5) *Point St. George YRCA.* The latitude and longitude coordinates of the Point St. George YRCA boundaries are specified at § 660.70, subpart C. Fishing with limited entry fixed gear is prohibited within the Point St. George YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with limited entry fixed gear within the Point St. George YRCA, on dates when the

closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Limited entry fixed gear vessels may transit through the Point St. George YRCA, at any time, with or without groundfish on board.

(6) *South Reef YRCA.* The latitude and longitude coordinates of the South Reef YRCA boundaries are specified at § 660.70, subpart C. Fishing with limited entry fixed gear is prohibited within the South Reef YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with limited entry fixed gear within the South Reef YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Limited entry fixed gear vessels may transit through the South Reef YRCA, at any time, with or without groundfish on board.

(7) *Reading Rock YRCA.* The latitude and longitude coordinates of the Reading Rock YRCA boundaries are specified at § 660.70, subpart C. Fishing with limited entry fixed gear is prohibited within the Reading Rock YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with limited entry fixed gear within the Reading Rock YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Limited entry fixed gear vessels may transit through the Reading Rock YRCA, at any time, with or without groundfish on board.

(8) *Point Delgada (North) YRCA.* The latitude and longitude coordinates of the Point Delgada (North) YRCA boundaries are specified at § 660.70, subpart C. Fishing with limited entry fixed gear is prohibited within the Point Delgada (North) YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with limited entry fixed gear within the Point Delgada (North) YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Limited entry fixed gear vessels may transit through the Point Delgada (North) YRCA, at any time, with or without groundfish on board.

(9) *Point Delgada (South) YRCA.* The latitude and longitude coordinates of the Point Delgada (South) YRCA boundaries are specified at § 660.70, subpart C. Fishing with limited entry fixed gear is prohibited within the Point Delgada (South) YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with limited entry fixed gear within the Point Delgada (South) YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Limited entry fixed gear vessels may transit through the Point Delgada (South) YRCA, at any time, with or without groundfish on board.

* * * * *

■ 22. In § 660.231, paragraphs (b)(1) and (b)(3)(i) are revised to read as follows:

§ 660.231 Limited entry fixed gear sablefish primary fishery.

* * * * *

(b) * * *

(1) *Season dates.* North of 36° N. lat., the sablefish primary season for the limited entry, fixed gear, sablefish-endorsed vessels begins at 12 noon local time on April 1 and closes at 12 noon local time on October 31, or closes for an individual permit holder when that permit holder's tier limit has been reached, whichever is earlier, unless otherwise announced by the Regional Administrator through the routine management measures process described at § 660.60, subpart C.

* * * * *

(3) * * *

(i) A vessel participating in the primary season will be constrained by the sablefish cumulative limit associated with each of the permits registered for use with that vessel. During the primary season, each vessel authorized to fish in that season under paragraph (a) of this section may take, retain, possess, and land sablefish, up to the cumulative limits for each of the permits registered for use with that vessel (*i.e.*, stacked permits). If multiple limited entry permits with sablefish endorsements are registered for use with a single vessel, that vessel may land up to the total of all cumulative limits announced in this paragraph for the tiers for those permits, except as limited by paragraph (b)(3)(ii) of this section. Up to 3 permits may be registered for use with a single vessel during the primary season; thus, a single vessel may not take and retain, possess or land more than 3 primary season sablefish cumulative limits in any one year. A vessel registered for use with multiple limited entry permits is subject to per vessel limits for species other than sablefish, and to per vessel limits when participating in the daily trip limit fishery for sablefish under § 660.232, subpart E. In 2011, the following annual limits are in effect: Tier 1 at 41,379 lb (18,769 kg), Tier 2 at 18,809 lb (8,532 kg), and Tier 3 at 10,748 lb–(4,875 kg). For 2012 and beyond, the following annual limits are in effect: Tier 1 at 40,113 lb (18,195 kg), Tier 2 at 18,233 lb (8,270 kg), and Tier 3 at 10,419 lb (4,726 kg).

* * * * *

■ 23. In § 660.232 paragraph (a)(2) is revised to read as follows:

§ 660.232 Limited entry daily trip limit (DTL) fishery for sablefish.

(a) * * *

(2) Following the start of the primary season, all landings made by a vessel authorized by § 660.231(a) of this subpart to fish in the primary season will count against the primary season cumulative limit(s) associated with the permit(s) registered for use with that vessel. A vessel that is eligible to fish in the sablefish primary season may fish in the DTL fishery for sablefish once that vessels' primary season sablefish limit(s) have been taken, or after the close of the primary season, whichever occurs earlier. Any subsequent sablefish landings by that vessel will be subject to the restrictions and limits of the limited entry DTL fishery for sablefish for the remainder of the fishing year.

* * * * *

■ 24. Table 2 (North) and Table 2 (South) to part 660, subpart E are revised to read as follows:

BILLING CODE 3510–22–P

Table 2 (North) to Part 660, Subpart E -- Non-Trawl Rockfish Conservation Areas and Trip Limits for Limited Entry Fixed Gear North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table 04292011

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 46°16' N. lat.	shoreline - 100 fm line[6/]					
2	46°16' N. lat. - 43°00' N. lat.	30 fm line[6/] - 100 fm line[6/]					
3	43°00' N. lat. - 42°00' N. lat.	20 fm line[6/] - 100 fm line[6/]					
4	42°00' N. lat. - 40°10' N. lat.	20 fm depth contour - 100 fm line[6/]					
	See § 660.60 and § 660.230 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
5	Minor slope rockfish[2/] & Darkblotched rockfish	4,000 lb/ 2 months					
6	Pacific ocean perch	1,800 lb/ 2 months					
7	Sablefish	1,900 lb per week, not to exceed 6,500 lb/ 2 months[7/]	2,000 lb/ week, not to exceed 7,000 lb/ 2 months		2,000 lb/ week, not to exceed 6,500 lb/ 2 months		
8	Longspine thornyhead	10,000 lb/ 2 months					
9	Shortspine thornyhead	2,000 lb/ 2 months					
10	Dover sole	5,000 lb/ month South of 42° N. lat., when fishing for "other flatfish," 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 two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
11	Arrowtooth flounder						
12	Petrale sole						
13	English sole						
14	Starry flounder						
15	Other flatfish[1/]						
16	Whiting	10,000 lb/ trip					
17	Minor shelf rockfish[2/], Shortbelly, Widow, & Yellowtail rockfish	200 lb/ month					
18	Canary rockfish	CLOSED					
19	Yelloweye rockfish	CLOSED					
20	Minor nearshore rockfish & Black rockfish						
21	North of 42° N. lat.	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[3/]					
22	42° - 40°10' N. lat.	6,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[3/]	7,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black rockfish[3/]				
23	Lingcod[4/]	CLOSED		800 lb/ 2 months		400 lb/ month	CLOSED
24	Pacific cod	1,000 lb/ 2 months					
25	Spiny dogfish	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
26	Other fish[5/]	Unlimited					

TABLE 2 (North)

1/ "Other flatfish" are defined at § 660.11 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

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

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 lb or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.

4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42° N. lat. and 24 inches (61 cm) total length South of 42° N. lat.

5/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (except longnose skates), ratfish, morids, grenadiers, and kelp greenling. Cabezon and longnose skate are included in the trip limits for "other fish."

6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

7/ The trip limit that was in place for sablefish north of 36° N. Lat. in Jan-Feb 2011 was "1,750 lb per week, not to exceed 7,000 lb per 2 months".

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

Table 2 (South) to Part 660, Subpart E -- Non-Trawl Rockfish Conservation Areas and Trip Limits for Limited Entry Fixed Gear South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table 04292011

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[5/]:						
1	40°10' - 34°27' N. lat.	30 fm line[5/] - 150 fm line[5/]					
2	South of 34°27' N. lat.	60 fm line[5/] - 150 fm line[5/] (also applies around islands)					
	See § 660.60 and § 660.230 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
3	**Minor slope rockfish[2/] & Darkblotched rockfish**	40,000 lb/ 2 months					
4	**Splitnose**	40,000 lb/ 2 months					
5	**Sablefish**						
6	40°10' - 36° N. lat.	1,900 lb per week, not to exceed 6,500 lb/ 2 months[6/]	2,000 lb/ week, not to exceed 7,000 lb/ 2 months		2,000 lb/ week, not to exceed 6,500 lb/ 2 months		
7	South of 36° N. lat.	2,000 lb per week[6/]	2,100 lb/ week				
8	**Longspine thornyhead**	10,000 lb / 2 months					
9	**Shortspine thornyhead**						
10	40°10' - 34°27' N. lat.	2,000 lb/ 2 months					
11	South of 34°27' N. lat.	3,000 lb/ 2 months					
12	**Dover sole**	5,000 lb/ month South of 42° N. lat., when fishing for "other flatfish," 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 two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
13	**Arrowtooth flounder**						
14	**Petrale sole**						
15	**English sole**						
16	**Starry flounder**						
17	**Other flatfish[1/]**						
18	**Whiting**	10,000 lb/ trip					
19	**Minor shelf rockfish[2/], Shortbelly, Widow rockfish, and Bocaccio (including Chilipepper between 40°10' - 34°27' N. lat.)**						
20	40°10' - 34°27' N. lat.	Minor shelf rockfish, shortbelly, widow rockfish, bocaccio & chilipepper: 2,500 lb/ 2 months, of which no more than 500 lb/ 2 months may be any species other than chilipepper.					
21	South of 34°27' N. lat.	3,000 lb/ 2 months	CLOSED	3,000 lb/ 2 months			
22	**Chilipepper rockfish**						
23	40°10' - 34°27' N. lat.	Chilipepper included under minor shelf rockfish, shortbelly, widow and bocaccio limits - - See above					
24	South of 34°27' N. lat.	2,000 lb/ 2 months, this opportunity only available seaward of the nontrawl RCA					
25	**Canary rockfish**	CLOSED					
26	**Yelloweye rockfish**	CLOSED					
27	**Cowcod**	CLOSED					
28	**Bronzespotted rockfish**	CLOSED					
29	**Bocaccio**						
30	40°10' - 34°27' N. lat.	Bocaccio included under Minor shelf rockfish, shortbelly, widow & chilipepper limits -- See above					
31	South of 34°27' N. lat.	300 lb/ 2 months	CLOSED	300 lb/ 2 months			

TABLE 2 (South)

Table 2 (South). Continued

TABLE 2 (South)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
32	**Minor nearshore rockfish & Black rockfish**						
33	Shallow nearshore	600 lb/ 2 months	CLOSED	800 lb/ 2 months	900 lb/ 2 months	800 lb/ 2 months	600 lb/ 2 months
34	Deeper nearshore						
35	40°10' - 34°27' N. lat.	700 lb/ 2 months	CLOSED	700 lb/ 2 months		800 lb/ 2 months	
36	South of 34°27' N. lat.	500 lb/ 2 months		600 lb/ 2 months			
37	California scorpionfish	1,200 lb/ 2 months[7/]	CLOSED	1,200 lb/ 2 months	1,200 lb/ 2 months		
38	**Lingcod**[3/]	CLOSED		800 lb/ 2 months			400 lb/ month, CLOSED
39	**Pacific cod**	1,000 lb/ 2 months					
40	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
41	**Other fish**[4/]	Unlimited					

1/ "Other flatfish" are defined at § 660.11 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

2/ POP is included in the trip limits for minor slope rockfish. Yellowtail is included in the trip limits for minor shelf rockfish. Bronzespotted rockfish have a species specific trip limit.

3/ The commercial mimimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.

4/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (except longnose skates), ratfish, morids, grenadiers, and kelp greenling. Cabezon and longnose skate are included in the trip limits for "other fish."

5/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

6/ The trip limit that was in place for sablefish north of 36° N. Lat. in Jan-Feb 2011 was "1,750 lb per week, not to exceed 7,000 lb per 2 months". The trip limit that was in place for sablefish south of 36° N. Lat. in Jan-Feb 2011 was "400 lb per week, not to exceed 1,500 lb per 2 months".

7/ The trip limit that was in place for California scorpionfish south of 40°10' N. Lat. in Jan-Feb 2011 was "600 lb per 2 months".

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

BILLING CODE 3510–22–C

Subpart F—West Coast Groundfish—Open Access Fisheries

■ 25. In § 660.330 paragraphs (c) introductory text, (c)(2) and (d)(5) through (9) are revised to read as follows:

§ 660.330 Open access fishery—management measures.

* * * * *

(c) *Sorting*. Under § 660.12(a)(8), subpart C, it is unlawful for any person to "fail to sort, prior to the first weighing after offloading, those groundfish species or species groups for which there is a trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY, if the vessel fished or landed in an area during a time when such trip limit, size limit, scientific sorting designation, quota, harvest guideline, ACL or ACT or OY applied." The States of Washington, Oregon, and California may also require that vessels record their landings as sorted on their state landing receipts. For open access vessels, the following species must be sorted:

* * * * *

(2) North of 40°10′ N. lat.—POP, yellowtail rockfish, Cabezon (Oregon and California);

* * * * *

(d) * * *

(5) *Point St. George YRCA*. The latitude and longitude coordinates of the Point St. George YRCA boundaries are specified at § 660.70, subpart C. Fishing with open access gear is prohibited within the Point St. George YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with open access gear within the Point St. George YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Open access vessels may transit through the Point St. George YRCA, at any time, with or without groundfish on board.

(6) *South Reef YRCA*. The latitude and longitude coordinates of the South Reef YRCA boundaries are specified at § 660.70, subpart C. Fishing with open access gear is prohibited within the South Reef YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with open access gear within the South Reef YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Open access gear vessels may transit through the South Reef YRCA, at any time, with or without groundfish on board.

(7) *Reading Rock YRCA*. The latitude and longitude coordinates of the Reading Rock YRCA boundaries are specified at § 660.70, subpart C. Fishing with open access gear is prohibited within the Reading Rock YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with open access gear within the Reading Rock YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through

inseason adjustment. Open access gear vessels may transit through the Reading Rock YRCA, at any time, with or without groundfish on board.

(8) *Point Delgada (North) YRCA.* The latitude and longitude coordinates of the Point Delgada (North) YRCA boundaries are specified at § 660.70, subpart C. Fishing with open access gear is prohibited within the Point Delgada (North) YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with open access gear within the Point Delgada (North) YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Open access gear vessels may transit through the Point Delgada (North) YRCA, at any time, with or without groundfish on board.

(9) *Point Delgada (South) YRCA.* The latitude and longitude coordinates of the Point Delgada (South) YRCA boundaries are specified at § 660.70, subpart C. Fishing with open access gear is prohibited within the Point Delgada (South) YRCA, on dates when the closure is in effect. It is unlawful to take and retain, possess, or land groundfish taken with open access gear within the Point Delgada (South) YRCA, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment. Open access gear vessels may transit through the Point Delgada (South) YRCA, at any time, with or without groundfish on board.

* * * * *

■ 26. Table 3 (North) and Table 3 (South) to part 660, subpart F are revised to read as follows:

BILLING CODE 3510–22–P

Table 3 (North) to Part 660, Subpart F -- Non-Trawl Rockfish Conservation Areas and Trip Limits for Open Access Gears North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table 04292011

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 46°16' N. lat.	shoreline - 100 fm line[6/]					
2	46°16' N. lat. - 43°00' N. lat.	30 fm line[6/] - 100 fm line[6/]					
3	43°00' N. lat. - 42°00' N. lat.	20 fm line[6/] - 100 fm line[6/]					
4	42°00' N. lat. - 40°10' N. lat.	20 fm depth contour - 100 fm line[6/]					
	See § 660.60, § 660.330, and § 660.333 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
5	**Minor slope rockfish[1/] & Darkblotched rockfish**	Per trip, no more than 25% of weight of the sablefish landed					
6	**Pacific ocean perch**	100 lb/ month					
7	**Sablefish**	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 2,400 lb/ 2 months	300lb/ day, or 1 landing per week of up to 950 lb, not to exceed 1,900 lb/ 2 months		300 lb/ day, or 1 landing per week of up to 1,200 lb, not to exceed 2,250 lb/ 2 months		
8	**Thornyheads**	CLOSED					
9	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. South of 42° N. lat., when fishing for "other flatfish," 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 two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
10	**Arrowtooth flounder**						
11	**Petrale sole**						
12	**English sole**						
13	**Starry flounder**						
14	**Other flatfish[2/]**						
15	**Whiting**	300 lb/ month					
16	**Minor shelf rockfish[1/], Shortbelly, Widow, & Yellowtail rockfish**	200 lb/ month					
17	**Canary rockfish**	CLOSED					
18	**Yelloweye rockfish**	CLOSED					
19	**Minor nearshore rockfish & Black rockfish**						
20	North of 42° N. lat.	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish 3/					
21	42° - 40°10' N. lat.	6,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish 3/	7,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black rockfish 3/				
22	**Lingcod[4/]**	CLOSED		400 lb/ month			CLOSED
23	**Pacific cod**	1,000 lb/ 2 months					
24	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
25	**Other Fish[5/]**	Unlimited					

TABLE 3 (North)

Table 3 (North). Continued

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
26	**SALMON TROLL** *(subject to RCAs when retaining all species of groundfish except for yellowtail rockfish and lingcod, as described below)*						
27	North	Salmon trollers may retain and land up to 1 lb of yellowtail rockfish for every 2 lbs of salmon landed, with a cumulative limit of 200 lb/month, both within and outside of the RCA. This limit is within the 200 lb per month combined limit for minor shelf rockfish, widow rockfish and yellowtail rockfish, and not in addition to that limit. Salmon trollers may retain and land up to 1 lingcod per 15 Chinook per trip, plus 1 lingcod per trip, up to a trip limit of 10 lingcod, on a trip where any fishing occurs within the RCA. This limit only applies during times when lingcod retention is allowed, and is not "CLOSED." This limit is within the per month limit for lingcod described in the table above, and not in addition to that limit. All groundfish species are subject to the open access limits, seasons, size limits and RCA restrictions listed in the table above, unless otherwise stated here.					
28	**PINK SHRIMP NON-GROUNDFISH TRAWL** *(not subject to RCAs)*						
29	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.					

TABLE 3 (North) con't

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 § 660.11 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

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 minimum size limit for lingcod is 22 inches (56 cm) total length North of 42° N. lat. and 24 inches (61 cm) total length South of 42° N. lat.

4/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (except longnose skates), ratfish, morids, grenadiers, and kelp greenling. Cabezon and longnose skate are included in the trip limits for "other fish."

6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

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

Table 3 (South) to Part 660, Subpart F -- Non-Trawl Rockfish Conservation Areas and Trip Limits for Open Access Gears South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.10 - § 660.399 before using this table 04292011

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[5/]:						
1	40°10' - 34°27' N. lat.	30 fm line[5/] - 150 fm line[5/]					
2	South of 34°27' N. lat.	60 fm line[5/] - 150 fm line[5/] (also applies around islands)					
	See § 660.60, § 660.330, and § 660.333 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.70-660.74 and §§ 660.76-660.79 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
3	**Minor slope rockfish**[1/] **& Darkblotched rockfish**						
4	40°10' - 38° N. lat.	Per trip, no more than 25% of weight of the sablefish landed					
5	South of 38° N. lat.	10,000 lb/ 2 months					
6	**Splitnose**	200 lb/ month					
7	**Sablefish**						
8	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 2,400 lb/ 2 months	300lb/ day, or 1 landing per week of up to 950 lb, not to exceed 1,900 lb/ 2 months		300 lb/ day, or 1 landing per week of up to 1,200 lb, not to exceed 2,250 lb/ 2 months		
9	South of 36° N. lat.	400 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 6,000 lb/ 2 months[6/]	300 lb/ day, or 1 landing per week of up to 1,200 lb, not to exceed 2,400 lb/ 2 months				
10	**Thornyheads**						
11	40°10' - 34°27' N. lat.	CLOSED					
12	South of 34°27' N. lat.	50 lb/ day, no more than 1,000 lb/ 2 months					
13	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. South of 42° N. lat., when fishing for "other flatfish," 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 two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
14	**Arrowtooth flounder**						
15	**Petrale sole**						
16	**English sole**						
17	**Starry flounder**						
18	**Other flatfish**[2/]						
19	**Whiting**	300 lb/ month					
20	**Minor shelf rockfish**[1/]**, Shortbelly, Widow & Chilipepper rockfish**						
21	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED	200 lb/ 2 months		300 lb/ 2 months	
22	South of 34°27' N. lat.	750 lb/ 2 months		750 lb/ 2 months			
23	**Canary rockfish**	CLOSED					
24	**Yelloweye rockfish**	CLOSED					
25	**Cowcod**	CLOSED					
26	**Bronzespotted rockfish**	CLOSED					
27	**Bocaccio**						
28	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED	100 lb/ 2 months		200 lb/ 2 months	
29	South of 34°27' N. lat.	100 lb/ 2 months		100 lb/ 2 months			

TABLE 3 (South)

Table 3 (South). Continued

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
30	**Minor nearshore rockfish & Black rockfish**						
31	Shallow nearshore	600 lb/ 2 months	CLOSED	800 lb/ 2 months	900 lb/ 2 months	800 lb/ 2 months	600 lb/ 2 months
32	Deeper nearshore						
33	40°10' - 34°27' N. lat.	700 lb/ 2 months	CLOSED	700 lb/ 2 months		800 lb/ 2 months	
34	South of 34°27' N. lat.	500 lb/ 2 months	CLOSED	600 lb/ 2 months		800 lb/ 2 months	
35	California scorpionfish	1,200 lb/ 2 months	CLOSED	1,200 lb/ 2 months			
36	**Lingcod 3/**	CLOSED		400 lb/ month			CLOSED
37	**Pacific cod**	1,000 lb/ 2 months					
38	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
39	**Other Fish 4/**	Unlimited					
40	**RIDGEBACK PRAWN AND, SOUTH OF 38°57.50' N. LAT., CA HALIBUT AND SEA CUCUMBER NON-GROUNDFISH TRAWL**						
41	**NON-GROUNDFISH TRAWL Rockfish Conservation Area (RCA) for CA Halibut, Sea Cucumber & Ridgeback Prawn:**						
42	*40° 10' - 38° N. lat.*	*100 fm line - 200 fm line 6/*	*100 fm line 5/ - 150 fm line 5/*				*100 fm line 5/ - 200 fm line 5/ 6/*
43	*38° - 34° 27' N. lat.*	*100 fm line 5/ - 150 fm line 5/*					
44	*South of 34° 27' N. lat.*	*100 fm line 5/ - 150 fm line 5/ along the mainland coast; shoreline - 150 fm line 5/ around islands*					
45		Groundfish: 300 lb/trip. Species-specific limits described in the table above 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°57.50' 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).					
46	**PINK SHRIMP NON-GROUNDFISH TRAWL GEAR** *(not subject to RCAs)*						
47	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 all groundfish species count toward the per day, per trip or other species-specific sublimits described here and the species-specific limits described in the table above do not apply. The amount of groundfish landed may not exceed the amount of pink shrimp landed.					

TABLE 3 (South) con't

1/ Yellowtail rockfish is included in the trip limits for minor shelf rockfish. POP is included in the trip limits for minor slope rockfish. Bronzespotted rockfish have a species specific trip limit.

2/ "Other flatfish" are defined at § 660.11 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

3/ The commercial minimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.

4/ "Other fish" are defined at § 660.11 and include sharks (except spiny dogfish), skates (including longnose skates), ratfish, morids, grenadiers, and kelp greenling.

5/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.71-660.74. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

6/ The trip limit that was in place for sablefish south of 36° N. Lat. in Jan-Feb 2011 was "400 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 8,000 lb/ 2 months".

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

BILLING CODE 3510–22–C

Subpart G—West Coast Groundfish—Recreational Fisheries

■ 27. In § 660.360,

■ a. Remove paragraphs (c)(3)(i)(C), (c)(3)(i)(A)(*5*), (c)(3)(ii)(A)(*5*),

■ b. Redesignate paragraphs (c)(1)(iii) as (c)(1)(iv), (c)(3)(i)(A)(*6*) as (c)(3)(i)(A)(*5*), (c)(3)(i)(D) through (J) as (c)(3)(i)(C) through (I), (c)(3)(ii)(A)(*6*) as (c)(3)(ii)(A)(*5*),

■ c. Revise newly redesignated paragraphs (c)(1)(iv)(A) and (B), (c)(3)(i)(A)(*5*), (c)(3)(i)(D) through (H), (c)(3)(ii)(A)(*5*),

■ d. Revise paragraphs (c)(1), (c)(1)(i)(D), (c)(1)(i)(D)(*1*) and (*2*), (c)(2)(iii), (c)(3)(i)(A)(*1*) through (*4*), (c)(3)(i)(B), (c)(3)(ii)(A)(*1*) through (*4*), (c)(3)(iii)(C), (c)(3)(iii)(D),

■ d. Add paragraphs (c)(1)(i)(D)(*3*), (c)(1)(iii), to read as follows:

§ 660.360 Recreational fishery—management measures.

* * * * *

(c) * * *

(1) *Washington.* For each person engaged in recreational fishing off the coast of Washington, the groundfish bag limit is 12 groundfish per day, including rockfish, cabezon and lingcod. Within the groundfish bag limit, there are sub-limits for rockfish, lingcod, and cabezon outlined in paragraph (c)(1)(i)(D) of this section. The recreational groundfish fishery is open year-round except for lingcod, which has season dates outlined in paragraph (c)(1)(iv) of this section. In the Pacific halibut fisheries, retention of groundfish is governed in part by annual management measures for Pacific halibut fisheries, which are published in the **Federal Register.** The following seasons, closed areas, sub-limits and size limits apply:

* * * * *

(i)* * *

(D) *Recreational rockfish conservation area.* Fishing for groundfish with recreational gear is prohibited within the recreational RCA unless otherwise stated. It is unlawful to take and retain, possess, or land groundfish taken with recreational gear within the recreational RCA unless otherwise stated. A vessel fishing in the recreational RCA may not be in possession of any groundfish unless otherwise stated. [For example, if a vessel participates in the recreational salmon fishery within the RCA, the vessel cannot be in possession of groundfish while in the RCA. The vessel may, however, on the same trip fish for and retain groundfish shoreward of the RCA on the return trip to port.]

(*1*) West of the Bonilla-Tatoosh line Between the U.S. border with Canada and the Queets River (Washington state Marine Area 3 and 4), recreational fishing for groundfish is prohibited seaward of a boundary line approximating the 20 fm (37 m) depth contour from June 1 through September 30, except on days when the Pacific halibut fishery is open in this area. Days open to Pacific halibut recreational fishing off Washington are announced on the NMFS hotline at (206) 526–6667 or (800) 662–9825. Coordinates for the boundary line approximating the 20 fm (37 m) depth contour are listed in § 660.71, subpart C.

(*2*) Between the Queets River (47°31.70' N. lat.) and Leadbetter Point (46°38.17' N. lat.) (Washington state Marine Area 2), recreational fishing for groundfish is prohibited seaward of a boundary line approximating the 30 fm (55 m) depth contour from March 15 through June 15 with the following exceptions: Recreational fishing for rockfish is permitted within the RCA from March 15 through June 15; recreational fishing for sablefish and Pacific cod is permitted within the recreational RCA from May 1 through June 15; and on days that the primary halibut fishery is open lingcod may be taken, retained and possessed within the RCA. Days open to Pacific halibut recreational fishing off Washington are announced on the NMFS hotline at (206) 526–6667 or (800) 662–9825. Retention of lingcod seaward of the boundary line approximating the 30 fm (55 m) depth contour south of 46°58' N. lat. is prohibited on Fridays and Saturdays from July 1 through August 31. For additional regulations regarding the Washington recreational lingcod fishery, see paragraph (c)(1)(iv) of this section. Coordinates for the boundary line approximating the 30 fm (55 m) depth contour are listed in § 660.71.

(*3*) Between Leadbetter Point (46°38.17' N. lat.) and the Washington/Oregon border (Marine Area 1), when Pacific halibut are onboard the vessel, no groundfish may be taken and retained, possessed or landed, except sablefish and Pacific cod from May 1 through September 30.

* * * * *

(iii) *Cabezon.* In areas of the EEZ seaward of Washington that are open to recreational groundfish fishing, there is a 2 cabezon per day bag limit.

(iv) *Lingcod.* In areas of the EEZ seaward of Washington that are open to recreational groundfish fishing and when the recreational season for lingcod is open, there is a bag limit of 2 lingcod per day. The recreational fishing seasons and size limits for lingcod are as follows:

(A) Between the U.S./Canada border and 48°10' N. lat. (Cape Alava) (Washington Marine Area 4), recreational fishing for lingcod is open, for 2011, from April 16 through October 15, and for 2012, from April 16 through October 13. Lingcod may be no smaller than 24 inches (61 cm) total length.

(B) Between 48°10' N. lat. (Cape Alava) and 46°16' N. lat. (Washington/Oregon border) (Washington Marine Areas 1–3), recreational fishing for lingcod is open for 2011, from March 19 through October 15, and for 2012, from March 17 through October 13. Lingcod may be no smaller than 22 inches (56 cm) total length.

* * * * *

(2) * * *

(iii) *Bag limits, size limits.* For each person engaged in recreational fishing off the coast of Oregon, the following bag limits apply:

(A) *Marine fish.* The bag limit is 10 marine fish per day, which includes rockfish, kelp greenling, cabezon and other groundfish species. The bag limit of marine fish excludes Pacific halibut, salmonids, tuna, perch species, sturgeon, sanddabs, flatfish, lingcod, striped bass, hybrid bass, offshore pelagic species and baitfish (herring, smelt, anchovies and sardines). From April 1 through September 30, no more than one fish may be cabezon. The minimum size for cabezon retained in the Oregon recreational fishery is 16 in (41 cm) total length. The minimum size for Kelp greenling retained in the Oregon recreational fishery is 10 in (25 cm).

(B) *Lingcod.* There is a 3 fish limit per day for lingcod From January 1 through December 31. The minimum size for lingcod retained in the Oregon recreational fishery is 22 in (56 cm) total length.

(C) *Flatfish.* There is a 25 fish limit per day for all flatfish, excluding Pacific halibut, but including all soles, flounders and Pacific sanddabs, from January 1 through December 31.

(D) *In the Pacific halibut fisheries.* Retention of groundfish is governed in part by annual management measures for Pacific halibut fisheries, which are published in the **Federal Register.** Between the Oregon border with Washington and Cape Falcon, when Pacific halibut are onboard the vessel, groundfish may not be taken and retained, possessed or landed, except sablefish and Pacific cod. Between Cape Falcon and Humbug Mountain, during days open to the Oregon Central Coast "all-depth" sport halibut fishery, when Pacific halibut are onboard the vessel, no groundfish may be taken and retained, possessed or landed, except sablefish and Pacific cod. "All-depth" season days are established in the annual management measures for Pacific halibut fisheries, which are published in the **Federal Register** and are announced on the NMFS halibut hotline, 1–800–662–9825.

(E) Taking and retaining canary rockfish and yelloweye rockfish is prohibited at all times and in all areas.

(3)* * *

(i)* * *

(A)* * *

(*1*) Between 42° N. lat. (California/Oregon border) and 40° 10.00' N. lat. (Northern Management Area), 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 May 14, 2011 through

October 31, 2011 (shoreward of 20 fm is open); and is closed entirely from January 1 through May 13, 2011 and from November 1 through December 31, 2011. Recreational fishing for groundfish is prohibited seaward of 20 fm (37 m) from May 12, 2012 through October 31, 2012 (shoreward of 20 fm is open), and is closed entirely from January 1 through May 11, 2012 and from November 1, 2012 through December 31, 2012.

(*2*) Between 40°10′ N. lat. and 38°57.50′ N. lat. (Mendocino Management Area), 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 May 14, 2011 through August 15, 2011 (shoreward of 20 fm is open), and is closed entirely from January 1, 2011 through May 13, 2011 and from August 16, 2011 through December 31, 2011; Recreational fishing for groundfish is prohibited seaward of 20 fm (37 m) and from May 12, 2012 through August 15, 2012 (shoreward of 20 fm is open); and is closed entirely from January 1, 2012 through May 11, 2012 and from August 16, 2012 through December 31, 2012.

(*3*) Between 38°57.50′ N. lat. and 37°11′ N. lat. San Francisco Management Area), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of the boundary line approximating the 30 fm (55 m) depth contour along the mainland coast and along islands and offshore seamounts from June 1 through December 31; and is closed entirely from January 1 through May 31. Closures around Cordell Banks (see paragraph (c)(3)(i)(C) of this section) also apply in this area. Coordinates for the boundary line approximating the 30 fm (55 m) depth contour are listed in § 660.71.

(*4*) Between 37°11′ N. lat. and 34°27′ N. lat. (Central Management Area), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of a boundary line approximating the 40 fm (73 m) depth contour along the mainland coast and along islands and offshore seamounts from May 1 through December 31; and is closed entirely from January 1 through April 30 (*i.e.* prohibited seaward of the shoreline). Coordinates for the boundary line approximating the 40 fm (73 m) depth contour are specified in § 660.71.

(*5*) South of 34°27′ N. lat. (Southern Management Area), recreational fishing for all groundfish (except California scorpionfish as specified below in this paragraph and in paragraph (v) of this section 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 December 31 along the mainland coast and along islands and offshore seamounts, 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 California scorpionfish and "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 34°27′ N. lat. is prohibited seaward of a boundary line approximating the 60 fm (110 m) depth contour from January 1 through December 31, except in the CCAs where fishing is prohibited seaward of the boundary line approximating the 30 fm (55 m) depth contour when the fishing season is open. Coordinates for the boundary line approximating the 30 fm (55 m) and 60 fm (110 m) depth contours are specified in §§ 660.71 and 660.72.

(B) *Cowcod conservation areas.* The latitude and longitude coordinates of the Cowcod Conservation Areas (CCAs) boundaries are specified at § 660.70, subpart C. In general, recreational fishing for all groundfish is prohibited within the CCAs, except that fishing for "other flatfish" is permitted within the CCAs as specified in paragraph (c)(3)(iv) of this section. However, recreational fishing for the following species is permitted shoreward of the 20 fm (37 m) depth contour when the season for those species is open south of 34°27′ N. lat.: Minor nearshore rockfish, cabezon, kelp greenling, lingcod, California scorpionfish, and "other flatfish" (subject to gear requirements at paragraph (c)(3)(iv) of this section during January–February). [NOTE: California state regulations also permit recreational fishing for California sheephead, ocean whitefish, and all greenlings of the genus Hexagrammos shoreward of the 20 fm (37 m) depth contour in the CCAs when the season for the RCG complex is open south of 34°27′ N. lat.] It is unlawful to take and retain, possess, or land groundfish within the CCAs, except for species authorized in this section.

(C) *Cordell banks.* Recreational fishing for groundfish is prohibited in waters less than 100 fm (183 m) around Cordell Banks as defined by specific latitude and longitude coordinates at § 660.70, subpart C, except that recreational fishing for "other flatfish" is permitted around Cordell Banks as specified in paragraph (c)(3)(iv) of this section. [Note: California state regulations also prohibit fishing for all greenlings of the genus Hexagrammos, California sheephead and ocean whitefish.]

(D) *Point St. George Yelloweye Rockfish Conservation Area (YRCA).* Recreational fishing for groundfish is prohibited within the Point St. George YRCA, as defined by latitude and longitude coordinates at § 660.70, subpart C, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment.

(E) *South reef YRCA.* Recreational fishing for groundfish is prohibited within the South Reef YRCA, as defined by latitude and longitude coordinates at § 660.70, subpart C, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment.

(F) *Reading Rock YRCA.* Recreational fishing for groundfish is prohibited within the Reading Rock YRCA, as defined by latitude and longitude coordinates at § 660.70, subpart C, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment.

(G) *Point Delgada (North) YRCA.* Recreational fishing for groundfish is prohibited within the Point Delgada (North) YRCA, as defined by latitude and longitude coordinates at § 660.70, subpart C, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment.

(H) *Point Delgada (South) YRCA.* Recreational fishing for groundfish is prohibited within the Point Delgada (South) YRCA, as defined by latitude and longitude coordinates at § 660.70, subpart C, on dates when the closure is in effect. The closure is not in effect at this time. This closure may be imposed through inseason adjustment.

* * * * *

(ii) * * *

(A) * * *

(*1*) Between 42° N. lat. (California/Oregon border) and 40°10′ N. lat. (North Management Area), recreational fishing for the RCG complex is open from May 14, 2011 through October 31, 2011 (*i.e.* it's closed from January 1 through May 13 and from November 1 through December 31 in 2011) and from May 12, 2012 through October 31, 2012 (*i.e.* it's closed from January 1 through May 11 and from November 1 through December 31 in 2012).

(*2*) Between 40°10′ N. lat. and 38°57.50′ N. lat. (Mendocino Management Area), recreational fishing for the RCG Complex is open from May 14, 2011 through August 15, 2011 (*i.e.* it's closed from January 1 through May 13 and August 16 through December 31 in 2011), and from May 12, 2012 through August 15, 2012 (*i.e.* it's closed from January 1 through May 11 and August 16 through December 31 in 2012). (*3*) Between 38°57.50′ N. lat. and 37°11′ N. lat. (San Francisco Management Area), recreational fishing for the RCG complex is open from June 1 through December 31 (*i.e.* it's closed from January 1 through May 31).

(*4*) Between 37°11′ N. lat. and 34°27′ N. lat. (Central Management Area), recreational fishing for the RCG complex is open from May 1 through December 31 (*i.e.* it's closed from January 1 through April 30).

(*5*) South of 34°27′ N. lat. (Southern Management Area), recreational fishing for the RCG Complex is open from March 1 through December 31 (*i.e.* it's closed from January 1 through February 28).

(B) *Bag limits, hook limits.* In times and areas when the recreational season for the RCG Complex is open, there is a limit of 2 hooks and 1 line when fishing for the RCG complex and lingcod. The bag limit is 10 RCG Complex fish per day coastwide. Retention of canary rockfish, yelloweye rockfish, bronzespotted and cowcod is prohibited. Within the 10 RCG Complex fish per day limit, no more than 2 may be bocaccio, no more than 2 may be greenling (kelp and/or other greenlings) and no more than 3 may be cabezon. Multi-day limits are authorized by a valid permit issued by California and must not exceed the daily limit multiplied by the number of days in the fishing trip.

* * * * *

(iii) * * *

(A) * * *

(*1*) Between 42° N. lat. (California/Oregon border) and 40°10.00′ N. lat. (Northern Management Area), recreational fishing for lingcod is open from May 14, 2011 through October 31, 2011 (*i.e.* it's closed from January 1 through May 13 and from November 1 through December 31 in 2011) and from May 12, 2012 through October 31, 2012 (*i.e.* it's closed from January 1 through May 11 and from November 1 through December 31 in 2012).

(*2*) Between 40°10′ N. lat. and 38°57.50′ N. lat. (Mendocino Management Area), recreational fishing for lingcod is open from May 14, 2011 through August 15, 2011 (*i.e.* it's closed from January 1 through May 13 and August 16 through December 31 in 2011) and from May 12, 2012 through August 15, 2012 (*i.e.* it's closed from January 1 through May 11 and August 16 through December 31 in 2012).

(*3*) Between 38°57.50′ N. lat. and 37°11′ N. lat. (San Francisco Management Area), recreational fishing for lingcod is open from June 1 through December 31 (*i.e.* it's closed from January 1 through May 31).

(*4*) Between 37°11′ N. lat. and 34°27′ N. lat. (Central Management Area), recreational fishing for lingcod is open from May 1 through December 31 (*i.e.* it's closed from January 1 through April 30).

(*5*) South of 34°27′ N. lat. (Southern Management Area), recreational fishing for lingcod is open from March 1 through December 31 (*i.e.* it's closed from January 1 through February 28).

* * * * *

(C) *Size limits.* Lingcod may be no smaller than 22 in (56 cm) total length.

(D) *Dressing/filleting.* Lingcod filets may be no smaller than 14 in (36 cm) in length.

* * * * *

[FR Doc. 2011–10799 Filed 5–10–11; 8:45 am]

BILLING CODE 3510–22–P

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY,

Plaintiffs,

v.

JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE,

Defendants.

Case No. CV 10 4829 TEH

[*PROPOSED*] ORDER ON REMEDY

[ALTERNATIVE 1]

After consideration of the parties' cross-motions for summary judgment, supplemental briefings on remedy, and the record in this case, and for the reasons set forth in its December 22, 2011 Order (Docket No. 49) (the "MSJ Order"), the Court hereby declares and orders:

1. Defendants John Bryson, National Oceanic and Atmospheric Administration ("NOAA") and National Marine Fisheries Service ("NMFS") (collectively, "Defendants") violated the Magnuson-Stevens Fishery Management and Conservation Act ("MSA"), 16 U.S.C. §1853a(c)(5)(A)(i), by failing to consider the fishing history beyond 2003 for harvesters and 2004

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

for processors in issuing their initial 2011 individual fishing quotas ("IFQs") as part of the implementing regulations for the fishery management plan for Pacific Whiting levels for 2011 (the "IFQ Regulations").

2. Defendants are directed to SUSPEND the IFQ Regulations for the mothership and shoreside sectors of the Pacific whiting fishery and make no allocations based on the existing IFQ Regulations to any entity operating in those sectors until further order of this Court.

3. The existing IFQ Regulations with respect to IFQ allocations to the mothership and shoreside sectors of the Pacific whiting fishery shall remain suspended pending the implementation of revised, final IFQ Regulations for Pacific whiting that are consistent with the MSA and the MSJ Order; provided, however, that all other fishery management measures for the Pacific whiting fishery that have been issued in accordance with the MSA will remain in effect during this time.

4. The Court will retain jurisdiction over Defendants' actions on remand.

5. Defendants will report regularly to this Court on their progress to meet the requirements of this Order on Remedy. Within three months of the date of issuance of this Order on Remedy, and every three months after that until the adoption of revised, final IFQ Regulations, Defendants will submit a report to the Court regarding their efforts to comply with the Order on Remedy.

IT IS SO ORDERED.

DATED: ____________________________

____
THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

PACIFIC DAWN LLC, CHELLISSA LLC, JAMES AND SANDRA SCHONES, DA YANG SEAFOOD INC., and JESSIE'S ILWACO FISH COMPANY, Plaintiffs, v. JOHN BRYSON[1], Secretary of Commerce, in his official capacity as Secretary of the United States, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, and NATIONAL MARINE FISHERIES SERVICE, Defendants.	Case No. CV 10 4829 TEH **[*PROPOSED*] ORDER ON REMEDY** **[ALTERNATIVE 2]**

After consideration of the parties' cross-motions for summary judgment, supplemental briefings on remedy, and the record in this case, and for the reasons set forth in its December 22, 2011 Order (Docket No. 49) (the "MSJ Order"), the Court hereby declares and orders:

1. Defendants John Bryson, National Oceanic and Atmospheric Administration ("NOAA") and National Marine Fisheries Service ("NMFS") (collectively, "Defendants") violated the Magnuson-Stevens Fishery Management and Conservation Act ("MSA"), 16 U.S.C. §1853a(c)(5)(A)(i), by failing to consider the fishing history beyond 2003 for harvesters and 2004

[1] John Bryson is substituted for defendant Gary Locke pursuant to Fed. R. Civ. Proc. 25(d).

DAVIS WRIGHT TREMAINE LLP

for processors in issuing their initial 2011 individual fishing quotas ("IFQs") as part of the implementing regulations for the fishery management plan for Pacific Whiting levels for 2011 (the "IFQ Regulations").

2. The IFQ Regulations are hereby REMANDED to NMFS for reconsideration and revision based on "current and historical harvest" for harvesters and processors for Pacific whiting within the meaning of 16 U.S.C. §1853a(c)(5)(A)(i) and consistent with the MSA and the MSJ Order.

3. Defendants shall use their best efforts and all available authority, including taking emergency action and interim measures pursuant to 16 U.S.C. §1855(c) as appropriate, to implement revised, final IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012.

4. The existing IFQ Regulations shall remain in effect pending the implementation of revised, final IFQ Regulations for the 2012 Pacific whiting season; provided, however, that if Defendants fail to implement revised IFQ Regulations for the 2012 Pacific whiting season by May 15, 2012, the existing IFQ Regulations will be vacated.

5. The Court will retain jurisdiction over Defendants' actions on remand.

6. Defendants will report regularly to this Court on their progress to meet the requirements of this Order on Remedy.

IT IS SO ORDERED.

DATED: ____________________________

____
THELTON E. HENDERSON, JUDGE
UNITED STATES DISTRICT COURT

Agenda Item F.2
Situation Summary
March 2012

BRIEFING ON AND LIMITED ACTIONS FOR EMERGING ISSUES IN THE 2013-2014 BIENNIAL SPECIFICATIONS PROCESS

A preliminary draft Environmental Impact Statement (DEIS), which analyzes impacts associated with proposed 2013-2014 groundfish harvest specifications and management measures, was recently prepared. A briefing by Council staff is scheduled under this agenda item to discuss some of the results of the DEIS analyses and answer any questions Council members may have. The briefing is designed to help the Council focus their attention on some of the key issues that will be discussed and decided at the upcoming April and June meetings.

In the course of analyzing alternative harvest specifications, two issues emerged that compelled Council staff to recommend the Council deliberate and decide some limited actions under this agenda item. These issues involve 2013-2014 harvest specifications for lingcod and the Other Fish complex.

In November, the Council heard testimony from representatives of the trawl industry explaining the problem with stratifying lingcod harvest specifications north and south of the Oregon-California border at 42° N. latitude. Trawl quotas are allocated by area according to how annual catch limits (ACLs) are specified. Limited entry trawl fishermen are restricted to fishing one management area per trip. The more management lines that are specified in regulation causes the fishery to be further constrained and the prospect of another management line at 42° N. latitude created problems for fishermen fishing out of ports in northern California and southern Oregon. Therefore, the Council proposed shifting the lingcod management line to the existing 40°10’ N. latitude management line, and tasked re-estimation of the appropriate catch values. Subsequent to that November 2011 decision, Dr. Owen Hamel, the author of the 2009 lingcod assessment, analyzed swept area biomass estimates from the NMFS trawl survey and determined that 48 percent of the estimated lingcod biomass south of 42° N. latitude occurred north of 40°10’ N. latitude. Therefore, revised lingcod overfishing limits (OFLs), acceptable biological catches (ABCs), and ACLs that correspond to the 40°10’ N. latitude are provided in Agenda Item F.2.a, Attachment 1 for Scientific and Statistical Committee (SSC) and Council consideration. The Council should review these proposed harvest specifications and the recommendations of the SSC to confirm these specifications.

In September 2011, the Council was advised by the SSC that OFLs and ABCs for the Other Fish complex had to have a scientific basis and should be based on the sum of OFLs and ABCs determined for the component stocks. However, the Other Fish OFLs and ABCs decided at the November 2011 meeting were incomplete since OFL values for seven of the eleven component stocks were missing. Analysis done subsequent to that meeting indicated that these biased harvest specifications would likely cause management problems in the next management cycle. Therefore, Council staff asked scientists at the Northwest and Southwest Fisheries Science Centers to investigate methods for determining OFLs for these component stocks. The proposed methods and OFLs for six of the seven stocks missing OFL values are provided in Agenda Item F.2.a, Attachment 2. Pending SSC approval of the proposed methods and OFLs, the revised OFLs, ABCs, and ACLs for the Other Fish complex provided in Agenda Item F.2.a, Attachment 1 should be considered for 2013 and 2014.

The Council should hear the advice of the SSC, other advisory bodies, and the public before considering adoption of revised harvest specifications for lingcod and the Other Fish complex.

Council Action:

1. Adopt preferred 2013 and 2014 OFLs, ABCs, and ACLs for lingcod and the Other Fish complex.

Reference Materials:

1. Agenda Item F.2.a, Attachment 1: Comparison of harvest specifications decided in November with proposed revised harvest specifications for lingcod and the Other Fish complex.
2. Agenda Item F.2.a, Attachment 2: Deriving estimates of OFL for species in the "Other Fish" complex.
3. Agenda Item F.2.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — John DeVore and Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Consider and Adopt Preferred Alternatives for Emerging Issues, Including Specifications for the Other Fish Stock Complex and Lingcod

PFMC
02/13/12

Agenda Item F.2.a
Attachment 1
March 2012

COMPARISON OF HARVEST SPECIFICATIONS DECIDED IN NOVEMBER WITH PROPOSED REVISED HARVEST SPECIFICATIONS FOR LINGCOD AND THE OTHER FISH STOCK COMPLEX

Revised harvest specifications (mt) for lingcod and the Other Fish complex.

Stock	**2013 OFL**	**2014 OFL**	**2013 ABC**	**2014 ABC**	**2012 ACL**	**2013 ACL**	**2014 ACL**
Lingcod N. of 42º (OR & WA) a/	2,102	1,984	2,010	1,897	2,151	2,010	1,897
Lingcod S. of 42º (CA) a/	2,566	2,454	2,137	2,044	2,164	2,137	2,044
Lingcod N. of 40º10' a/	3,334	3,162	3,036	2,878	NA	3,036	2,878
Lingcod S. of 40º10' a/	1,334	1,276	1,111	1,063	NA	1,111	1,063
Other Fish b/	3,328	3,298	2,286	2,265	5,575	2,286	2,265
Other Fish c/	6,864	6,832	4,739	4,718		4,739	4,718

a/ The Council requested analysis of shifting the lingcod management line from the OR-CA border at 42° N. latitude to 40°10’ N. latitude. An analysis using swept area biomass estimates of lingcod derived from the NWFSC trawl survey indicates 48% of the biomass south of 42° N. latitude occurs north of 40°10' N. latitude. The 40°10' N. latitude management line for lingcod is the Council preferred alternative for lingcod specifications to be analyzed in the DEIS.

b/ Harvest specifications decided in November 2011 were biased low due to missing OFL values for seven component stocks.

c/ Revised harvest specifications based on the methods proposed in Agenda Item F.2.a, Attachment 2 for determining OFLs and using the same basis for the ABCs and ACLs as decided by the Council in November 2011.

PFMC
02/13/12

Deriving estimates of OFL for species in the "Other Fish" complex

Jason Cope
NMFS, NWFSC, FRAM

E.J. Dick and Alec MacCall
NMFS, SWFSC, FED

Seven species (Table 1) currently managed in the "Other fish" complex were lacking proposed OFLs for the 2013-2014 management cycle. The following work proposes OFLs for each of these species, with methods to estimate OFLs for six of the seven species identified (detailed below). Given the lack of any biological and fisheries information on finescale codling and the fact that the overall species complex OFL is the sum of all component species OFLs, an OFL of 0 is proposed for finecalse codling so as to reduce the risk of inflating a complex-level OFL that contains species with variable vulnerabilities (Cope et al. 2011). The authors caution that risk of overfishing for each component stock is difficult to measure when combining small OFLs for targeted species (e.g. cabezon, kelp greenling) with relatively large OFLs for bycatch and underutilized species (e.g. ratfish, Pacific grenadier) into a grouped OFL.

Table 1. Species currently within the "Other Fish" species complex and their associated OFLs (mt) for 2013-2014. The italicized species were previously lacking estimates and are the ones addressed in this work.

Stock	**2013 OFL**	**2014 OFL**
Other Fish Complex	6864	6832
Big skate	*458*	*458*
Cabezon (WA)	*4*	*3*
California skate	*86*	*86*
Finescale codling	*0*	*0*
Kelp greenling (CA)	118.9	118.9
Kelp greenling (OR & WA)	*28*	*27*
Leopard shark	167.1	167.1
Pacific grenadier	*1519*	*1519*
Ratfish	*1441*	*1441*
Soupfin shark	61.6	61.6
Spiny dogfish	2,980	2,950

OFL estimates derived from survey biomass and MSY harvest rates

We estimated Overfishing Limits (OFLs) for four species currently managed in the 'Other Fish' complex by applying approximate MSY harvest rates to estimates of stock biomass from the NWFSC West Coast Bottom Trawl Survey (Keller et al., 2008). We modified the approach of Rogers et al. (1996) to estimate OFLs for Pacific grenadier (*Coryphaenoides acrolepis*), big skate (*Raja binoculata*), California skate (*Raja inornata*), and spotted ratfish (*Hydrolagus colliei*) using the equation

$$OFL = F_{MSY} B_w$$

where F_{MSY} is the fishing mortality rate that maximizes long-term yield, and B_w is an inverse-variance weighted average of recent survey biomass estimates. For all species, we made a simplifying assumption about survey catchability, namely that $q = 1$, which is likely to result in conservative estimates of OFL for species whose range extends beyond survey boundaries or that occupy habitats inaccessible to survey gear.

To estimate F_{MSY} for each species, we took the product of estimates for the natural mortality rate (M) and the ratio F_{MSY}/M. Natural mortality rates were obtained from the literature or estimated from maximum observed ages using Hoenig's method (Hoenig, 1980). Maximum reported ages for Pacific grenadier and big skate were 73 and 26 years, respectively (Andrews et al., 1999; McFarlane and King, 2006). No published estimates of maximum age for California skate were found, so we assume a maximum age equal to that of big skate (26 years). Barnett (2008) reports a range for M of 0.17 – 0.26 for spotted ratfish based on reproductive output. For the ratio F_{MSY}/M, previous studies (e.g. Dick and MacCall, 2011) followed the suggestion of Walters and Martel (2004) that $F_{MSY} = 0.8M$ for demersal groundfish in the northeast Pacific. The present analysis incorporates estimates of F_{MSY}/M, tailored to specific taxonomic groups, from a recent meta-analysis based on more than 200 species (Shijie Zhou, CSIRO; personal communication).

To propagate uncertainty in M and F_{MSY}/M into the OFL estimates, we specified probability density functions for each quantity (Table 2). For Pacific grenadier and the two skate species, we assumed M was lognormally distributed with a species-specific mean and a log-scale standard deviation of 0.4 (CV = 0.417; Dick and MacCall, 2011). Ageing methods for ratfish remain highly imprecise, so we assumed a uniform distribution of M over the range 0.17 – 0.26, following Barnett (2008). The meta-analysis of Zhou (pers. comm.) reports estimates of the mean and CV of the posterior predictive distribution of F_{MSY}/M for teleosts (mean = 0.87, CV = 0.55) and chondrichthyans (mean = 0.41, CV = 0.55). We assume lognormal distributions for F_{MSY}/M.

Trawl survey estimates of abundance were provided by NWFSC staff (A. Keller and B. Horness, personal communication) for the years 2003-2010. Estimates were stratified by year, depth, and INPFC area. We calculated annual biomass and variance estimates as the sum of stratum-specific biomasses and variances within each year (Table 3, Figure 1). To reduce the effect of spurious annual estimates, we assume current biomass is the inverse-variance weighted average over the most recent three years (2008-2010). This approach assumes that no significant changes in abundance occurred during this time period, which is not unreasonable for low-productivity stocks that are not primary targets of the fishery.

Table 2. Assumed distributions for natural mortality (*M*) and F_{MSY} / *M* by species, with associated coefficients of variation (CV). For spotted ratfish, bounds of the assumed uniform distribution on *M* are provided in place of a CV.

	Pacific grenadier	**Big skate**	**California skate**	**Spotted ratfish**
Natural Mortality, M yr^{-1}				
Distribution	lognormal	lognormal	lognormal	uniform
Expected Value	0.053	0.162	0.162	0.215
CV (range)	0.417	0.417	0.417	(0.17, 0.26)
F_{MSY} / *M*				
Distribution	lognormal	lognormal	lognormal	lognormal
Expected Value	0.87	0.41	0.41	0.41
CV	0.55	0.55	0.55	0.55

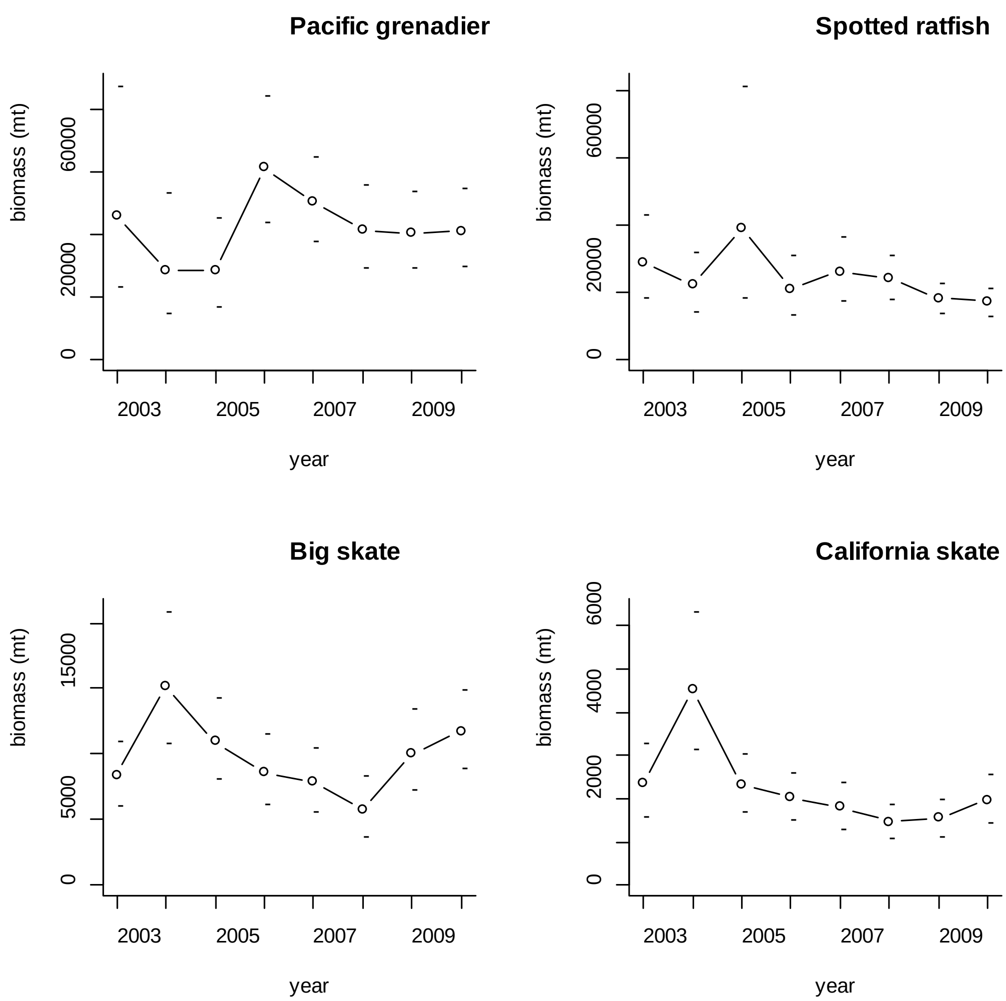


Figure 1. Time series of estimated survey biomass (mt), 2003-2010, with estimated 95% confidence intervals.

Table 3. Biomass estimates (mt) and associated coefficients of variation (CV) from the NWFSC trawl survey, by year and species.

	Pacific grenadier		Big skate		California skate		Spotted ratfish	
Year	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV
2003	45796	34.3%	8331	14.6%	2340	18.4%	28895	21.5%
2004	28564	33.3%	15159	16.7%	4516	17.6%	22086	19.9%
2005	28395	25.1%	10943	14.3%	2336	14.5%	39262	39.0%
2006	61292	16.7%	8587	15.9%	2025	13.8%	21080	20.8%
2007	50235	13.6%	7844	15.7%	1804	15.1%	26030	18.2%
2008	41205	16.3%	5742	20.3%	1463	14.0%	24123	13.8%
2009	40267	15.7%	10070	15.3%	1546	14.2%	18151	12.7%
2010	41007	15.3%	11709	12.8%	1975	14.6%	17125	12.6%

OFL estimates

OFL point estimates are typically based on the median of the OFL distribution, as this statistic represents the catch associated with a 50% probability of overfishing. Median OFLs for Pacific grenadier, big skate, California skate, and spotted ratfish are 1519, 458, 86, and 1441 mt, respectively. Descriptions of the OFL distributions (mean, median, and selected percentiles) for the four species are provided in Table 4. Illustrations of prior distributions for M and F_{MSY}/M, along with derived distributions for weighted average biomass and OFL, are included in Figures 2-5. All distributions were approximated using 1 million Monte Carlo draws.

Table 4. Summary statistics for distributions of OFL (mt) based on estimated survey biomass and MSY harvest rates

		percentile				
Species	**Mean**	**2.5%**	**25%**	**50%**	**75%**	**97.5%**
Pacific grenadier	1882	421	977	1519	2361	5479
Big skate	568	127	294	458	713	1653
California skate	107	24	55	86	134	311
Spotted ratfish	1657	510	1009	1441	2059	4058

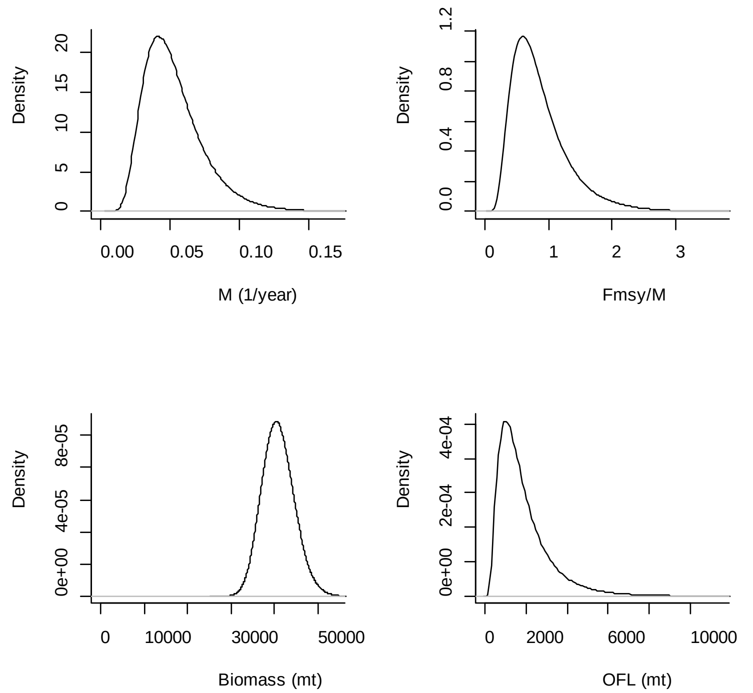


Figure 2. Assumed distributions for M and F_{MSY} /M (upper panels) and distributions of the weighted average survey biomass (2008-2010) and OFL (lower panels) for Pacific grenadier.

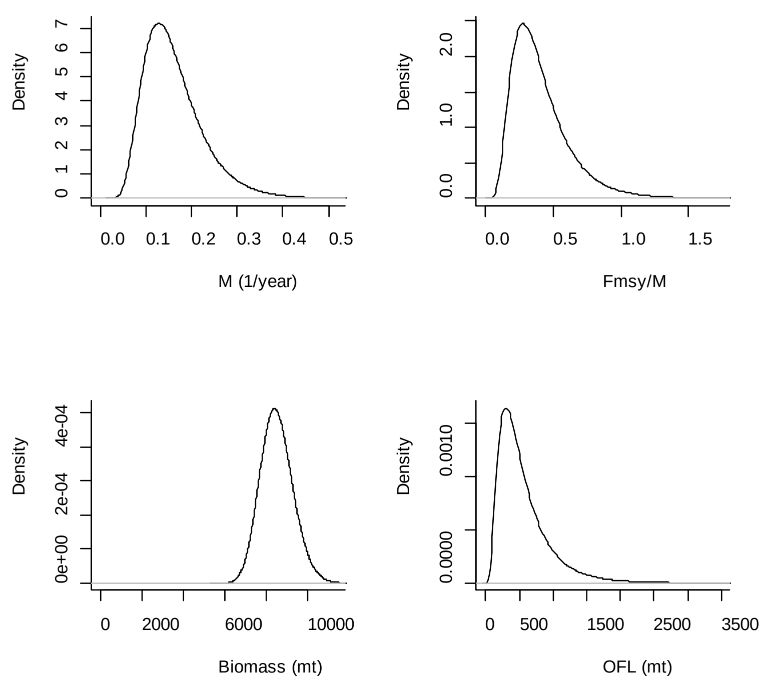


Figure 3. Assumed distributions for M and F_{MSY} /M (upper panels) and distribution of the weighted average survey biomass (2008-2010) and OFL (lower panels) for big skate.

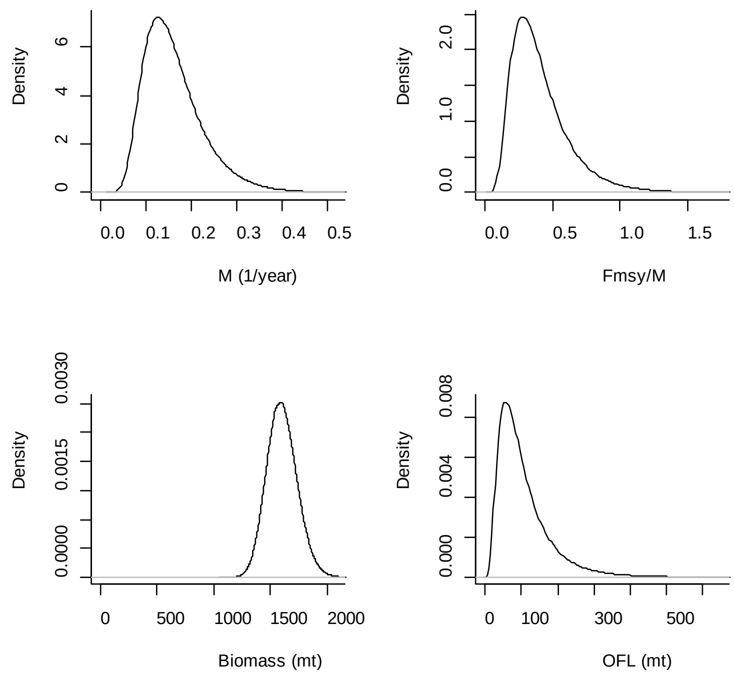


Figure 4. Assumed distributions for M and F_{MSY} /M (upper panels) and distributions of the weighted average survey biomass (2008-2010) and OFL (lower panels) for California skate.

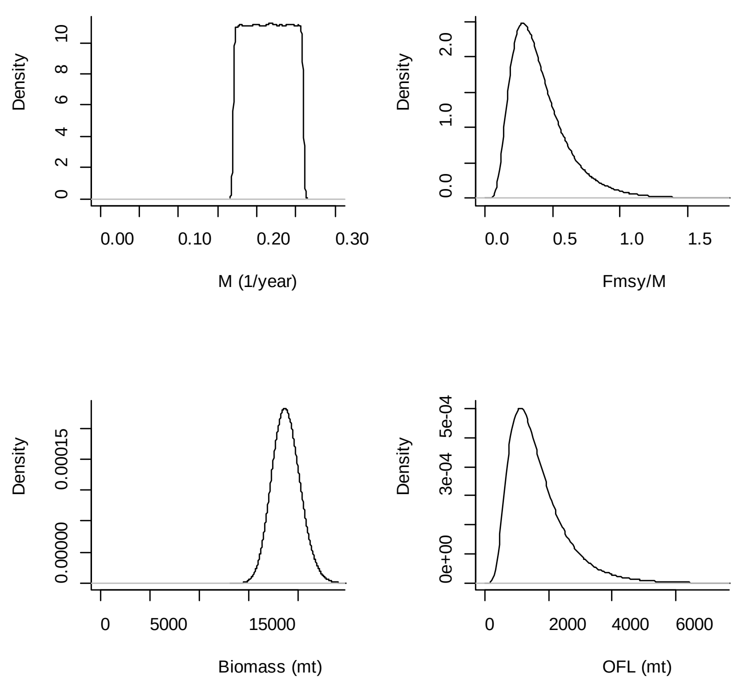


Figure 5. Assumed distributions for M and F_{MSY} /M (upper panels) and distributions of the weighted average survey biomass (2008-2010) and OFL (lower panels) for spotted ratfish.

OFL estimates derived using previous stock assessments

Cabezon (WA)
The 2009 Oregon cabezon assessment (Cope and Key 2009) was used as the base case to forecast catches in 2013 and 2014 for the Washington area. The first step entailed updating commercial and recreational catches in the Oregon assessment and re-running the forecast through 2014 to obtain updated estimates of Oregon OFLs for 2013-2014. Washington catch (recreational only; no commercial catches of cabezon were reported in PacFIN, with the missing RecFIN years 1989-1992 assumed the average of years 1980-1988) was then added to the Oregon assessment data and forecast files and the model re-run using the par file from the Oregon run to maintain input parameter estimates. The resultant OFL values were considered the Washington/Oregon combined estimate of OFL. The Washington contribution to the OFL was then determined by subtracting the Washington/Oregon and Oregon estimates, yielding 3.92 mt and 2.82 mt for 2013 and 2014, respectively.

Kelp greenling (OR/WA)
The 2005 Oregon kelp greenling assessment (Cope and MacCall 2005) was used as the base assessment to which Washington recreational catches (extracted from RecFIN) were added to the catch history up to 2004. Four recreational modes were used in the assessment, so catch was assigned to each mode. Only the combined shore-based mode catches were reported for years 1986-1988, so the harmonic mean of the proportion of the man-made mode to total shore-based catch was calculated, with 1 minus this value assigned as the beach-bank proportion. The shore-based catch for those missing years was then allocated to each mode using these parameters. All modes were missing 1989-1992, years that recreational catch data was not being sampled. Average catch from 1981to 1988 was used to interpolate these values for each mode. Catches for years 2005-2011 were updated in the forecast file, with years 2012-2014 estimated in the forecast file using the 40-10 option.

The resultant OFL for 2013 and 2014 is 28.1 and 27.3, respectively. This is compared to 19.8 and 20.2, respectively, if the Washington catches are not included.

Acknowledgements

We thank Amy Keller and Beth Horness for providing estimates of survey biomass on short notice.

References

Andrews, A. H., G. M. Caillet, and K. H. Cole. 1999. Age and growth of the Pacific grenadier (*Coryphaenoides acrolepis*) with age estimate validation using an improved radiometric ageing technique. Canadian Journal of Fisheries and Aquatic Sciences 56: 1339-1350.

Barnett, L. A. K. 2008. Life history, abundance, and distribution of the spotted ratfish, *Hydrolagus colliei*. Masters thesis, Moss Landing Marine Laboratories, California State University, Monterey Bay. 173 p.

Cope, J.M., J. DeVore, E.J. Dick, K. Ames, J. Budrick, D. Erickson, J. Grebel, G. Hanshew, R. Jones, L. Mattes, C. Niles, S. Williams. 2011. An approach to defining species complexes for U.S. west coast groundfishes using vulnerabilities and ecological distributions. *North American Journal of Fisheries Management* 31: 589-604.

Cope, J.M. and M. Key. 2009. Status of Cabezon (*Scorpaenichthys marmoratus*) in California and Oregon Waters as Assessed in 2009. Pacific Fishery Management Council, 7700 Ambassador Place NE, Suite 200, Portland, OR 97220. 390 pp.

Cope, J.M. and A.D. McCall. 2005. Status of Kelp Greenling (*Hexagrammos decagrammus*) in Oregon and California Waters as Assessed in 2005. Pacific Fishery Management Council, 7700 Ambassador Place NE, Suite 200, Portland, OR 97220. 158 pp.

Dick, E. J. and A. D. MacCall. 2011. Depletion-Based Stock Reduction Analysis: A catch-based method for determining sustainable yields for data-poor fish stocks. Fisheries Research 110: 331-341.

Keller, A. A., B. H. Horness, E. L. Fruh, V. H. Simon, V. J. Tuttle, K. L. Bosley, J. C. Buchanan, D. J. Kamikawa, and J. R. Wallace. 2008. The 2005 U.S. West Coast bottom trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-93, 136 p.

McFarlane, G. A. and J. R. King. 2006. Age and growth of big skate (*Raja binoculata*) and longnose skate (*Raja rhina*) in British Columbia waters. Fisheries Research 78: 169-178.

Rogers, J. B. M. Wilkins, D. Kamikawa, F. Wallace, T. L. Builder, M. Zimmerman, M. Kander, and B. Culver. 1996. Status of the remaining rockfish in the *Sebastes* complex in 1996 and recommendations for management in 1997. Appendix E In Pacific Fishery Management Council Status of the Pacific coast groundfish fishery through 1996 and Recommended Acceptable Biological Catches for 1997. Pacific Fishery Management Council, Portland, OR. 59 p.

Agenda Item F.2.a
Supplemental Attachment 3 PowerPoint
March 2012

2013-14 Harvest Specifications and Management Measures

PFMC
March 2012

Harvest Specifications

Review of Harvest Specifications Actions

- November 2011
  - Adopted final preferred OFLs, ABCs in November 2011
  - Adopted preliminary preferred ACLs

Lingcod Harvest Specifications Realigned at 40º10’ N. latitude

- **Lingcod N:**
  - OFLs: 3,334 mt (2013); 3,162 mt (2014)
  - ABCs & ACLs: 3,036 mt (2013); 2,878 mt (2014)

- **Lingcod S:**
  - OFLs: 1,334 mt (2013); 1,276 mt (2014)
  - ABCs & ACLs: 1,111 mt (2013); 1,063 mt (2014)

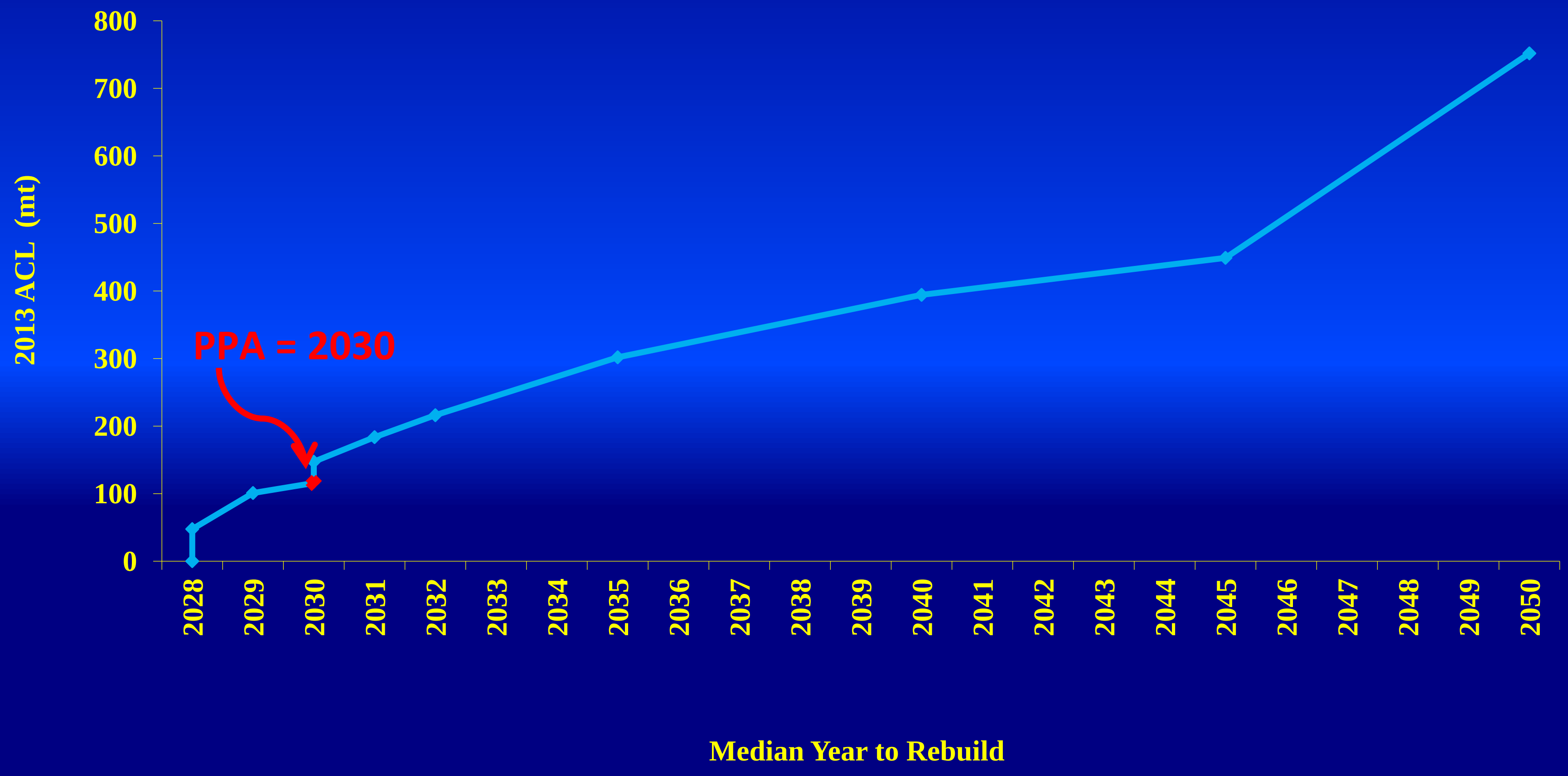
Other Fish Complex
Revised OFLs

Stock	2013 OFL	2014 OFL
Other Fish	**6,864**	**6,832**
Big skate	***458.0***	***458.0***
Cabezon (WA)	***4.0***	***3.0***
California skate	***86.0***	***86.0***
Finescale codling		
Kelp greenling (CA)	***118.9***	***118.9***
Kelp greenling (OR & WA)	***28.0***	***27.0***
Leopard shark	***167.1***	***167.1***
Pacific rattail	***1,519.0***	***1,519.0***
Ratfish	***1,441.0***	***1,441.0***
Soupfin shark	***61.6***	***61.6***
Spiny dogfish	***2,980.0***	***2,950.0***

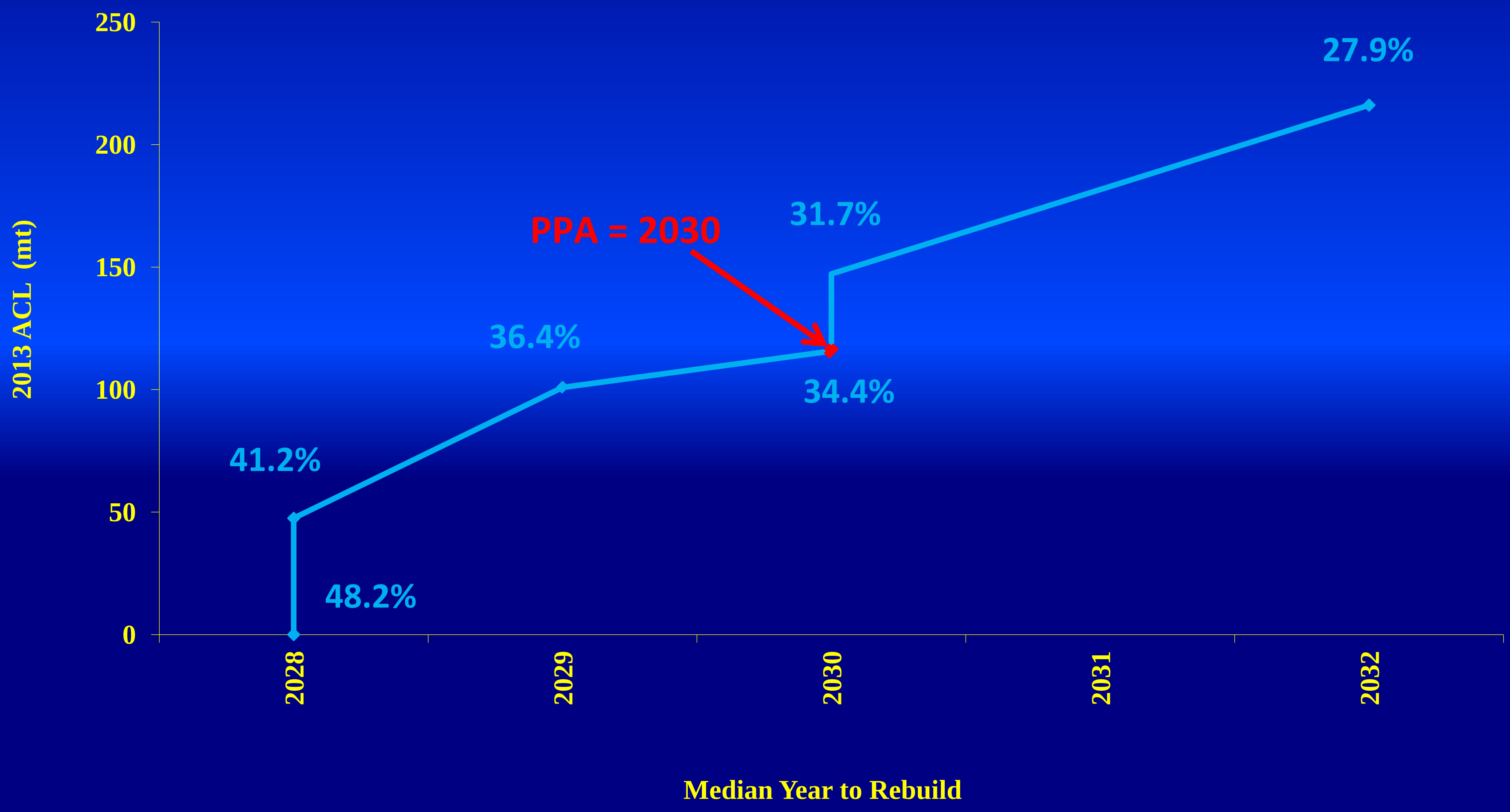
Other Fish Complex Revised Specifications

2013 OFL	6,864
2014 OFL	6,832
2013 ABC & ACL	4,739
2014 ABC & ACL	4,718
2012 ACL	5,575

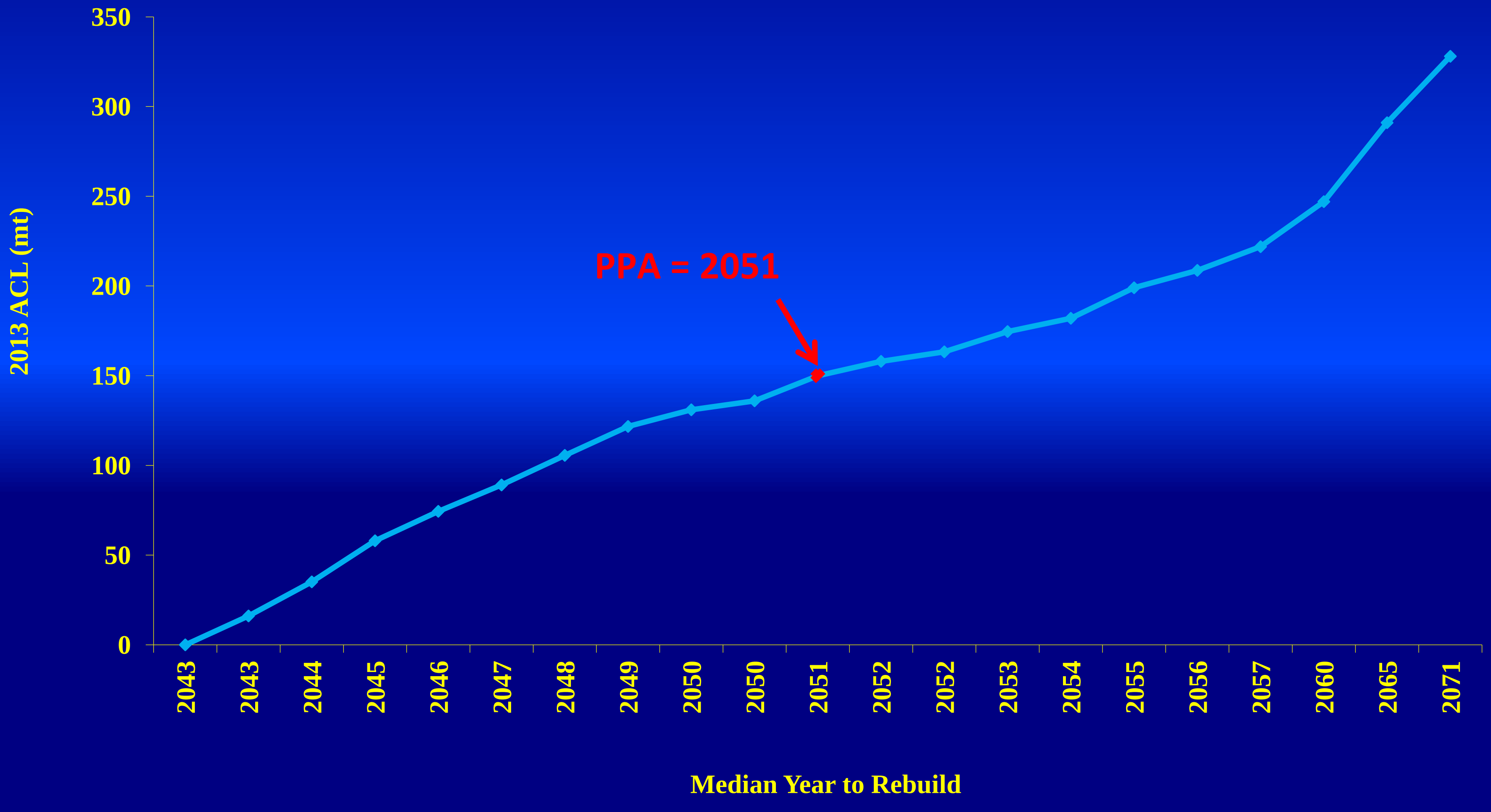
Canary Rebuilding



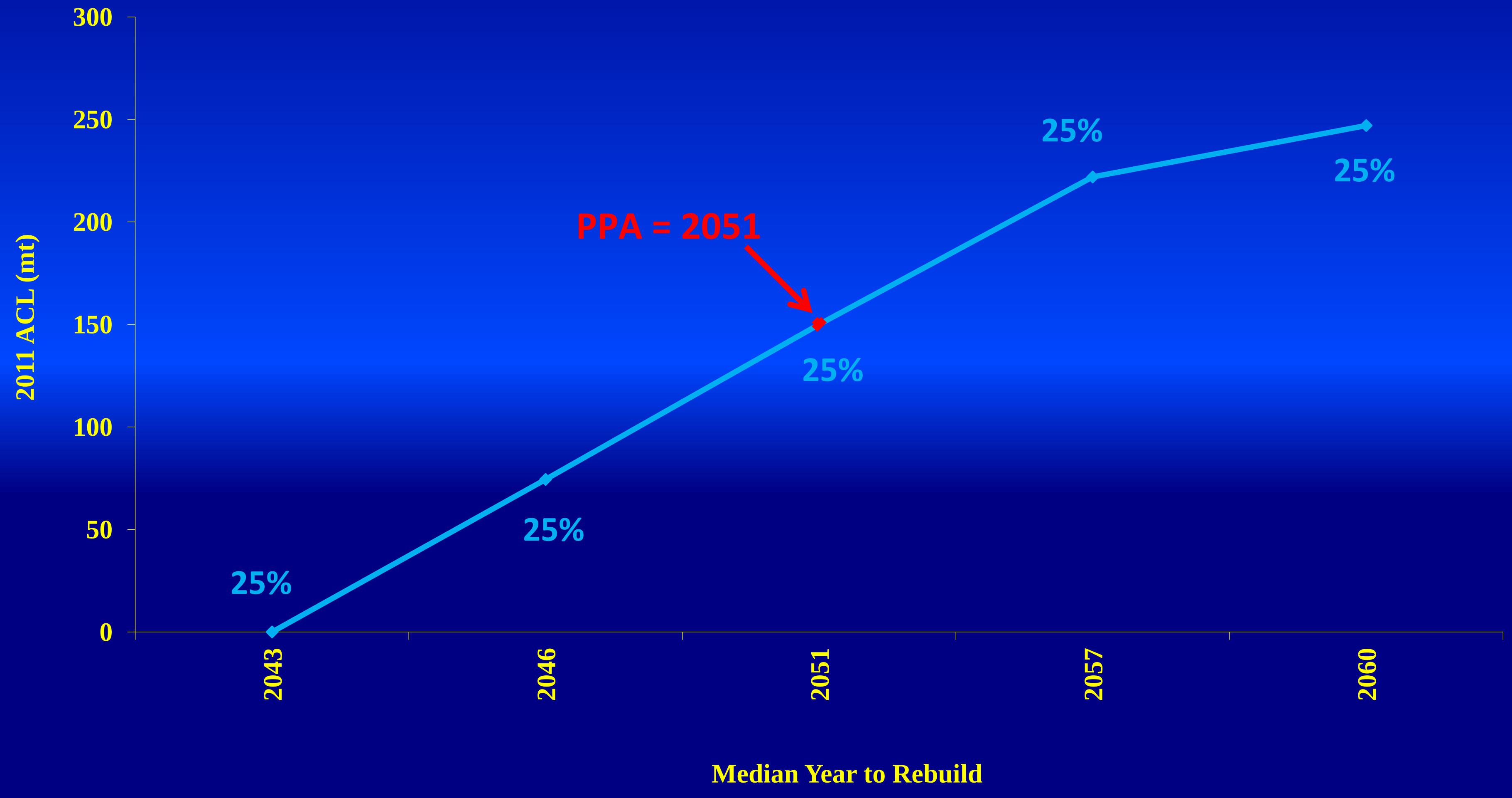
Canary Rebuilding
Analyzed ACL Alts. (with P_{TARGET})



POP Rebuilding



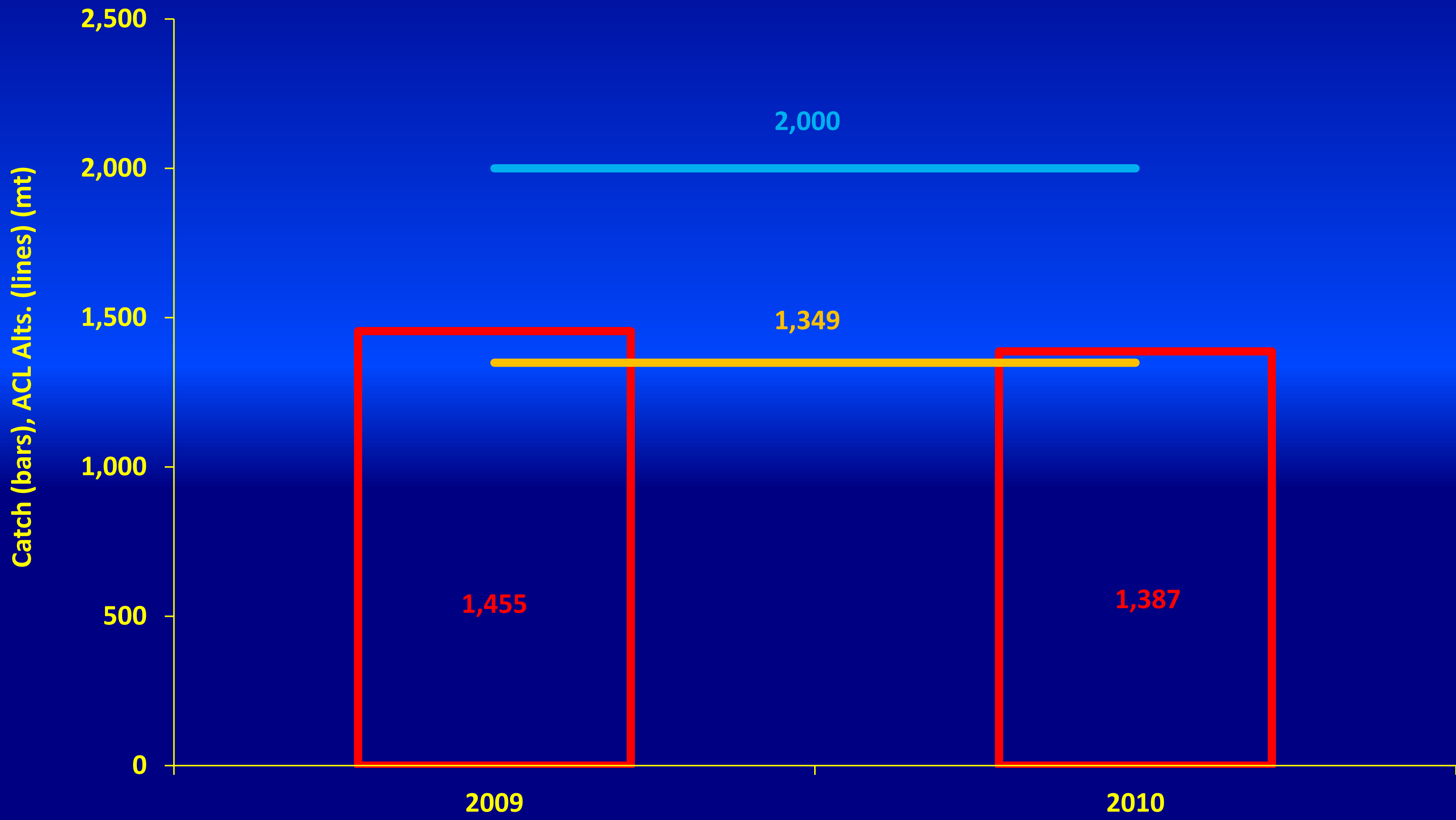
POP Rebuilding
Analyzed ACL alts. (with P_{TARGET})



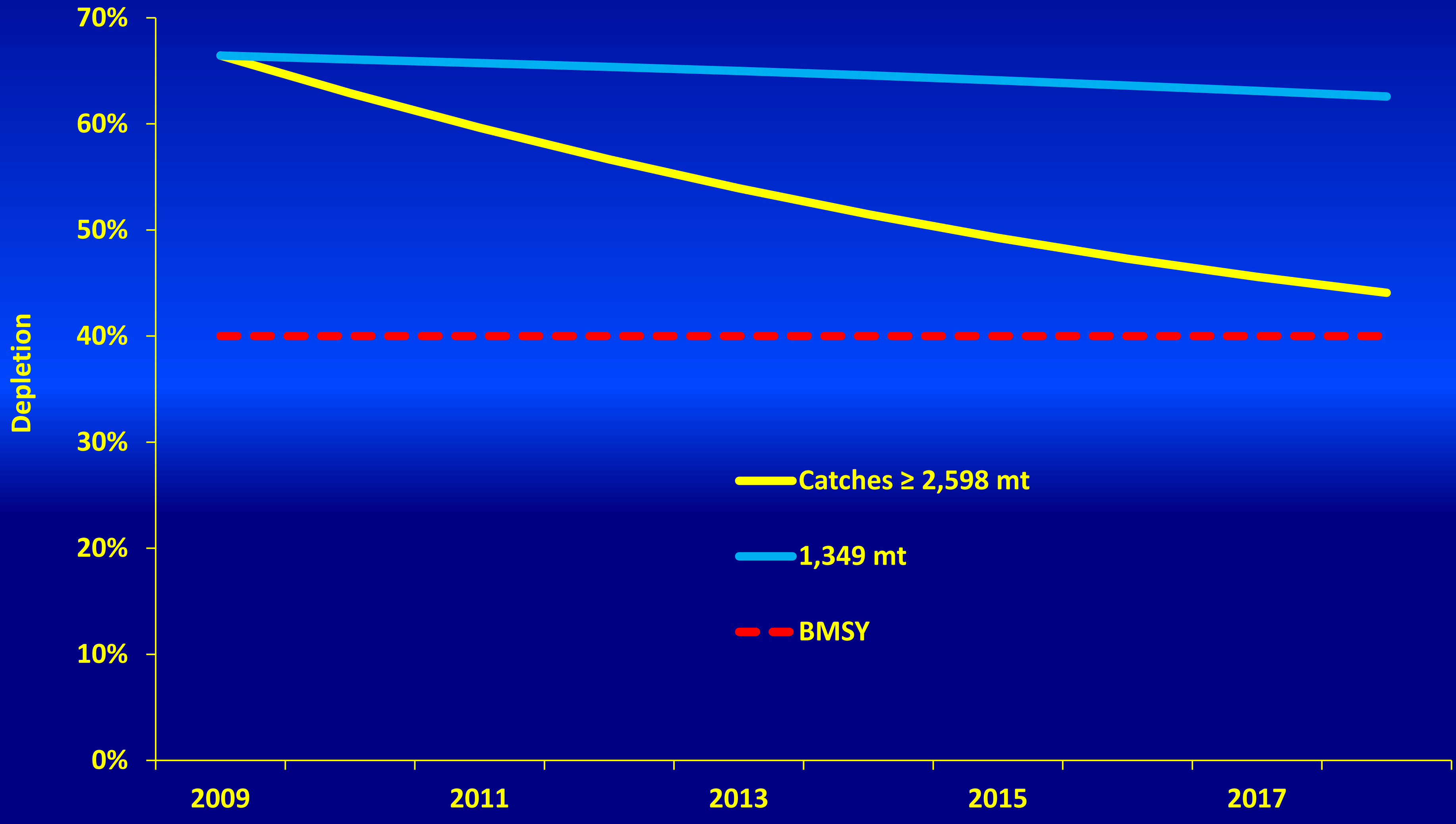
Widow ACLs

- No Action = 600 mt
- ACL alts. = 1,500 mt (PPA) & 2,500 mt
  - Both alts. maintain healthy biomass in next 10 yrs. under base model (h = 0.76)
  - Highest constant catch ACL that maintains biomass above MSST in next 10 yrs. under low productivity model (h = 0.41) = 1,500 mt

Longnose Skate
Recent Catches & ACL Alts.



Longnose Skate
ACL Impact Projections



Integrated Alternatives

Previous Process

Step 1 : Adopt Harvest Specifications for all Species

Step 2: Adopt Management Measures

Proposed Process

Step 1 : Adopt Harvest Specifications for non-OFS

Step 2: Adopt Action Alternatives, including OFS ACLs & Management Measures

2013-2014 FISHERIES

Integrated Alternatives

- An explanation for how each alternative is structured
- Overfished species (OFS) ACLs
- Estimates of non-OFS mortality, given OFS constraints – provides link to harvest specifications decisions
- Two-year allocations for overfished species
- Management measures necessary to stay within the ACLs or to achieve other management objectives (i.e., routine measures)
- Impact analysis of proposed new measures

Structure Behind the Integrated Alternatives

- Designed to clearly demonstrate trade offs in the time to rebuild for OFS
- Demonstrates how the choice of OFS ACLs constrains fishing opportunities by
  - sector
  - north and south of 40°10 N. lat.
  - shelf and slope

2013 Integrated Alternatives

	No Action	1 - PPA	2	3	4	5	6	7
Bocaccio	274	320						
Canary	107	116	101	116	48	216	101	147
Cowcod	3	3						
DRK	296	317						
POP	183	150	150	74	247	74	222	222
Petrale	1,160	2,592						
YE	17	18						

2014 Integrated Alternatives

	No Action	1 - PPA	2	3	4	5	6	7
Bocaccio	274	337						
Canary	107	119	104	119	49	220	104	151
Cowcod	3	3						
DRK	296	330						
POP	183	153	153	76	251	76	226	226
Petrale	1,160	2,652						
YE	17	18						

New Management Measures

- Changes to the waypoints that define RCA boundaries
- Sorting requirements north of 40°10 N. lat for aurora, shortraker, and rougheye
- Catch accounting between limited entry and open access
- Widow rockfish within trawl allocation

New Management Measures – con't

- Shorebased IFQ accumulation limits
- Shorebased carry-over
- Remove or modify the lingcod length limit
- Recreational shelf rockfish retention in the CCA
- Remove the bocaccio size limit

Widow Allocations

- A21 trawl alloc. = 91% of Fishery HG
- A21 within-trawl alloc.:
  - 500 mt or 10% of trawl alloc., whichever is greater, to whiting sectors (apportioned according to whiting alloc. %s)
  - Shoreside whiting allocation (42%) is added to the shoreside non-whiting allocation to determine the shorebased IFQ allocation
  - at-sea in 2012 = 147.9 mt
  - at-sea in 2013-14 under PPA ACL = 290 mt
- At-sea alloc. alts. (no PPA yet) = 147.9 mt, 200 mt, 250 mt, 290 mt, & 300 mt

Considerations for Deciding Widow Trawl Sector Allocations

- Shorebased IFQ sector benefits from max. widow alloc. since a healthy widow stock is targeted
- At-sea sectors need enough widow to attain whiting allocations (a low widow allocation can limit opportunities)
- Lower widow bycatch rates later in the season
- Lower widow bycatch rates when whiting are abundant

Trawl Sector Widow Allocation Alts. vs. Max. 2005-11 Widow Catch

ACL Alt.	Widow Alloc. Alt.	At-sea Trawl	SB IFQ Alloc.	MS Alloc.	CP Alloc.
Max. 2005-11 widow catch			124	73	73
600	SQ (A21)	290	181	120	170
	Alt. 1	147.9	323	61	86.7
	Alt. 2	200	271	83	117
	Alt. 3	250	221	103	147
	Alt. 4	300	171	124	176
1,500	SQ (A21)	290	1,000	120	170
	Alt. 1	147.9	1,142	61	87
	Alt. 2	200	1,090	83	117
	Alt. 3	250	1,040	103	147
	Alt. 4	300	990	124	176
2,500	SQ (A21)	290	1,910	120	170
	Alt. 1	147.9	2,052	61	87
	Alt. 2	200	2,000	83	117
	Alt. 3	250	1,950	103	147
	Alt. 4	300	1,900	124	176

Notable Modifications to Existing Management Measures

- **Sablefish trip limit reductions**
- **Regulatory adjustment to the primary to DTL fishery**
- **Trip limit adjustments to blackgill rockfish south of 40°10**
- **RCA and trip limit adjusts for spiny dogfish and longnose skate**
- **Increase the California recreational bocaccio bag limit**
- **Increase the California recreational greenling bag limit**

Socioeconomic Impacts

Ex-vessel Revenue, Personal Income Change from No Action

	No Action	1 - PPA	2	3	4	5	6	7
Canary	107	116	101	116	48	216	101	147
POP	183	150	150	74	247	74	222	222

Change in ex-vessel revenue from No Action (commercial “A” suboption only)

Sector	No Action	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Shoreside Whiting	23,650	-1.2%	-1.2%	-9.7%	-10.9%	-9.7%	-0.5%	-0.5%
Shoreside Nonwhiting Trawl	26,912	-11.8%	-11.8%	-23.2%	-19.2%	-23.2%	-11.7%	-11.7%
Shoreside LE Fixed Gear	19,068	-19.8%	-19.8%	-19.8%	-19.8%	-19.8%	-19.8%	-19.8%
Shoreside Nearshore OA	4,218	17.4%	17.4%	17.4%	-16.5%	17.4%	17.4%	17.4%
Shoreside Non-nearshore OA	7,687	-18.7%	-18.7%	-18.7%	-18.7%	-18.7%	-18.7%	-18.7%
Shoreside Incidental OA	151	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Shoreside Tribal (incl. whiting)	11,825	-8.8%	-8.8%	-8.8%	-8.8%	-8.8%	-8.8%	-8.8%
Total	**93,512**	**-9.6%**	**-9.6%**	**-15.0%**	**-15.7%**	**-15.0%**	**-9.4%**	**-9.4%**

Change in personal income from No Action (commercial “A” suboption only)

Community Groups	No Action	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Puget Sound	2,376	-21.40%	-21.40%	-25.70%	-21.60%	-25.70%	-21.40%	-21.40%
Washington Coast	16,905	-11.50%	-11.50%	-17.90%	-16.20%	-17.90%	-11.50%	-11.50%
Astoria-Tillamook	27,877	-6.80%	-6.80%	-19.90%	-20.90%	-19.90%	-6.10%	-6.10%
Newport	16,025	-9.70%	-9.70%	-12.10%	-13.60%	-12.10%	-9.50%	-9.50%
Coos Bay-Brookings	13,881	-13.00%	-13.00%	-14.60%	-17.70%	-14.60%	-13.00%	-13.00%
Crescent City-Eureka	7,937	-11.40%	-11.40%	-21.90%	-11.40%	-21.90%	-11.20%	-11.20%
Fort Bragg - Bodega Bay	5,786	-10.40%	-11.20%	-11.70%	-8.60%	-11.70%	-11.20%	-11.20%
San Francisco Area	7,616	-3.90%	-3.90%	-4.00%	-8.20%	-4.00%	-3.90%	-3.90%
Santa Cruz - Monterey - Morro Bay	13,948	3.30%	3.30%	3.10%	-8.00%	3.10%	3.30%	3.30%
Santa Barbara - Los Angeles - San Diego	52,167	0.10%	0.10%	0.10%	0.00%	0.10%	0.10%	0.10%
Coastwide Total	164,518	-5.50%	-5.50%	-9.30%	-10.20%	-9.30%	-5.40%	-5.40%

Socioeconomic Impacts

Projected Ex-vessel Revenue Change from Baseline (2005-10)

	No Action	1 - PPA	2	3	4	5	6	7
Canary	107	116	101	116	48	216	101	147
POP	183	150	150	74	247	74	222	222

By commercial fishery sector, commercial "A" suboptions

		No Action	1	2	3	4	5	6	7
Shoreside Whiting	*11,141*	+112%	+110%	+110%	+92%	+89%	+92%	+111%	+111%
Shoreside Nonwhiting Trawl	*27,824*	-3%	-15%	-15%	-26%	-22%	-26%	-15%	-15%
Shoreside LE Fixed Gear	*13,796*	+38%	+11%	+11%	+11%	+11%	+11%	+11%	+11%
Shoreside Non-nearshore OA	*3,756*	+105%	+66%	+66%	+66%	+66%	+66%	+66%	+66%
Shoreside Tribal (incl. whiting)	*6,376*	+85%	+69%	+69%	+69%	+69%	+69%	+69%	+69%
Shoreside Nearshore OA (suboption A)	*3,185*	+32%	+55%	+55%	+55%	+11%	+55%	+55%	+55%
Shoreside Nearshore OA (suboption B)		N/A	+49%	+49%	+49%	-16%	+49%	+49%	+49%
All other groundfish landings*	*$1,138*								
Total % change (suboption A)		+41%	+28%	+28%	+20%	+19%	+20%	+28%	+28%
Total change $000 (suboption A)	*$67,218*	$27,281	$18,302	$18,302	$13,221	$12,583	$13,221	$18,483	$18,483

By community group, commercial "A" suboptions

Community Groups	**Baseline (2005-10)**	**No Action**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**
Puget Sound		-54%	-64%	-64%	-66%	-64%	-66%	-64%	-64%
Washington Coast		+71%	+52%	+52%	+46%	+47%	+46%	+52%	+52%
Astoria-Tillamook		+77%	+64%	+64%	+40%	+40%	+40%	+65%	+65%
Newport		+37%	+20%	+20%	+16%	+14%	+16%	+20%	+20%
Coos Bay-Brookings		+16%	-1%	-1%	-3%	-8%	-3%	-1%	-1%
Crescent City-Eureka		-7%	-19%	-19%	-30%	-21%	-30%	-19%	-19%
Fort Bragg - Bodega Bay		+18%	-0%	-0%	-1%	-14%	-1%	-0%	-0%
San Francisco Area		-1%	-17%	-17%	-17%	-19%	-17%	-17%	-17%
Santa Cruz - Monterey - Morro Bay		+69%	+82%	+82%	+82%	+71%	+82%	+82%	+82%
Santa Barbara - Los Angeles - San Diego		+45%	+48%	+48%	+48%	+46%	+48%	+48%	+48%
Total (% change from baseline)		**+39%**	**+26%**	**+26%**	**+18%**	**+17%**	**+18%**	**+26%**	**+26%**
Total ($000 change from baseline)	**67,216**	**26,296**	**17,316**	**17,316**	**12,235**	**11,598**	**12,235**	**17,498**	**17,498**

Comparison of Commercial "A" and "B" Suboptions

Average annual 2005-10 ex-vessel revenue by the nearshore open access fishery (dollars and percent of total groundfish ex-vessel revenue in the community group), and difference in ex-vessel revenue impacts ($,000) between suboption B and suboption A under each alternative by community group.

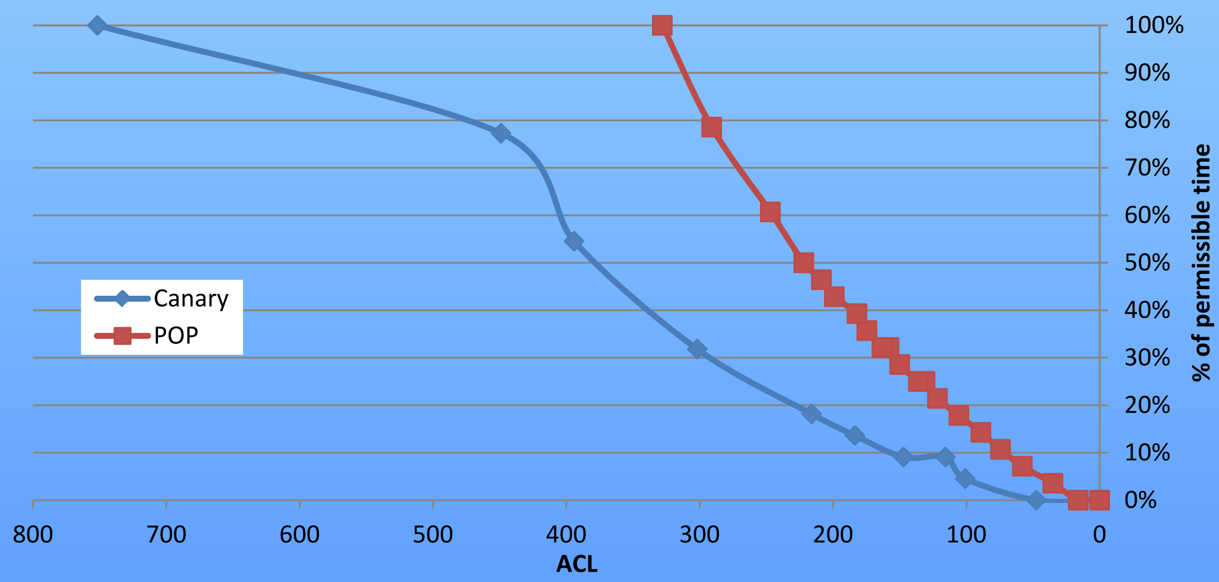
	Nearshore OA Baseline		Integrated Action Alternatives						
Community Group	**$,000**	**Pct.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Puget Sound		0%		(Difference in exvessel revenue)					
Washington Coast	<1	<1%							
Astoria-Tillamook	125	1%	-23	-23	-23	0	-23	-23	-23
Newport	23	0%	-8	-8	-8	0	-8	-8	-8
Coos Bay-Brookings	854	9%	-163	-163	-163	0	-163	-163	-163
Crescent City-Eureka	479	8%	0	0	0	-164	0	0	0
Fort Bragg - Bodega Bay	248	7%	0	0	0	-81	0	0	0
San Francisco Area	136	9%	0	0	0	-41	0	0	0
Santa Cruz - Monterey - Morro Bay	1,116	30%	0	0	0	-486	0	0	0
Santa Barbara - Los Angeles - San Diego	226	10%	0	0	0	-61	0	0	0
Coastwide Difference			-194	-194	-194	-833	-194	-194	-194

Integrated Alternatives: Rebuilding

Percent of "permissible" rebuilding time (T_{TARGET}-$T_{F=0}$ / T_{MAX} – $T_{F=0}$)

	No Action	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Bocaccio	17%							
Canary	5%	9%	5%	9%	0%	18%	5%	9%
Cowcod	22%							
Darkblotched	5%							
POP	39%	29%	29%	11%	61%	11%	50%	50%
Petrale	0%							
Yelloweye	55%							
Overall Assessment		**4**	**3**	**1**	**7**	**2**	**5**	**6**

ACL – rebuilding tradeoff: Amount of ACL foregone for each year closer to $T_{F=0}$
Canary: 34 mt /year POP: 12 mt/year (ACL/ "permissible" rebuilding period)



Integrated Alternatives: Summary of Impacts

	1 - PPA	2	3	4	5	6	7
Canary	116	101	116	48	216	101	147
POP	150	150	74	247	74	222	222

Ranking of impacts, 1 = least adverse / most beneficial

	Commercial "A" suboption							Rec
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 4B
Socioeconomic Impacts (Revenue & Income)								
Commercial Fishery Impacts	3	3	5	7	5	1	1	
Recreational Fishery Impacts	1	2	2	7	2	2	2	8
Community Impacts	3	3	5	7	5	1	1	
Stock Rebuilding (Target Year)								
Canary	4	2	4	1	7	2	4	
POP	3	3	1	7	1	5	5	
Overall Ranking	**4**	**2**	**5**	**7**	**6**	**1**	**2**	

Next Steps

- March
  - Adopt preferred 2013-2014 OFLs, ABCs, ACLs for lingcod and Other Fish complex
- April
  - Adopt preferred harvest specifications and management measures
- June
  - Final action

Agenda Item F.2.b
Supplemental GAP Report
March 2012

GROUNDFISH ADVISORY SUBPANEL REPORT ON LIMITED ACTIONS FOR EMERGING ISSUES IN THE 2013-14 BIENNIAL SPECIFICATIONS PROCESS

The Groundfish Advisory Subpanel (GAP) discussed emerging issues under Agenda Item F.2.

Widow rockfish

The GAP discussed the November 2011 action by the Council concerning widow rockfish. The motion that passed addressed the sector allocation of widow rockfish within the trawl fishery between at-sea and shorebased sectors, and would freeze the current individual fishing quota (IFQ) allocations of widow rockfish at their current levels.

The GAP has no problem with the sector allocations; however it is greatly concerned that alternatives are not being considered for IFQ allocations now that widow rockfish are no longer listed as overfished.

The current allocations are based entirely upon bycatch needs in the past at a time when widows rockfish was considered overfished. The GAP believes that other approaches should be explored for the distribution of quota for the future when widows will be part of a target fishery.

We are asking the Council give consideration to expanding the alternatives for quota share allocations of widow rockfish.

Lingcod management line

The GAP still supports of the use of the 40°10’ line to manage lingcod.

OFLs and ACLs

We also reviewed the overfishing limits and annual catch limits for the “other fish” complex and don’t feel the proposed changes will have any constraint on existing fisheries at those levels.

PFMC
03/03/12

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON BRIEFING ON AND LIMITED ACTIONS FOR EMERGING ISSUES IN THE 2013-214 BIENNIAL SPECIFICATIONS PROCESS

The Scientific and Statistical Committee (SSC) reviewed methods and estimates for overfishing limits (OFLs) and acceptable biological catch (ABC) for lingcod North and South of 40°10' N Latitude (Agenda Item F.2.a, Attachment 1) and methods and OFL estimates for six species included in the "Other Fish" complex (Agenda Item F.2.a, Attachment 2). The SSC also discussed a supplemental document developed by the Groundfish Management Team (GMT) on skate and shark discard mortality. Mr. John Devore and Dr. Jason Cope were present to summarize materials and answer questions.

At the November 2011 meeting, the Council suggested shifting the lingcod management line from 42° to 40°10' N Latitude to address concerns raised by representatives of trawl industry. The revised estimates for lingcod OFLs, ABCs and annual catch limits (ACLs) were developed using proportions of lingcod North and South of 40°10', estimated from survey biomass by Dr. Owen Hamel, the author of the 2009 lingcod assessment. The SSC discussed methods used to estimate OFLs and agreed that they are conceptually sound and can be used for lingcod harvest specifications.

Dr. Jason Cope described methods used to estimate OFLs for six species in the "Other Fish" complex, previously lacking contribution OFL values for the 2013-2014 management cycle. OFLs for four species (Pacific grenadier, spotted ratfish, big skate and California skate) were calculated using survey biomass and maximum sustainable yield (MSY) harvest rate estimates, while OFLs for the other two species (cabezon in Washington and kelp greenling in Washington/Oregon) were estimated using previously accepted assessment models where additional catch was added to account for areas that were not included in the original assessment. The SSC endorses the methods and OFL estimates based on survey biomass and MSY harvest rates, although cautions that several strong assumptions were made. Further evaluation of the methods would require a review of background materials used to estimate OFLs, such as the meta-analyses of the ratio of the MSY harvest rate to natural mortality rate.

The SSC does not endorse the OFLs for cabezon in Washington and kelp greenling in Washington/Oregon estimated by modifying previous assessment models (adding extra catch), since the interplay between amounts of catch used in the model, model parameters and estimated OFLs was found to be counterintuitive, and further exploration is required to address this issue.

It should be noted that methods used to derive these OFL estimates are a short-term solution for the "Other Fish," since the complex is expected to be restructured during the next management cycle. The SSC recommends that the OFLs and ABCs for the "Other Fish" complex be set equal to the sum of the OFLs and ABCs for the species in the complex for which these values are available. The revised harvest specifications for "Other Fish" endorsed by the SSC to use in 2013-2014 cycle are provided in Table 1.

Finally, the SSC discussed the supplemental report provided by the GMT on discard mortality of longnose skate and spiny dogfish. Stock assessments for both species assume less than 100 percent discard mortality, and the GMT requested advice on whether management should follow assumptions used in stock assessments while calculating total mortality for these two species. The SSC recommends discard mortality assumptions be consistent between assessments and management. Although the discard mortality assumptions used in the assessments are based on very limited information, they represent the best information available. The SSC recommends that this information be used for management of these two species.

Table 1. Revised harvest specifications (in mt) for "Other Fish" complex.

Stock Complex	**2013 OFL**	**2014 OFL**	**2013 ABC**	**2014 ABC**	**2012 ACL**	**PPA ACLs**	
						2013	**2014**
Other Fish	6,832	6,802	4,717	4,697	5,575	4,717	4,697

PFMC
03/05~~3~~/12

Agenda Item F.2.c
Public Comment
March 2012

North Coast Fishing Association
P. O. Box 2075, Fort Bragg, CA 95437

February 8, 2012

Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Council,

On behalf of NCFA (North Coast Fishing Association), thank you for the opportunity to offer public input on the 2013-2014 Rockfish season.

It is our understanding that the past and current rockfish seasons for the North Central region north of Point Arena has been set for May 15th through August 15th out of concern for Yelloweye rockfish. This extremely short season has a negative impact on related businesses and limits opportunities unnecessarily.

NCFA believes that data collected for the DFG and the PFMC clearly shows minimal Yelloweye contact for recreational anglers south of Point Vizcaino. Collected data likewise shows the area to be highly concerned with is Shelter Cove, specifically an area known as the " Hat".

The PFMC has put a boundary line below the Hat and well above Noyo Harbor. We recommend that line be used to create a new management zone with a longer rockfish season, opening on May 15th and running through October 31st. The maximum depth limit should remain at 120 feet (20 fathoms), thus further minimizing Yelloweye contact. We believe the data justifies this action and feel the change should be implemented for the 2013-2014 seasons or sooner.

NCFA is a 501c non-profit organization that promotes recreational fishing opportunities and participates in good stewardship projects. In the past two years, NCFA has given out over 1500 fish decsenders and fish ID charts free of charge to recreational anglers. We are grateful to the game wardens and DFG biologists that partnered with us on this project, and we intend to continue this project going forward.

Thank You again for this opportunity to participate in the process.

Sincerely,

John Gebers, President
North Coast Fishing Association

Cc: Maria Vojkevich, California Department of Fish and Game
John Budrick, California Department of Fish and Game

OREGON TRAWL
COMMISSION

February 1, 2012

Dan Wolford
Chairman, Pacific Fisheries Management Council
7700 NE Ambassador Way, Suite 101
Portland Oregon 97220

Re: Widow Rockfish Allocation

Dear Chairman Wolford,

I am writing to you about my concerns with the proposed allocation of Widow Rockfish for the 2013-2014 biennium. While it was certainly a great day to see Widow Rockfish declared rebuilt, I believe that the Council may have erred in how it dealt with the long term allocation of this species and the effect on the fleet that historically caught them.

During Council deliberations, it was mentioned that the Council should retain the status quo allocation this management cycle and the issue could then be revisited in the next management cycle (2015-16). I believe that this option is fatally flawed, as quota shares can be traded in January 2013 and it will be very difficult (if not impossible) to reallocate at a later date.

In reviewing the MSA requirements to establish procedures that ensure fair and equitable allocations it appears that the Council neglected to take into account any of the considerations that were explicitly mentioned in the act; (i) current and historical harvests; (ii) employment in the harvesting and processing sectors; (iii) investments in, and dependence upon, the fishery; and (iv) the current and historical participation of fishing communities.

With that, I believe that the decision to use the current allocation formula, as an interim allocation for overfished species, lacked proper deliberation and consideration. The Widow Rockfish fishery historically was a targeted fishery, in which mid-water gear and unique electronics are used in harvesting. Unfortunately, the current allocation proposal assigns the fish as bycatch with the result that vessels that don't have the equipment to catch the fish and never historically participated in the fishery receive the major allocation.

I believe that the Council needs to revisit this issue and use the initial allocation formula as used for all other target species as a starting point. The combination of using a permit's landing history and the equal sharing component ensures that the vessels that need some Widow Rockfish for incidental catch get it, but it also respects the historical participants in the directed fishery.

If you have any questions, please don't hesitate to contact me for further information or comments.

Sincerely,

Brad Pettinger
Director
Oregon Trawl Commission

Cc: Don McIsaac
Frank Lockhart

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Agenda Item F.3
Situation Summary
March 2012

NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) Northwest Region (NWR) will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Pacific Fishery Management Council (Council). Recent *Federal Register* notices are provided in Agend Item F.3.b, Attachment 1. The NWR will also discuss the groundfish fishery consultation process for protected species, including the risk assessment (Agenda Item F.3.b, Attachment 2, [*on Briefing Book website and CD Only*]) and the biological opinion (Agenda Item F.3.b, Attachment 3 [*on Briefing Book website and CD Only*]).

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

Council Task:

1. Discussion.

Reference Materials:

1. Agenda Item F.3.b, Attachment 1: *Federal Register* Notices Published Since the Last Council Meeting.
2. Agenda Item F.3.b, Attachment 2: Risk Assessment of U.S. West Coast Groundfish Fisheries to Threatened and Endangered Marine Species **(*On Briefing Book website and CD Only*)**.
3. Agenda Item F.3.b, Attachment 3: Endangered Species Act Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination **(*On Briefing Book website and CD Only*)**.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Regulatory Activities — Frank Lockhart
c. Fisheries Science Center Activities — John Stein and Michelle McClure
d. Reports and Comments of Advisory Bodies and Management Entities
e. Public Comment
f. Council Discussion

PFMC
02/08/12

Agenda Item F.3.b
Attachment 1
March 2012

***FEDERAL REGISTER* NOTICES**
Groundfish and Halibut Notices
from 10/12/11 to 2/10/2012

Documents available at NMFS Sustainable Fisheries Groundfish Web Site
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/index.cfm

2012-02-03
77FR5473: Proposed changes to Pacific Halibut Catch Sharing Plan for International Pacific Halibut Commission's regulatory Area 2A off Washington, Oregon and California; request for comments

2012-01-19
77FR2655: Reapportionment of nonwhiting catch allocations from mothership sector to catcher/processor sector in Pacific Coast Groundfish Fishery; request for comments

2011-12-21
76FR79122: Inseason adjustments to biennial groundfish management measures in Pacific Coast Groundfish Fishery; request for comments

2011-12-13
76FR77415: 2012 harvest specifications and management measures under Pacific Coast Groundfish Fishery Management Plan, including regulations to implement Secretarial Amendment 1

2011-12-05
76FR75873: Modifications to economic data collection for West Coast groundfish trawl fishery; request for comments

2011-12-01
76FR74725: Revisions to Pacific Coast Groundfish Fishery trawl rationalization program

2011-11-14
76FR7020 : Determination of overfished condition of Pacific ocean perch

2011-11-14
76FR70418: Intent to prepare EIS on Pacific Coast Groundfish Fishery Management Plan 2013-2014 management measures and notice of public scoping meetings; request for comments

2011-11-07
76FR68658: Specifications and Management Measures for Remainder of 2011 Pacific Coast Groundfish Fishery

2011-10-31
76FR67092: Inseason changes to management measures in commercial Pacific Coast Groundfish Fisheries

PFMC
02/10/12

Agenda Item F.3.b
Attachment 2 - Web and CD Only
March 2012

Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species[1]

January 13, 2012

[1] This report should be cited as: Northwest Fisheries Science Center. 2011. Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species. Northwest Fisheries Science Center, National Marine Fisheries Service. 2725 Montlake Blvd E, Seattle, WA.

Acknowledgements

This report was prepared by staff from the NWFSC Conservation Biology and Fishery Resource Analysis and Monitoring Divisions and the NMFS Northwest Region Sustainable Fisheries Division. Specific contributors include:

Marlene Bellman (FRAMD; fishery description, spatial analysis)
Steve Copps (SFD; fishery description)
Candice Emmons (CBD; whales)
Jon Drake (CBD, turtles)
Blake Feist (CBD, spatial analysis)
Michael Ford (CBD; whales, birds, turtles)
Tom Good (CBD; birds)
Rick Gustufson (CBD; fish)
Brad Hanson (CBD; whales)
Gretchen Hanshew (SFD; Fisheries Description)
Eli Holmes (CBD; pinnipeds)
Marla Holt (CBD; pinnipeds)
Isaac Kaplan (CBD; trophic analysis)
Janell Majewski (FRAMD; fishery description)
Sean Matson (SFD; Fisheries Description)
Eric Ward (CBD; whales)
Greg Williams (CBD; fish)
Pacific Fishery Management Council, Groundfish Management Team (Fisheries Description)

Ed Melvin and Troy Guy (Washington Sea Grant) made valuable contributions to the sea bird section; Alison Agness, Kevin Duffy, Frank Lockhart, Sheila Lynch, Becky Renko (NWR); Steve Lindley, Jay Barlow, Lisa Ballance, Jeffrey Seminoff (SWC); Dan Lawson, Lauren Saez (SWR) and Kim Rivera (AKR) all provided valuable review and input.

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Chapter 1: Introduction

The purpose of this report is to evaluate risks from the U.S. West Coast Groundfish Fisheries (WCGF) on a subset Endangered Species Act (ESA) listed marine species found off the West Coast (Table 1).

Table 1: List of ESA-listed species evaluated in this report

Marine Mammals
Blue whale (Balaenoptera musculus)
Fin whale (Balaenoptera physalus)
Humpback whale (Megaptera novaeangliae)
Sei whale (Balaenoptera borealis)
Sperm whale (Physeter macrocephalus)
Southern Resident killer whale DPS (Orcinus orca)
North Pacific Right whale (Eubalaena japonica)
Steller sea lion (Eumetopias jubatus), Eastern DPS
Guadalupe fur seal (Arctocephalus townsendi)
Sea Turtles
Leatherback turtle (Dermochelys coriacea)
Loggerhead turtle (Carretta Carretta)
Olive ridley (Lepidochelys olivacea)
Green turtle (Chelonia mydas)
Fish
Green sturgeon (Acipenser medirostris), Southern DPS
Eulachon (Thaleichthys pacificus), Southern DPS
Birds
Short-tailed albatross (Phoebastria albatrus)
California least tern (Sterna antillarum browni)
Marbled murrelet (Brachyramphus marmoratus)

The report is intended to assist the Pacific Fisheries Management Council (PFMC) and the National Marine Fisheries Service (NMFS) Northwest Regional Office with an evaluation of the WCGF under section 7 of the ESA. Section 7 of the ESA requires that federal agencies consult with NMFS on proposed actions that have the potential to harm listed species. Consultations are required for all federal fishery management plans, including the Pacific Coast Groundfish Fishery Management Plan (FMP). This report therefore summarizes the scientific information currently available to characterize the degree of risk imposed by the WCGF fishery on the species listed in Table 1.

Chapter 2: Description of the fisheries

Introduction

This section describes the federally managed Pacific Coast groundfish fisheries that may interact with Endangered Species Act (ESA) listed species and their critical habitat. The fishery description sets the context for assessing direct and indirect effects in later sections. Of primary concern here are those attributes that influence the exposure of listed species to the fishery and potential outcomes including:

- Gear Type and Target Species – Configuration of gear, including the potential for direct interaction with listed species and their critical habitat.
- Seasonality and Geographic Extent – When and where the gear is deployed for comparison with the distribution of listed species.
- Fishing Effort – The amount of fishing effort, particularly in areas of overlap with listed species.

Additional consideration is given to monitoring strategies, data sources, and management jurisdiction.

Overview of the Groundfish Fishery[2]

The West Coast Groundfish Fishery is diverse and includes over 90 different fish species in the Pacific Coast Groundfish Fishery Management Plan (FMP) that are caught by multiple commercial and recreational fisheries using many different gear types along the entire coast.

Managed species include the following:

- Rockfish – The plan covers 64 different species of rockfish, including widow, yellowtail, canary, shortbelly, vermilion, bocaccio, chilipepper, cowcod, yelloweye, thornyheads, and Pacific Ocean perch.
- Flatfish – The plan covers 12 species of flatfish, including various soles, starry flounder, arrowtooth flounder, and sanddab.
- Roundfish – The six species of roundfish included in the Fishery Management Plan are lingcod, cabezon, kelp greenling, Pacific cod, Pacific whiting (hake), and sablefish.
- Sharks and skates – The six species of sharks and skates are leopard shark, soupfin shark, spiny dogfish, big skate, California skate, and longnose skate.
- Other species – These include ratfish, finescale codling, and Pacific rattail grenadier.

[2] Adapted from PFMC 2011, pp. xiii-ix and West Coast Observer Program reports: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm

The National Marine Fisheries Service (NMFS) manages the fishery in partnership with the Pacific Fishery Management Council (PFMC), and the states of California, Oregon, and Washington. A major emphasis of the current fishery management framework is focused on rebuilding overfished species. A management framework is used that includes a variety of fixed elements and routine management measures that may be adjusted through a biennial harvest specifications process. The management measures are intended to constrain the total fishing mortality to within Annual Catch Limits (ACL). Additionally, they are designed to achieve other goals and objectives that pertain to socioeconomics and equitable utilization of the resource.

Regulations for the groundfish fishery are recommended by the PFMC and implemented by NMFS. Active management of the fishery began in the early 1980s with the establishment of optimum yields (OYs) for several managed species and trip limits for widow rockfish, the *Sebastes* complex, and sablefish. The objective of trip limits has been to slow the pace of landings to maintain year-round fishing, processing, and marketing opportunities. Since the 1980s, regulations have evolved to further separate individual groundfish species for management purposes and led to the current use of cumulative two-month trip limits and individual fishing quotas for most species (PFMC 2008). Cumulative trip limits are a specified weight of fish that can be landed during a particular time period.

Under the FMP, the groundfish fishery is defined as consisting of four management components:

- Limited Entry (LE) – The LE component includes all commercial fishers who hold a federal limited entry permit. The total number of limited entry permits available is capped, and permitted vessels are allotted a larger portion of the total allowable catch for commercially desirable species than non-permitted vessels.

- Open Access (OA) – The OA component includes commercial fishers who are not federally permitted. However, state agencies (California Department of Fish and Game and Oregon Department of Fish and Wildlife) have instituted permit programs for certain OA fisheries.

- Recreational – This component includes recreational anglers who target or catch groundfish species.

- Tribal – This component includes native tribal commercial fishers in Washington State that have treaty rights to fish groundfish.

These four components can then be further subdivided into sectors based on gear type, target species, and various regulatory factors. Commercial LE and OA sectors have traditionally caught the largest quantities of groundfish and are observed by federal at-sea observer programs.

Groundfish Fishery Sectors

Managers identify groundfish fishery sectors, around which regulations are structured. Commercial fisheries are identified based on the regulatory status, gear types, and target strategy of the vessels comprising each sector. From a regulatory standpoint, groundfish fisheries are identified based on whether vessels possess a federal groundfish limited access ("limited entry") permit and the particular endorsements on that permit. In addition, Washington coastal Indian Tribes prosecute groundfish fisheries based on treaty rights. Given their sovereign status, these fisheries are considered separately from other commercial fishery sectors.

An important reason for identifying fishery sectors relates to the allocation of catch opportunity. Overall catch limits by management unit (a stock, stock complex, or geographic subdivision of either) determined by the ACL may be divided among sectors for the purpose of management. These allocations may be "formal" or "informal." Formal allocations identified in the regulations and management measures are generally crafted in order to ensure that a sector has the opportunity to catch the portion of the ACL determined by an allocation. Informal or implicit allocations are a function of the particular management measures established as part of the biennial process for stocks that do not have a formal allocation. The way in which these management measures constrain catch opportunities creates functional allocations of the stocks available for harvest. In addition to allocations, managers also consider "set asides." These divisions of harvest opportunity play more of a bookkeeping function so that managers can estimate the total catch that is likely to occur during the management period. Set asides are an accounting device applied primarily to research catches and fisheries prosecuted under an exempted fishing permit (see below). Treaty fisheries are also accorded a set aside, because the sovereign status of these groups means that their fisheries are independently managed in coordination with the Council.

The following provides a list of sectors comprising the groundfish fishery and are further described later in the section. An analysis of anticipated changes is included at the end of this section. The following non-Tribal commercial fishery sectors are identified for the purposes of management:

1. Catcher-processor vessels targeting Pacific whiting using mid-water trawl gear and processing their catch at sea.
2. Catcher vessels targeting Pacific whiting using mid-water trawl gear and delivering to at-sea mothership processors (referred to as the mothership sector).
3. Catcher vessels targeting Pacific whiting using mid-water trawl gear and delivering to processing plants on land (referred to as the shoreside whiting sector).
4. Vessels using bottom trawl gear to target groundfish species other than Pacific whiting, with their catch landed onshore (referred to as the non-whiting trawl sector).
5. Vessels using longline or pot gear under gear switching provisions in the IFQ program.
6. Vessels using longline or pots (referred to as fixed gear) to target groundfish and possessing a federal limited entry permit with this gear endorsement (referred to as the limited entry fixed gear sector).
7. Vessels using legal groundfish gear other than trawl (principally longline and pot gear) to target groundfish but not possessing a federal limited entry permit (referred to as the "directed open access sector").

8. Incidental open access sector vessels using a variety of gear types that catch groundfish incidentally, usually defined by catch composition rather than regulatory status.

In addition to the above-mentioned sectors, a variety of fisheries are also considered in the groundfish management process as follows:

- The exempted trawl fisheries—pink shrimp, spot prawn, ridgeback prawn, and California halibut—incidentally catch groundfish. Vessels in this sector (often referred to as the "incidental open access sector,") are subject to the same trip limits and management measures imposed on the directed open access sector, and special measures may apply to particular fisheries, such as pink shrimp and California halibut trawl.
- Recreational groundfish fisheries, including charter vessels (commercial passenger fishing vessels [CPFVs]) and private recreational vessels (individuals fishing from their own or rented boats).
- Tribal fisheries are those fisheries prosecuted by Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) in their usual and accustomed grounds and stations, under treaties with the Federal government.
- Exempted Fishing Permits (EFPs) are allocated groundfish harvest to authorize a vessel to engage in an activity that is otherwise prohibited by the MSA or other fishery regulations for the purpose of collecting limited experimental data.

Pacific Whiting

Pacific whiting form dense, semi-pelagic schools so that vessels targeting the species generally encounter only small amounts of bycatch. However, rockfish and salmon can be caught incidentally, either because they co-occur with Pacific whiting or because vessels mistakenly set the gear on the wrong species. The at-sea whiting sectors are managed through a season and quota structure. The season opens around May 1 each year (and occasionally a few weeks earlier off of central California). The third whiting sector, shore-based, is managed with individual fishing quota (IFQ). Pacific whiting is allocated among the three whiting sectors after a portion is set aside for expected catch in Tribal fisheries. The season for each sector then runs until its allocation is used up. As with other groundfish fisheries, catch limits on overfished rockfish have created a constraint on whiting fisheries, resulting in a "race for bycatch"—competition among the whiting sectors to catch their target species quota before limits on overfished species are reached. As a result, beginning with the 2009–2010 management period, sector-specific bycatch limits have been put in place for canary rockfish, darkblotched rockfish, and widow rockfish.

The Pacific whiting fisheries encompass the first three sectors described above; however, beginning in 2011, the shoreside whiting sector is combined with the non-whiting trawl sector and managed with Individual Fishing Quotas (IFQ). The mothership sector is managed through a co-op structure with catcher vessels within a co-op delivering to a specified mothership. The catcher-processor sector operates as a voluntary co-op. Prior to 2011, most vessels in the shoreside fishery operated under Exempted Fishing Permits (EFP, see below), where participants dumped unsorted catch directly into refrigerated tanks, rather than sorting the catch on deck. Individuals within this fishery may continue to maximize retention (i.e., dump all catch directly into refrigerated tanks) or sort their catch on deck, because 100% of IFQ Program trips are monitored by observers.

Commercial Limited Entry Bottom Trawl

The LE groundfish bottom trawl fishery off the west coast of the United States operates from the Canadian border to Morro Bay, California. In 2009, there were 178 LE trawl permits. Groundfish bottom trawl vessels range in size from 35 to 95 feet, with an average length of 65 feet. Vessels fish throughout the year in a wide range of depths and deliver catch to shoreside processors. Bottom trawlers often target species assemblages, which can result in diverse catch. A single groundfish bottom trawl tow often includes 15 to 20 species. It is expected that fleet size will be reduced considerably under the new IFQ Program (see below).

Commercial Limited Entry and Open Access Bottom Trawl – Targeting California Halibut

Vessels that participate in the California halibut trawl fishery can belong to either the LE or OA sector of the federal groundfish trawl fishery. Some vessels with a federal limited entry groundfish trawl permit also have a state California Halibut Bottom Trawl Vessel Permit, and these vessels primarily operate in federal waters out of the ports of Monterey and San Francisco. Federal LE groundfish-permitted vessels targeting California halibut are subject to federal groundfish regulations, depth-based conservation area closures, and trip limits for groundfish, and they must participate in a vessel monitoring system for enforcement purposes.

The California halibut trawl fishery generally operates out of U.S. ports from San Francisco to Los Angeles. Commercial bottom trawling is prohibited in California State waters, with the exception of the California Halibut Trawl Grounds (CHTG). The fishing season within the CHTG covers two calendar years. Regulations for vessels operating in the CHTG include minimum mesh sizes of 7.5 inches in length to reduce bycatch, a three-month closed season during California halibut spawning (March 15–June 15), a 500 pound possession limit on the incidental take of fish other than California halibut, a 22-inch minimum size limit for retained California halibut, and mandated federal observer coverage. A comprehensive review of the California halibut bottom trawl fishery in the CHTG was published by the California Department of Fish and Game (CDFG 2008). In federal waters, trawling for California halibut can occur year-round, but a state permit is required (as of 2006) to land more than 150 pounds of California halibut per trip.

Vessels range in size from 29 to 71 feet, with an average length of 46 feet. Fishing generally occurs in less than 30 fathoms of water, and fishers deliver their catch to shore-based processors.

Commercial Fixed Gear Sectors

There are four major sectors in the fixed gear groundfish fishery: the LE sablefish-endorsed sector, the LE non-sablefish-endorsed sector, the federal open access sector, and the state-permitted nearshore fisheries. There were 227 LE fixed gear permits in 2009. LE fixed gear permits are either sablefish-endorsed or non-sablefish-endorsed. In addition, all LE fixed gear permits have gear endorsements (longline, pot/trap, or both). Of the 227 LE fixed gear permits in 2009, 164 had sablefish-endorsements. Of these, 132 were associated with longline gear, 32 were associated with pot/trap gear, and 4 were associated with both longline and pot/trap gear. The remaining 63 limited entry non-sablefish-endorsed permits were all associated with longline gear. The open access fixed gear sector does not require federal or state permits. Therefore, the total number of participants varies widely from year to year. Open access vessels can use any type of hook-and-line or pot/trap gear, including longline, fishing pole, and vertical longline.

Limited Entry Sablefish Primary Tier-Endorsed Fixed Gear

Vessels participating in the LE sablefish-endorsed sector range in size from 33 to 95 feet and operate north of 36º N. latitude. Fishing generally occurs in depths greater than 80 fathoms. Nearly all of the vessels participating in this sector deliver their iced catch to shoreside processors. Catch in the LE sablefish-endorsed fishery is composed mostly of sablefish, with bycatch primarily composed of spiny dogfish shark, Pacific halibut, rockfish species, and skates. LE sablefish-endorsed permits provide the permit holder with an annual share of the sablefish catch. Sablefish-endorsed permits are assigned to Tier 1, 2, or 3. Each Tier 1 permit receives 1.4% of the primary-season sablefish allocation, with Tiers 2 and 3 receiving 0.64% and 0.36%, respectively. Each year, these shares are translated into amounts of catch (in pounds), or "tier limits", which could be caught during the primary fishery. Regulations allow for up to three LE sablefish-endorsed permits to be 'stacked' on a single vessel. Permit stacking was implemented to increase the economic efficiency of the fleet and promote fleet capacity reduction. Stacking more than one sablefish-endorsed permit on a vessel allows the vessel to land sablefish up to the sum of the associated tier limits. However, permit stacking does not convey additive landing limits for any other species. LE sablefish-endorsed primary season fishing currently takes place over a seven-month period from April 1 to October 31. The seven-month season was first implemented in 2002. Permit holders land their tier limits at any time during the seven-month season. Once the primary season opens, all sablefish landed by a sablefish-endorsed permit is counted toward attainment of its tier limit. Vessels that have LE sablefish- endorsed permits can fish in the LE non-sablefish-endorsed fishery under trip limits once their quota of primary season sablefish has been caught or when the primary season is closed, from November 1 through March 31.

Limited Entry Non-Sablefish-Endorsed Fixed Gear

The LE non-sablefish-endorsed fixed gear sector occurs coastwide but operates primarily out of southern California ports. The fishery operates year-round, but the majority of fishing activity occurs during the summer months when weather conditions improve. Vessels in the LE non-sablefish-endorsed sector range in size from 17 to 60 feet, with an average length of 34 feet. Vessels catch a variety of groundfish species, including thornyheads, sablefish, rockfish, and flatfish. The fleet typically operates in depths greater than 80 fathoms. Nearly all of the vessels participating in this fishery deliver their iced catch to fresh fish markets. LE non-sablefish-endorsed fixed gear permits are subject to daily and weekly trip limits for sablefish, thornyheads, and other groundfish species.

Open Access Fixed Gear

As the open access sector of the fixed gear groundfish fishery does not require federal or state permits (state requirements for commercial fishing licenses notwithstanding), characterizing the participants can be difficult. Vessels range in size from 10 to 97 feet, with an average length of 33 feet. Vessels catch a variety of groundfish species, including sablefish, spiny dogfish, and skates. Vessels operate out of all three coastal states and generally fish in waters shoreward of 30 fathoms or seaward of 100 fathoms. Open access fixed gear vessels are subject to daily and weekly trip limits for sablefish, spiny dogfish shark, and other groundfish species. Flatfish species—including dover sole, arrowtooth flounder, petrale sole, English sole, starry flounder, and all other flatfish—are managed as a single group for the open access fishery.

State-Permitted Nearshore Fixed Gear

The state-permitted nearshore groundfish sectors operate from northern Oregon to southern California. Vessels that participate in the state-permitted nearshore fixed gear fisheries can belong to either the federal limited entry or open acces fixed gear sectors. Historically, nearshore fisheries were accessible to everyone. However, due to the increasing number of participants and concerns of overcapacity, California and Oregon began requiring state permits in 2003 and 2004, respectively. Regulations for the nearshore fisheries are set by both the PFMC and the states. The PFMC sets the ACL for groundfish species and harvest guidelines.

In addition to regulations set by the PFMC, each state manages its nearshore fishery independently by issuing state regulations on the cumulative trip limits of nearshore species in their state waters. Cumulative trip limits are a specified weight of fish that can be landed during a particular time period, usually two-months. Often, cumulative trip limits set by the states are more restrictive than the federal limits. Additional management measures for each state are highlighted in the sections below. Further information on state nearshore fishery regulations can also be found online for Oregon at: (http://www.dfw.state.or.us/mrp/regulations/commercial_fishing/index.asp) and for California at: (www.dfg.ca.gov/marine/regulations.asp#commercial).

Vessels participating in the nearshore fisheries range in size from 10 to 50 feet, with an average length of 25 feet. They use a variety of fixed gear, including hand-lines, cable gear, fishing poles, longlines, and pots. In shallow water, fishers often fish in coves or drift along a reef. They set and retrieve their gear multiple times a day and generally land their fish on a daily basis. Quotas for the nearshore fisheries are small—generally between 100 to 2,000 pounds every two-months although can be higher for some species. Many of those who fish in shallow water participate in the live fish market, necessitating careful handling of retained fish.

Washington

The State of Washington does not allow commercial fishing within its territorial waters (0–3 miles from the coastline). This prohibition removes fishing grounds from access by commercial nearshore fishers.

Oregon

Oregon's nearshore commercial fishery typically occurs in shallow water (< 30 fathoms) and targets species, such as black rockfish, blue rockfish, china rockfish, copper rockfish, quillback rockfish, grass rockfish, cabezon, and greenlings. Oregon's nearshore permitting process assigns permits to vessels. State nearshore management employs minimum size limits for many nearshore species, as well as two-month cumulative trip limits and annual landing caps (maximum landed weight in a 12-month period), and annual harvest caps that include all sources of fisheries-mortality. Black rockfish trip limits are tied to four latitudinal Oregon Black Rockfish Zones. In 2004, Oregon began requiring that nearshore fishers complete a vessel logbook.

In 2009, Oregon issued 55 black/blue rockfish permits, which allow for the landing of black rockfish and blue rockfish, and 72 black/blue rockfish permits with a nearshore endorsement, which allows landing of black rockfish and blue rockfish along with 21 additional Oregon designated nearshore groundfish species. In 2010, Oregon issued 55 black/blue rockfish permits and 70 black/blue rockfish permits with a nearshore endorsement.

California

California state management designates four geographic zones along the coastline. State management has implemented seasonal closures in some south of 40°10'N latitude. The north coast area (north of 40°10'N latitude to the Oregon-California border) remained open year-round, except for seasonal closures of cabezon, greenlings, and California sheephead.

The State of California issues two permits for fishing within the nearshore area: (1) a shallow nearshore species fishery permit, and (2) a deeper nearshore species fishery permit. In 2009, there were a total of 319 California nearshore permits, and in 2010, there were 304 permits. The permits are assigned to an individual person and can only be used in the one regional management area specified on the permit. Fishers can either have a single nearshore permit (deeper or shallow) or hold both types of permits. A trap endorsement can also be tied to a shallow nearshore permit to allow for the use of trap gear when fishing for nearshore species. In addition, a nearshore fishery bycatch permit can be issued for trawl gear or entangling nets to allow for small amounts of nearshore landings per trip, but only in two management zones.

The deeper nearshore permit is required for landing black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish. The shallow nearshore permit is required for landing black-and-yellow rockfish, cabezon, California scorpionfish, California sheephead, china rockfish, gopher rockfish, grass rockfish, greenlings, and kelp rockfish. Lingcod is also commonly targeted in conjunction with shallow nearshore permit species. Most live fish landings consist of species in the shallow nearshore group. State nearshore management employs minimum size limits for many nearshore species and two-month cumulative trip limits. A limit on the number of hooks per vessel or line also exists for certain areas. California instituted a voluntary nearshore logbook program in 2005.

Recreational Fisheries

Recreational fisheries are primarily managed by the states, so catch and effort data are often grouped by state and sub-state region. A distinction is also made between charter vessels (commercial passenger fishing vessels, or CPFVs) and private recreational vessels (individuals fishing from their own or rented boats). As would be expected, participation is higher during warmer months. The number of marine angler trips peaks in the July–August period, but the seasonal concentration is more pronounced in northern areas. For example, in 2003, Washington

State saw no trips recorded in November–December, and 36% of trips were in July–August, while in Southern California the proportions for the same periods were 12% and 30%, respectively (PFMC 2011).

Tribal Groundfish Fisheries

West Coast treaty tribes have formal allocations or set-asides for sablefish, black rockfish, and Pacific whiting. The tribes also have harvest guidelines for Pacific cod and lingcod. Members of the four coastal treaty tribes participate in commercial, ceremonial, and subsistence fisheries for groundfish off the Washington coast. Participants in the tribal commercial fisheries use similar gear to non-tribal fishers. Groundfish caught in the tribal commercial fishery pass through the same markets as non-tribal commercial groundfish catch.

There are several groundfish species taken in tribal fisheries for which the tribes have no formal allocations and some species for which no specific allocation has been determined. Rather than try to reserve specific allocations of these species, the tribes recommend trip limits for these species to the Council, which then managed other sectors to accommodate these fisheries. Tribal trip limits for groundfish species without tribal allocations are usually intended to constrain direct catch as well as interactions of overfished species in the tribal groundfish fisheries.

Thirteen western Washington tribes possess and exercise treaty fishing rights to halibut, including the four tribes that possess treaty fishing rights to groundfish. Tribal halibut allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence component.

Approximately one-third of the tribal sablefish allocation is taken during an open competition fishery, in which vessels from the sablefish tribes all have access to this portion of the overall tribal sablefish allocation. The open competition portion of the allocation tends to be taken during the same period as the major tribal commercial halibut fisheries in March and April. The remaining two-thirds of the tribal sablefish allocation is split among the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual tribes, beginning in March and lasting into the autumn, depending on vessel participation and management measures used. Participants in the halibut and sablefish fisheries tend to use hook-and-line gear, as required by the International Pacific Halibut Commission (IPHC). By agreement the tribes also use snap gear for equity reasons in the fully competitive sablefish fishery (i.e., someone participating in a fully competitive sablefish fishery who landed no halibut would not have to meet any IPHC requirements, but would still have to use snap line gear by tribal regulation).

In 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 {50 CFR 660.385(e)}. The tribal allocation is subtracted from the whiting OY before allocation to the non-tribal sectors. From 1999 to 2009, the tribal allocation was based on a sliding scale related to the U.S. whiting OY. Since 2009, the tribal allocation has been based on estimated need by tribes anticipating participating in the fishery. To date, only the Makah tribe has conducted a whiting fishery.

Makah non-whiting vessels fit with mid-water trawl gear have also been targeting yellowtail rockfish in recent years. Tribal regulations specify the monthly limit of yellowtail, based on the number of vessels participating, as well as limits for canary rockfish (300 pounds per trip), and minor nearshore, shelf, and slope rockfish (300 pounds per trip combined) and interactions with widow rockfish (not to exceed 10% of yellowtail landings). This fishery is managed by both time and area to stay within projected impacts on overfished rockfish, primarily widow and canary, taken incidentally with yellowtail. Short test tows are taken in areas previously identified as having low bycatch rates before that area is open to fishing. If vessels in the fishery approach the limits established by tribal regulation, the area is closed to further fishing until it can be shown to have reduced bycatch rates. An observer program is in place to verify bycatch levels in the fishery, and assigned vessels must carry an observer to participate.

Table 2: Distribution of vessels engaged in Tribal groundfish fisheries (Source PFMC 2011).

Treaty Tribe	Number of Vessels in Groundfish Fishery				Port
	Longline (length in ft)	Whiting (length in ft)	Trawl (length in ft)	Total	
Makah	31 (33'-62')	5 (95'-124')	5 (49'-62')	45	Neah Bay
Hoh	-	-	-	1	N/A
Quileute	8 (45’-68’)	-	-	8	La Push
Quinault	15(38'-62')	-	-	15	West Port

Exempted Fishing Permits

An Exempted Fishing Permit (EFP) is a NMFS-issued federal permit that authorizes a vessel to engage in an activity that is otherwise prohibited by the MSA or other fishery regulations for the purpose of collecting limited experimental data. EFPs can be issued to federal or state agencies, marine fish commissions, or other entities, including individuals.

The specific objectives of a proposed exempted fishery may vary. The Groundfish FMP provides for EFPs 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 management goals of the FMP. However, EFPs are commonly used to explore ways to reduce effort on depressed stocks, encourage innovation and efficiency in the fisheries, provide access to constrained stocks while directly measuring the bycatch associated with those fishing strategies, and evaluate current and proposed management measures. EFPs are adopted biennially with preliminary adoption by the Council at their November meeting and final approval in June. For additional information on EFP protocols, visit the Council website and review Council Operating Procedure 19 at: (www.pcouncil.org/operations/cops.html).

Seasonality

Groundfish are commercially harvested year-round with changes in effort related to management and markets. Seasonality of the groundfish fisheries varies by sector and is shown in Table 3. As described above, the seasonality of Pacific whiting fisheries is driven by regulations which open the season around May 1 each year (and occasionally a few weeks earlier off of central California). The season for each Pacific whiting sector then runs until its allocation is used up.

Table 3: Seasonality of non-whiting commercial groundfish landings—over 2005–2009 timeframe, average in metric tons per two-month seasons by sector (excerpted from PFMC 2011, p. F-14)

Sector	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Shoreside Non-whiting Trawl	3,637.56	3,672.64	3,918.75	3,988.75	3,788.83	2,659.96
Limited Entry Fixed Gear	101.90	261.88	678.20	759.48	718.41	119.06
Open Access Fixed Gear	101.82	142.69	266.89	280.65	289.08	187.65
Incidentally Caught	25.58	23.40	37.23	48.43	37.08	10.70
Tribal Shoreside Nonwhiting Groundfish	68.71	427.75	362.38	304.72	299.57	172.77

Recreational effort tends to peak during warmer months, particularly in Oregon and Washington where weather is more variable. Figure 1 shows the seasonal distribution of recreational fishing activity off the West Coast.

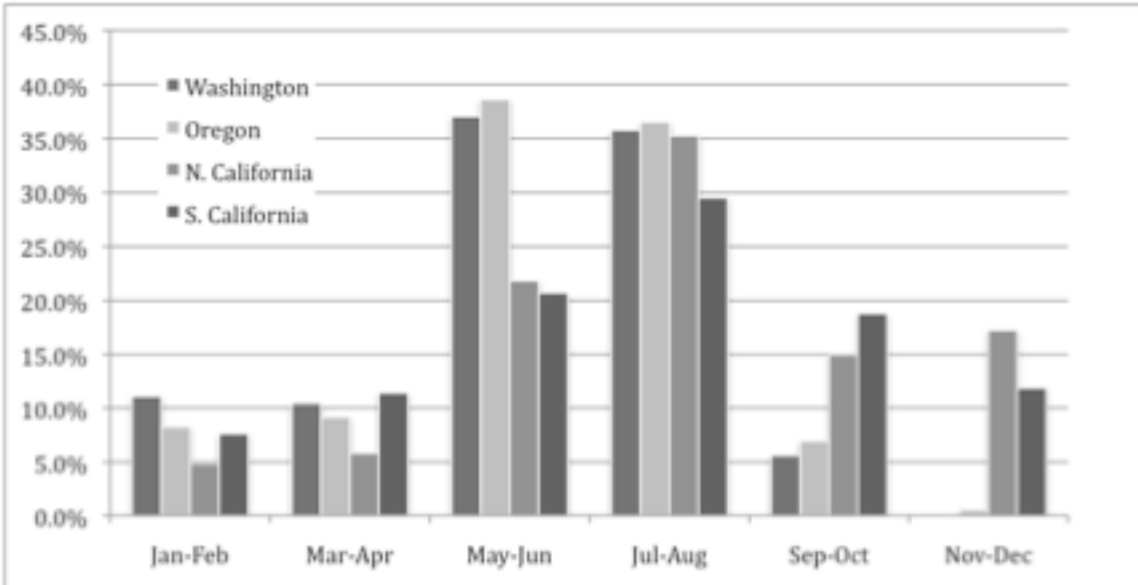

Figure 1: Seasonal distribution of marine angler trips in 2003 (Source PFMC 2011).

Geographic Extent

Groundfish are harvested coastwide in state and federal waters. The fishery is constrained in some cases by established Marine Protected Areas, such as those to protect groundfish Essential Fish Habitat (EFH) (PFMC 2005). In other cases, area closures are implemented through the harvest specification process to protect overfished species (PFMC 2011). Table 4 shows groundfish landings by port group during 2009 (excerpted from PFMC 2011, p. F-24). Figure 2 shows several maps of commercial fishing effort for West Coast groundfish fisheries.

Table 4: Commercial groundfish landings (mt) by sector and port group for 2009 (x=excluded for data confidentiality) (excerpted from PFMC 2011, p. F-24).

Port Group	Shoreside Whiting Trawl	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Open Access Fixed Gear	Incidentally Caught Groundfish	Total
Puget Sound		1,295.5	257.4		x	x
North Washington Coast		x	220.2	23.1	1.7	x
South & Central Washington Coast	10,090.9	1,346.2	308.6	41.0	3.8	11,790.6
Astoria	14,085.8	8,406.4	148.3	16.5	5.1	22,662.2
Tillamook		x		34.5	0.2	x

Newport	12,993.0	3,774.6	525.1	42.4	11.8	17,347.0
Coos Bay	x	3,619.1	191.4	85.2	6.5	x
Brookings		1,201.1	263.5	276.9	1.8	1,743.3
Crescent City	1,489.4	982.5	108.0	81.4	0.4	2,661.7
Eureka	x	2,678.7	101.8	73.0	x	3,162.0
Fort Bragg		1,684.1	154.6	102.9	0.6	1,942.3
Bodega Bay		x	x	17.2	3.8	81.4
San Francisco		648.5	59.9	36.3	29.0	773.7
Monterey		x	108.2	72.3	0.7	x
Morro Bay		x	202.0	568.8	2.1	x
Santa Barbara			35.6	74.2	15.9	125.7
Los Angeles			117.7	12.9	12.7	143.2
San Diego			82.1	13.3	3.8	99.2
Total	40,580.1	26,164.7	x	1,571.1	104.7	71,314.5

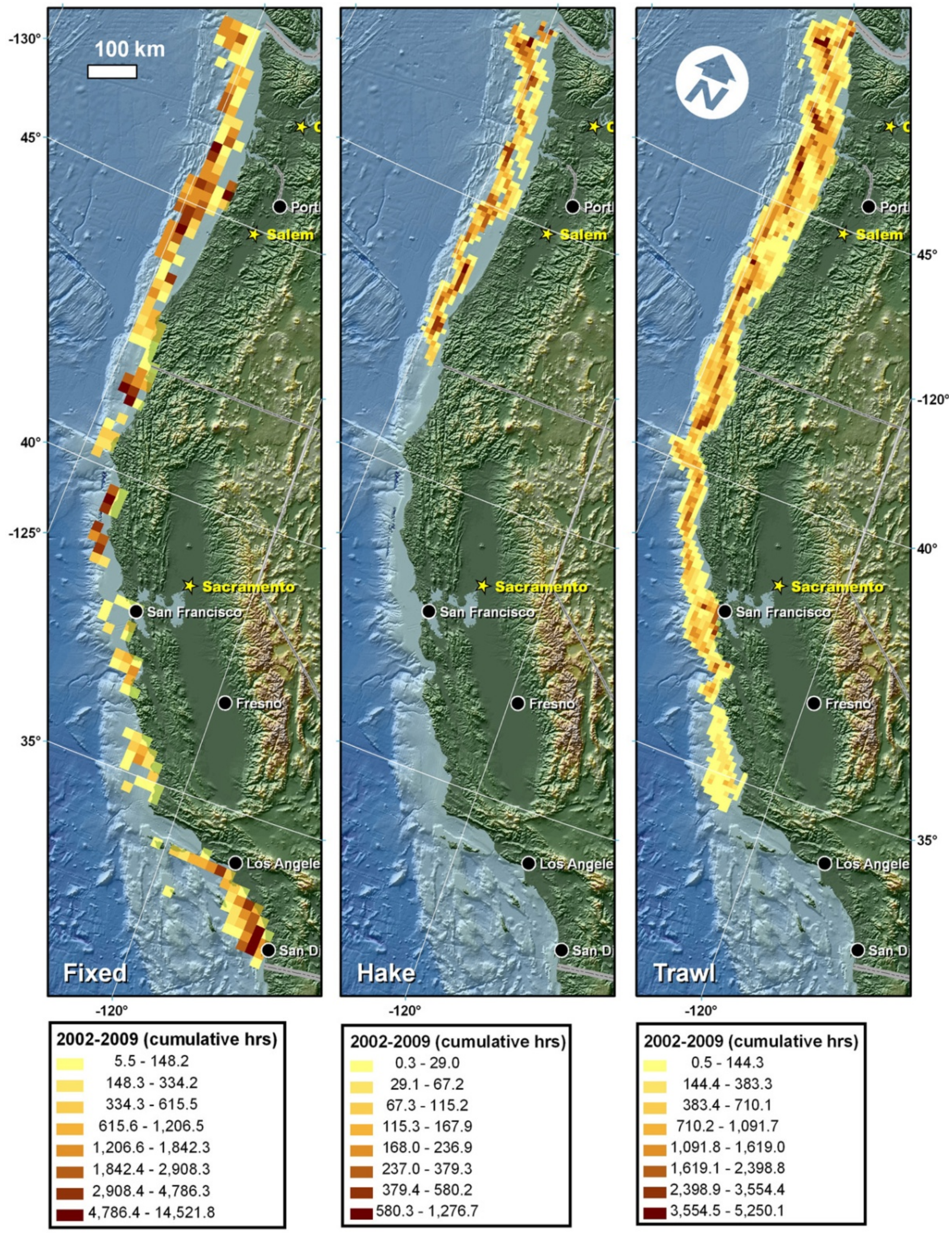

Figure 2: The figure demonstrates the general spatial distribution of fishing effort from 2002–2009 (as cumulative hours gear was deployed) in various sectors of the groundfish fishery for which spatial fishing effort information is available. Fixed represents the limited entry sablefish primary, limited entry non-sablefish endorsed, open access fixed gear, and state-permitted nearshore fixed gear sectors. Hake represents all at-sea hake sectors. Trawl represents the limited entry bottom trawl sector.

Gear Fished in the Groundfish Fishery

Many different types of fishing gear are used in West Coast fisheries and specifically in commercial, tribal, and recreational fisheries. Gear types include trawl nets, gillnets, longline, troll, jig, rod and reel, vertical hook and line, pots (also called traps), and other gear (e.g., spears, throw nets). Technical descriptions of each type of gear used on the West Coast (groundfish and non-groundfish fisheries) are available in the West Coast Observer Program Training Manual (NWFSC 2011) and are incorporated by reference. Table 5 summarizes the gear types used in West Coast fisheries.

Longline fisheries involve setting out 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). Figure 3 shows typical bottom longline gear deployed in the groundfish fishery.

Trawling involves the towing of a funnel shaped net or nets behind a fishing vessel. The trawl gear varies depending on the species sought and the size and horsepower of the boats used. Trawl gear may be fished on the bottom, near the bottom, or up in the water column to catch a large variety of species. Figure 4 shows trawl gear as it is generally deployed on the West Coast.

Table 5: Gear Types Used in West Coast Fisheries (Source PFMC 2005).

	Nets	**Longline, Pot, Hook and Line Gears**	**Other Gears**
Limited Entry	Bottom Trawl Mid-water Trawl Scottish Seine	Pot Longline Vertical hook/line Rod and reel Troll/dinglebar Jig Stick Gear	
Open Access – Directed	Set Gillnet Sculpin Trawl	Pot Longline Vertical hook/line Rod and reel Troll/dinglebar Jig Stick Gear	
Open Access – Incidental	Exempted Trawl (pink shrimp, spot and ridgeback prawn, Calif. halibut, sea cucumber) Setnet Driftnet Purse seine	Pot (Dungeness crab, sheephead, spot prawn) Longline Rod and reel Troll	Dive/spear Dive/hook and line Poke pole
Tribal	As above	As above	As above
Recreational	Dip net	Hook and Line	Dive/spear

	Throw net	Pots	

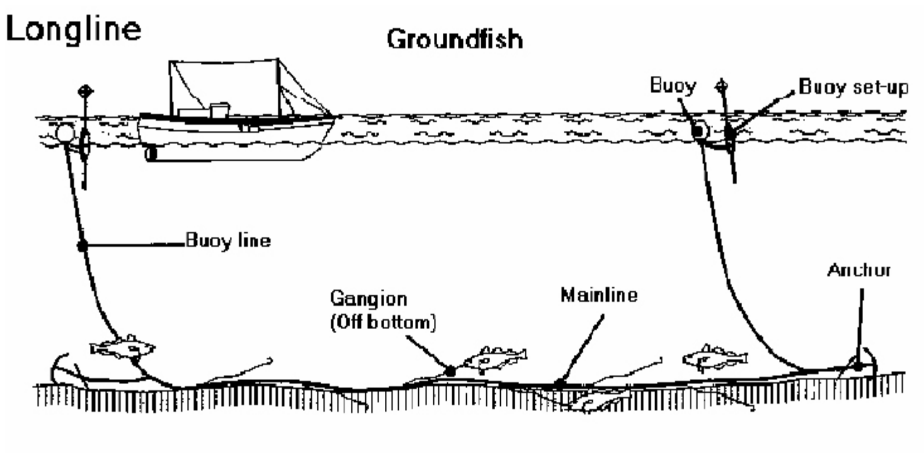

Figure 3: Schematic of groundfish longline gear (source NWFSC 2011).

To reduce take of seabirds, streamer lines (also called bird lines or tori lines) are sometimes deployed as the gear is set in the water (see Figure 5). A streamer line is a 50-fathom (or 90-meter) line that extends from a high point near the stern of the vessel to a drogue (usually a buoy with a weight). As the vessel moves forward, the drogue creates tension in the line, producing a span from the stern where the streamer line is aloft. The aloft section includes streamers made of UV-protected, brightly colored tubing spaced every 16 feet (5 meters). Streamers must be heavy enough to maintain a near-vertical fence in moderate to high winds. Individual streamers should extend to the water to prevent aggressive birds from getting to the groundline. When deployed in pairs—one from each side of the stern—streamer lines create a moving fence around the sinking groundline eliminating birds (Melvin 2000). Streamer lines have been effective at reducing seabird bycatch in Alaskan fisheries (USFWS 2008; Ed Melvin, personal communication; and, http://www.afsc.noaa.gov/Quarterly/amj2011/divrptsREFM4.htm). Seabird mitigation is not currently required in West Coast groundfish fisheries, although Washington Sea Grant has recently initiated a NMFS-funded program to promote voluntary use of streamer lines (WA Sea Grant 2011).

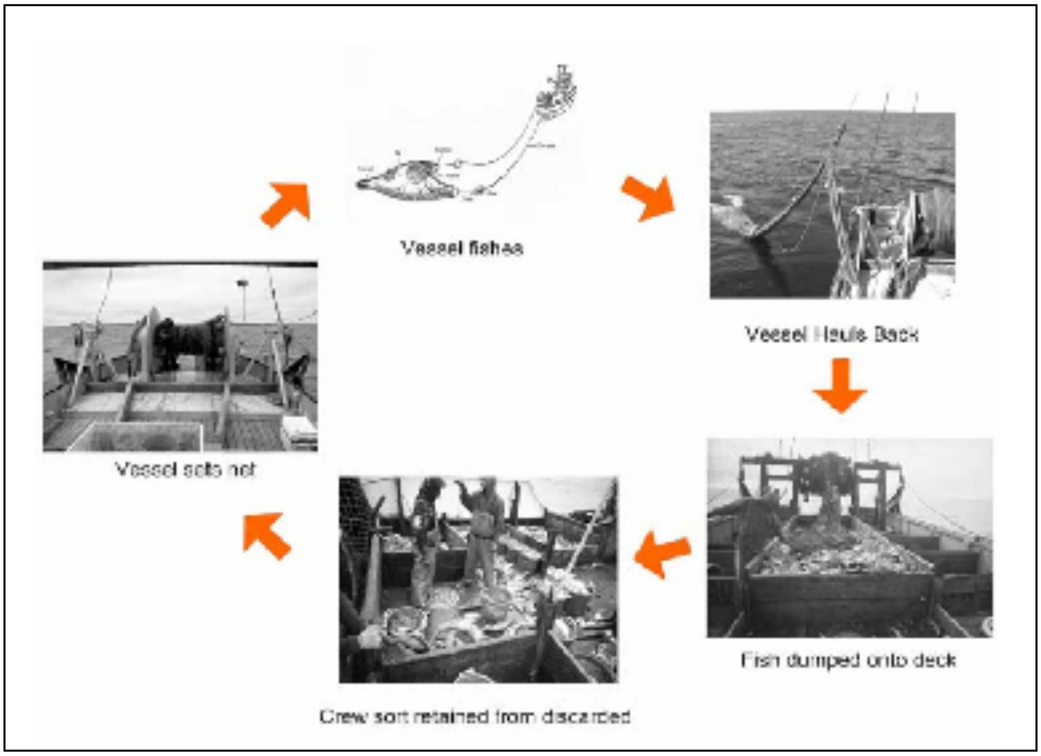

Figure 4: Typical activity on a groundfish trawl vessel (source NWFSC 2011).

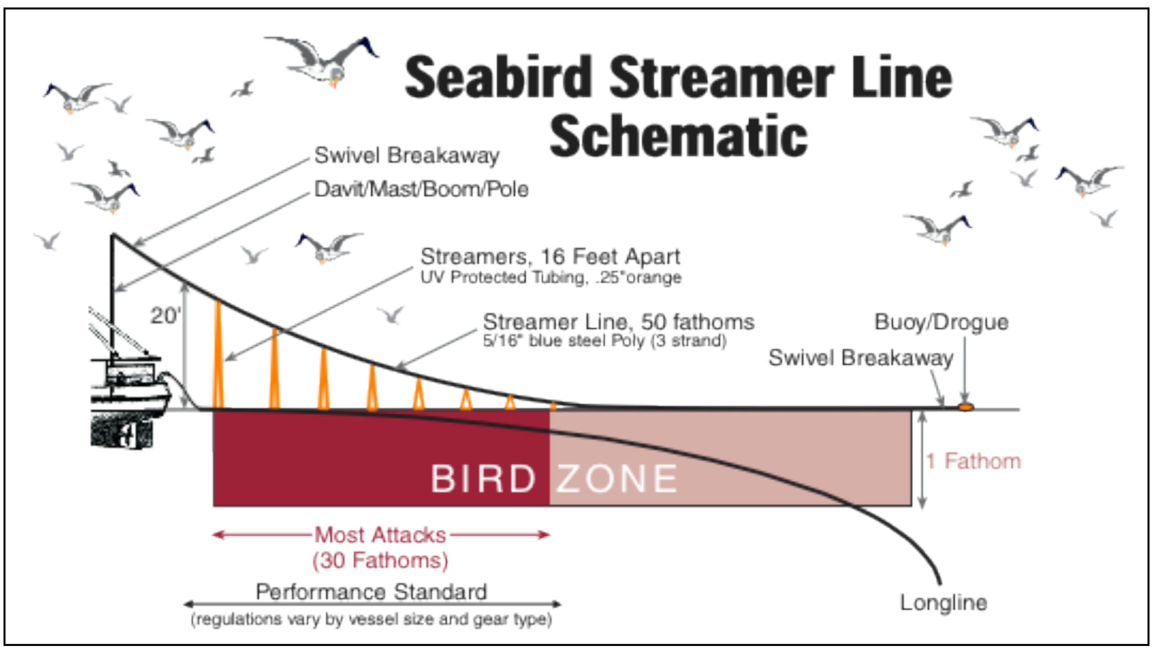

Figure 5: Schematic of streamer lines to reduce seabird bycatch (modified from Melvin 2000).

Catch Monitoring, Accounting, and Enforcement[3]

Establishing a standardized bycatch reporting methodology and limiting bycatch to the extent practicable are mandates of the Magnuson-Stevens Fishery Conservation and Management Act, referred to as the Magnuson-Stevens Act (MSA).[4] Effective bycatch accounting and control mechanisms are also critical for staying within ACLs. The first element in limiting bycatch is accurately measuring bycatch rates by time, area, depth, gear type, and fishing strategy.

At its November 2005 meeting, the Council approved Amendment 18 to the Groundfish FMP. The Council recommendation addresses National Standard 9 and Section 303(a)(11) of the MSA, which require practicable means to minimize bycatch and bycatch mortality and a standardized bycatch reporting methodology. The purpose of FMP Amendment 18 is to clearly and comprehensively describe measures that address these requirements, which have been established through long-term regulations and the biennial management process. The amendment also describes new measures that could be implemented by future regulatory or amendment actions. For additional information on Amendment 18, see the Council web page at: (www.pcouncil.org/groundfish/gffmp/gfa18.html).

Various state, federal, and tribal catch monitoring systems are used in West Coast groundfish management. There are two components to total catch: (1) catch landed in port, and (2) catch discarded at-sea. A description of the relevant data systems used to monitor total catch and discards in commercial and recreational groundfish sectors follows.

Data Collection Programs – Commercial sectors

Monitoring Commercial Landings

Sorting requirements monitoring programs are in place for all groundfish species and species groups with IFQ, trip limits, harvest guidelines, or ACLs including all overfished species. This provides accounting for the weight of landed depleted species when catches are hailed at-sea or landed. Limited entry groundfish trawl fishermen are also required to maintain state logbooks to record the start and haul locations, time, duration of trawl tows, and 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, PSMFC coordinates record-keeping requirements between state and federal managers. Poundage by sorted species category, area of catch, vessel identification number, and other data elements are required on fishtickets. Landings are also sampled in port by state personnel to collect species composition data, otoliths for ageing, lengths, and other biological data. A suspension of at-sea sorting requirements coupled with full retention of catch is allowed in the whiting fishery (by FMP Amendment 10 and an annual EFP in the Shoreside Whiting sector). Fishticket landings, logbook data, and state port sampling data are reported as the season

[3] This Section Excerpted from Chapter 4 of PFMC 2008 with minor adaptations.
[4] For more information on bycatch, including NMFS' definition of bycatch, see: http://www.nmfs.noaa.gov/by_catch/SPO_final_rev_12204.pdf

progresses to the regional commercial catch monitoring database and the Pacific Fisheries Information Network (PacFIN), managed by PSMFC (www.psmfc.org/pacfin/index.html).

The Groundfish Management Team (GMT - advisory body to the PFMC) and PSMFC manage the Quota Species Monitoring (QSM) dataset reported in PacFIN for the purpose of informing inseason managment. All landings of groundfish stocks of concern (e.g., overfished stocks) and target stocks and stock complexes in West Coast fisheries are tracked in QSM reports of landed catch. The GMT recommends prescribed landing limits and other inseason management measures to the Council to attain, but not exceed, total catch ACLs 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.

At-Sea Hake Observer Program

There are two federal observer programs that collect information aboard groundfish vessels on the U.S. West Coast. These are separate programs because they deal with distinctly different components of the groundfish fishery: the federally permitted sectors targeting Pacific hake using mid-water trawl gear which processes catch at-sea, and the federal and state permitted sectors targeting non-hake species that deliver shoreside.

Observers were first deployed in the at-sea hake sectors in the late 1970s under the management of the North Pacific Groundfish Observer Program at NOAA's Alaska Fishery Science Center. NMFS made observer coverage mandatory for at-sea processors in July 2004 (65 FR 31751). The At-Sea Hake Observer Program (A-SHOP), now at NOAA's Northwest Fisheries Science Center (NWFSC), places fishery observers on all vessels that process Pacific hake at-sea. The at-sea hake sector consists of 8 to 14 catcher-processor vessels and motherships, along with the associated catcher vessels, that begin fishing in mid-May of each year and continue until the hake quota is reached or until bycatch caps are met. All at-sea hake vessels (catcher-processors and motherships) over 125 feet are required to carry two observers, while vessels under 125 feet carry only one. As of January 2011, all catcher vessels delivering to at-sea processor/vessels require 100% observer coverage as well. At-sea hake observers monitor and record catch data in accordance with protocols detailed in the A-SHOP manual available online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm.

To increase the utilization of bycatch otherwise discarded as a result of trip limits, Amendment 13 to the Groundfish FMP implemented an increased utilization program on 1 June 2001, which allows catcher/processors and motherships in the whiting fishery to exceed groundfish trip limits without penalty, providing specific conditions are met. These conditions include provisions for 100% observer coverage, non-retention of prohibited species, and either donation of retained catch in excess of cumulative trip limits to a bona fide hunger relief agency or processing of retained catch into mince, meal, or oil products.

West Coast Groundfish Observer Program

Non-hake groundfish sectors are observed by the West Coast Groundfish Observer Program (WCGOP), which was established in May 2001 by NOAA Fisheries (NMFS) in accordance with the Pacific Fishery Management Plan (50 CFR Part 660) (50 FR 20609). This regulation requires that all vessels that catch groundfish in the U.S. Exclusive Economic Zone (EEZ) from 3–200 miles offshore carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require that vessels, which only fish in the 0–3 mile state territorial zone, also carry observers. WCGOP observers are stationed along the U.S. West Coast from Bellingham, Washington to San Diego, California.

The WCGOP's goal is to improve estimates of total catch and discard by observing shoreside groundfish sectors along the U.S. West Coast. Originally, the WCGOP focused observer effort in the LE bottom trawl and LE fixed gear sectors. Obsesrver coverage has varied considerably among sectors (Table 6 -- Table 9). In 2002, the WCGOP began deploying observers in open access sectors while increasing its coverage of the LE bottom trawl sector. In 2005, the WCGOP increased its coverage of the LE fixed gear sector, and in 2006, the WCGOP improved coverage of the nearshore sector. Observer coverage in the open access fixed gear sector has generally been very low (Table 9). In 2010, the WCGOP coverage goal was to maintain, at a minimum, 20% coverage in the LE bottom trawl and LE fixed gear sectors by landings, while continuing to improve coverage in the open access sectors of the groundfish fishery. In 2011, WCGOP coverage of the LE bottom trawl sector increased to 100% under the catch share management structure with IFQs. An observer coverage plan from the WCGOP is available at:
(http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm).

Additionally, the NWFSC has worked closely with the Council and NMFS Northwest Region (NWR) to coordinate the availability of WCGOP results into the management regime. The WCGOP has released annual reports since 2003 that describe the analysis of observer data for various fishery sectors and species collected under the program. These reports and background materials on the WCGOP are available on the Northwest Fisheries Science Center website at:
(http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm).

Table 6 -- Total trips, tows, vessels and groundfish landings observed in the limited entry groundfish bottom trawl fishery. Coverage rates are computed as the observed proportion of total FMP groundfish landings (excluding Pacific hake), summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

Coastwide Total						
	Observed				Fleet Total	Coverage Rate
Year	# of trips	# of tows	# of vessels	Groundfish landings (mt)	Groundfish landings (mt)	% landings observed
2002	559	3127	131	2583.7	20231.6	13%
2003	461	2284	125	2592.0	18625.6	14%
2004	613	3433	103	4300.7	17796.8	24%
2005	522	3460	105	4243.2	19372.6	22%
2006	476	2972	87	3438.4	17876.8	19%
2007	371	2515	88	3442.1	20513.6	17%

2008	438	3185	100	4889.6	24212.4	20%
2009	588	4381	101	6044.9	26159.5	23%
2010	348	2616	84	4100.3	22410.2	18%

Table 7 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the limited entry sablefish-endorsed fixed gear groundfish fishery during the primary season. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

	Coastwide Total								
	Observed					Fleet Total		Coverage Rate	
Year	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002	91	638	31	273.3	298.6	1064.4	1287.0	26%	23%
2003	82	711	20	371.2	390.1	1504.7	1639.6	25%	24%
2004	58	459	19	261.8	272.0	1830.5	1919.6	14%	14%
2005	139	1154	32	762.6	813.9	1757.2	1889.2	43%	43%
2006	106	757	24	496.8	519.9	1855.9	1992.0	27%	26%
2007	105	671	26	388.6	461.4	1406.6	1563.5	28%	30%
2008	101	868	24	574.9	599.9	1343.9	1478.6	43%	41%
2009	73	354	12	164.7	177.2	1843.3	1986.6	9%	9%
2010	180	1068	27	511.2	541.6	1792.3	1929.9	29%	28%

Table 8 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the limited entry non-sablefish-endorsed fixed gear groundfish fishery. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

	Coastwide Total								
	Observed					Fleet Total		Coverage Rate	
Year	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002	11	22	4	1.7	3.0	142.4	275.5	1%	1%
2003	130	219	17	14.3	32.1	135.7	309.2	11%	10%
2004	62	130	14	3.7	15.9	109.4	283.2	3%	6%
2005	35	60	11	2.4	9.3	134.3	306.7	2%	3%
2006	121	196	21	6.9	23.7	123.1	306.0	6%	8%
2007	158	303	36	16.5	37.5	113.1	260.2	15%	14%

2008	122	220	32	9.3	31.7	136.5	292.4	7%	11%
2009	138	271	34	12.0	30.3	279.9	444.8	4%	7%
2010	226	470	38	33.8	57.3	359.4	613.4	9%	9%

Table 9 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the open access fixed gear groundfish fishery. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

	Coastwide Total								
	Observed					Fleet Total		Coverage Rate	
Year	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002						358.5	433.0	0%	0%
2003	57	99	20	10.0	19.5	517.5	647.9	2%	3%
2004	136	235	30	24.3	33.2	419.7	562.1	6%	6%
2005	77	87	24	17.1	20.5	855.7	919.5	2%	2%
2006	48	50	22	10.6	12.4	736.9	825.4	1%	2%
2007	95	138	44	18.5	19.1	417.8	442.2	4%	4%
2008	111	141	51	23.0	26.6	517.1	570.3	4%	5%
2009	93	146	48	25.7	30.2	921.3	983.7	3%	3%
2010	105	173	60	30.0	33.7	990.3	1092.0	3%	3%

Shore-based Pacific Whiting Observation Program

The Shoreside Hake Observation Program (SHOP) was established in 1992 to provide information for evaluating bycatch in the directed Pacific whiting fishery and for evaluating conservation measures adopted to limit the catch of salmon, other groundfish, and prohibited species. Though instituted as an experimental monitoring program, it has been continued annually to account for all catch in targeted whiting trip landings, enumerate potential discards, and accommodate the landing and disposal of non-sorted catch from these trips. Initially, the SHOP included at-sea samplers aboard shore-based whiting vessels. However, when an Oregon Department of Fish and Wildlife (ODFW) analysis of bycatch determined no apparent difference between vessels with and without samplers, sampler coverage was reduced to shoreside processing plants. In 1995, the SHOP's emphasis changed from a high observation rate (50% of landings) to a lower rate (10% of landings), and the SHOP increased emphasis on collection of biological information (e.g., otoliths, length, weight, sex, and maturity) from Pacific whiting and selected bycatch species (yellowtail rockfish, widow rockfish, sablefish, chub [Pacific] mackerel [*Scomber japonicus*], and jack mackerel [*Trachurus symmetricus*]). The required observation rate was decreased as studies indicated that fishtickets were a good representation of what was actually landed. Focus shifted again due to 1997 changes in the allocation of yellowtail rockfish and increases in yellowtail bycatch rates. Since then, yellowtail and widow bycatch in the shoreside whiting fishery has been dramatically reduced because of increased awareness by fishermen of the bycatch and allocation issues involved in the SHOP program.

The SHOP is a cooperative effort between the fishing industry and state and federal management agencies to sample and collect information on directed Pacific whiting landings at shoreside processing plants. Participating vessels apply for and carry an EFP issued by NMFS. Permit terms require vessels to retain all catch and land unsorted catch at designated shoreside processing plants. Permitted vessels are not penalized for landing prohibited species (e.g., Pacific salmon, Pacific halibut, and Dungeness crab), nor are they held liable for overages of groundfish trip limits. For additional information and complete reports go to: (www.dfw.state.or.us/MRP/hake/).

Since inception, an EFP has been adopted annually to allow suspension of at-sea sorting requirements in the shore-based whiting fishery, enabling full retention and subsequent port sampling of the entire catch. However, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based Pacific whiting fishery. In 2008, the Council and NMFS implemented a monitoring program to maximize retention opportunity without the use of the EFP process. Electronic monitoring of catches through the use of deck cameras and human at-sea observers were used, prior to catch share implementation to ensure maximized retention of catch at sea. Since the inception of the IFQ Program in January, 2011, 100% observer coverage has replaced electronic deck monitoring.

Data Collection Programs – Recreational sectors

Monitoring Recreational Catch

Recreational catch is monitored by the states as it is landed in port. These data are compiled by the PSMFC in the RecFIN database. The types of data compiled in RecFIN include sampled biological data, estimates of landed catch plus discards, and economic data. Descriptions of the RecFIN program, state recreational fishery sampling programs in Oregon and Washington, and the most recent data available to managers, assessment scientists, and the general public, can be found on the PSMFC web site at: (http://www.psmfc.org/Recreational_Fisheries_Information_Network_RecFIN).

Central California Marine Sport Fish Project

The CDFG has been collecting angler catch data from the CPFV industry intermittently for several decades in order to assess the status of the nearshore California recreational fishery. The project has focused primarily on rockfish and lingcod angling and has not sampled salmon trips. Reports and analyses from these projects document trends by port area in species composition, angler effort, catch, and, for selected species, Catch Per Unit Effort (CPUE), mean length, and length frequency. In addition, total catch and effort estimates are based on adjustments of logbook data by sampling information. Before 1987, catch information was primarily obtained on a general port basis from dockside sampling of CPFVs, also called party boats. This did not allow for documentation of specific areas of importance to recreational anglers and was not sufficient to assess the status of rockfish populations at specific locations.

CPFV operators in California are required by law to record total catch and location for all fishing trips in logbooks provided by the CDFG. However, the required information is too general to use in assessing the status of the multispecies rockfish complex on a reef-by-reef basis. Rockfish catch data are not reported by species, and information on location is only requested by block number (a block is an area of 100 square miles). Many rockfish tend to be residential, underscoring the need for site-specific data. Thus, there is a strong need to collect catch information on board CPFVs at-sea. However, locations of specific fishing sites are often not revealed for confidentiality reasons.

In May 1987, the Central California Marine Sport Fish Project began on board sampling of the CPFV fleet. Data collection continued until June 1990, when state budgetary constraints temporarily precluded further sampling, resumed in August 1991, and continued through 1994. The program depends on the voluntary cooperation of CPFV owners and operators. Angler catches on board central and northern California CPFVs were sampled from 14 ports, ranging from Crescent City in the north to Port San Luis (Avila Beach) in the south.

Oregon Marine Recreational Observation Program

In response to depleted species declarations and increasing concerns about fishery interactions with these species, ODFW started this program to improve understanding of recreational impacts. There were three objectives to this program: (1) document the magnitude of canary rockfish discard in the Oregon recreational fishery; (2) improve the biological database for several rockfish and groundfish species; and (3) gather reef location information for future habitat mapping. A seasonal sampler was stationed in each of the ports of Garibaldi, Newport, and Charleston to ride recreational groundfish charter vessels coastwide in Oregon from July through September, 2001. The Garibaldi sampler covered boats out of Garibaldi, the Newport sampler covered both Newport and Depoe Bay, and the Charleston sampler covered Charleston, Bandon, and Brookings charter vessels. During a typical day, the sampler would ride a five to eight hour recreational groundfish charter trip and spend the remainder of the day gathering biological and genetic data dockside from several rockfish and groundfish species for which little is known, mostly due to their infrequency in the catch. The sampler records locations of fishing sites by handheld GPS for future use by the Habitat Mapping Project of the ODFW Marine Resources Program. Results from this program have been incorporated into recreational fishery modeling by ODFW. This program has continued and expanded to document the magnitude of discard of all groundfish species, not just canary rockfish. For more information on this program as well as other fishery research and survey programs, see the ODFW Marine Resources Program website at: (www.dfw.state.or.us/MRP/).

WDFW Groundfish At-Sea Data Collection Program

The WDFW At-Sea Data Collection Program was initiated in 2001 to allow fishery participants access to healthier groundfish stocks while meeting the rebuilding targets of depleted stocks and to collect bycatch data through an at-sea sampler program. The data collected in these programs could assist with future fishery management by producing valuable and accurate data on the amount, location, and species composition of the bycatch of rockfish associated with these fisheries, rather than using calculated bycatch assumptions. These data could also allow the Council to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

In recent years, WDFW has implemented its At-Sea Data Collection Program through the use of federal EFPs. In 2001, 2002, 2003, and 2004, WDFW sponsored and administered a trawl EFP for arrowtooth flounder and petrale sole, and in 2002, WDFW also sponsored a mid-water trawl EFP for yellowtail rockfish. The primary objective for these experimental fisheries was to measure bycatch rates for depleted rockfish species associated with these trawl fisheries. Fishery participants were provided access to healthier groundfish stocks and were constrained by individual vessel bycatch caps. State-sponsored samplers were used to collect data on the amount of rockfish bycatch caught on a per tow basis and to ensure the vessel complied with the bycatch cap; therefore, vessels participating in the EFP were required to have 100% sampler coverage. In 2003 and 2004, WDFW sponsored a longline EFP for spiny dogfish that also required 100% sampler coverage to measure the bycatch rate of depleted rockfish species associated with directed dogfish fishing.

WDFW Ocean Sampling Program

In addition to the At-Sea Data Collection Program, WDFW collects at-sea data through the Ocean Sampling Program. The WDFW recreational observer program is designed to observe catch on salmon charter trips only. Groundfish are occasionally observed on these trips but biological data is not collected. The estimated discard weights are derived from landed retained catch. The at-sea portion is not intended to be an observer program for the purposes of enumerating the bycatch alone, but is coupled with shore-based sampling of anglers to calculate an estimated discard weight. At-sea samplers record biological information from discarded species. Shore-based creel surveys of anglers provide the estimate of total number of discards. Combining these two data sources yields estimates of the weight of total fishery discard by species.

Data Collection Programs – Tribal sectors

Tribal Observer Program

Tribal-directed groundfish fisheries are subject to full rockfish retention. For some rockfish species where the tribes do not have formal allocations, trip limits proposed by the tribes are adopted by the Council to accommodate incidental catch in directed fisheries (i.e., Pacific halibut, sablefish, and yellowtail rockfish). These trip limits are intended to constrain direct catches while allowing for small incidental catches. Incidental catch and discard of depleted species is minimized through the use of full rockfish retention, shore based sampling, observer coverage, and shared information throughout the fleets regarding areas of known interactions with species of concern. Makah trawl vessels often participate in paired tows in close proximity where one vessel has observer coverage. If landings on the observed vessel indicate higher than anticipated catches of depleted species, the vessels relocate and inform the rest of the fleet of the results (Joner 2004). In order to avoid depleted species, fleet communication is practiced by all tribal fleets.

Additional Relevant Data Collection Programs

Stranding network

Under the Marine Mammal Protection Act (MMPA) of 1972, NOAA Fisheries' regional marine mammal stranding networks were established in the early 1980's and are composed of cooperating scientific investigators, academic institutions, volunteer individuals and non-government organizations, wildlife and fisheries agencies, and federal, state and local enforcement agencies. Network participants are trained in systematic data collection and are experienced in handling a variety of marine mammal stranding related tasks. The regional stranding networks are administered via authority delegated to the regional administrators in each of the six NOAA Fisheries regions (Northeast, Southeast, Alaska, Northwest, Southwest, and Pacific Islands). The 1992 amendments to the MMPA established the Marine Mammal Health and Stranding Response Program (MMHSRP) and began the systematic compilation of regional stranding data and standardization of stranding response practices on a national level.

Two regional stranding networks operate on the Pacific coast of the continental U.S. The northwest network responds to marine mammal and sea turtle stranding events along the Washington and Oregon coasts, and the southwest network responds to events along the California coast. The stranding networks receive reports of stranding events from the public and respond to investigate and collect standardized data. Coordinators in each region verify and enter the data into a national database to establish baseline information on marine mammal populations and monitor their health. The reporting form containing prompts for standardized data collection is accessible online at: http://www.nmfs.noaa.gov/pr/pdfs/health/levela.pdf. These standardized data include evidence of human interaction, such as signs of fishery interaction or boat collision. Where there are findings of human interaction an additional report is generated that includes more details about the observations that support the determination of the specific interaction type.

For data quality control, specific reporting protocols have been developed for use by the networks and regional coordinators. The collection of stranding data, in the field, is strongly influenced by the condition of the remains when examined as well as environmental factors such as severe weather or tidal fluctuation at the exam location. These factors can obscure the detection of human interaction evidence thus affecting the confidence in a human interaction determination. To assist with data interpretation, the MMHSRP protocols assign four confidence levels to the field data; 1) unconfirmed – low; 2) confirmed – minimum; 3) confirmed – medium; and 4) confirmed – high. Confirmed reports are used to inform the periodic updates to marine mammal stock assessment reports and annual modifications to the MMPA list of fisheries.

NOAA Fisheries is completing policy development for analyzing and using marine mammal/human interaction data in stock assessment reports and list of fisheries decisions. Regional fisheries science centers compile information on marine mammal/human interactions from a variety of source including reports from regional stranding coordinators, fisher self reports, fisheries observer data and other reports from the field. Although the publication of stock assessment reports and list of fisheries decisions are periodic (annul or semi-annual) the compilation of data from the various sources, including regional stranding data, may lag behind the current reporting cycle by up to two years.

Fishery Enforcement Monitoring

Enforcement of fishery regulations has become increasingly complex with the addition of large closed areas, smaller cumulative trip limits and bag limits, and depth-based closures for commercial and recreational fisheries. At the same time, decreased catch limits and the need to rebuild depleted stocks has placed additional importance on controlling and monitoring fishery-related mortality. Enforcement agencies continue to use traditional methods to ensure compliance with groundfish fishery regulations, including dockside sampling, at-sea patrols, and air surveillance. Vessel Monitoring Systems (VMS) enhance, rather than replace, traditional enforcement techniques. Recent declines in enforcement agency budgets, combined with increased regulatory complexity, have stressed the ability to adequately monitor fisheries for regulatory compliance. In response, NMFS implemented a VMS monitoring program, which includes satellite tracking of vessel positions and a declaration system for those vessels legally fishing within an RCA. VMS was initially implemented on 1 January 2004, and is currently required on all vessels participating in the groundfish fishery with a limited entry permit. In November 2005, the Council recommended expansion of VMS requirements to all commercial vessels that take and retain, possess, or land federally-managed groundfish species taken in federal waters or in state waters prior to transiting federal waters. Additionally, to enhance enforcement of closed areas for the protection of groundfish essential fish habitat, the Council recommends requiring VMS on all non-groundfish trawl vessels, including those targeting pink shrimp, California halibut, sea cucumber, and ridgeback prawn. Implementation of expanded VMS requirements is recommended to coincide with implementation of regulations for the protection of groundfish habitat but, no sooner than 1 January 2007.

Detailed descriptions of VMS and the analyses of VMS monitoring alternatives are contained in an EA prepared by NMFS and were presented to the Council in support of decisions to first implement and later expand the VMS monitoring program (NMFS 2003). Additional information on VMS, including links to the supporting NEPA documentation, can be found on the Council web site at: (www.pcouncil.org/groundfish/gfvms.html#info).

Anticipated Fishing Effort Changes

Most of our information on interactions between the WCGF and ESA-listed species has been obtained over the period from 2002–2010, corresponding to initiation of federal observer programs (see above). However, fishing effort patterns and the associated exposure of listed species to fishery effects is subject to change through a variety of factors, including the population dynamics of fish species and behavioral drivers of fishing fleets through economic factors, such as fuel prices, market dynamics, and regulations. Of these, regulatory drivers are the most foreseeable, and an assessment of how listed species exposure may be impacted is provided below. Due to limitations in predictive capability, the assessment is qualitative. Precise characterization of effort shifts is a function of monitoring and is performed through retrospective analysis. NMFS and the Council track changes in the fishery through the monitoring programs described in this document. The information is compiled in reports submitted throughout the year to the Council and is available for public review. In addition, the response of fishing behavior to individual quota programs, as implemented under amendments 20 and 21, is an area of increased research that is expected to be refined over time and may lead to improvements in predicting effort shifts (for example, see Toft et al. 2011; Kaplan unpublished; and Marchal et al. 2009).

Regulatory Induced Effort Shifts

NMFS and the Council implemented a trawl rationalization program in January 2011 that represents a significant change to management of the groundfish fishery. Of importance to listed species are potential changes in fishing effort profiles by time, area, and gear type. The trawl rationalization program is a limited access privilege program designed to reduce capacity and improve the management, accountability, economic, and environmental stability of the groundfish fishery by vesting the conditional privilege of catch shares for a predetermined quantity of fish with permit holders. The program was implemented in 2011 by amendments 20 and 21 to the FMP and accompanying regulations. The Council's goal for the program is to:

> *Create and implement a capacity rationalization plan that increases net economic benefits, creates individual economic stability, provides for full utilization of the trawl sector allocation, considers environmental impacts, and achieves individual accountability of catch and bycatch.*

The objectives supporting this goal are to:

- Provide a mechanism for total catch accounting;
- Provide for a viable, profitable, and efficient groundfish fishery;
- Promote practices that reduce bycatch and discard mortality, and minimize ecological impacts;
- Increase operational flexibility; minimize adverse effects from the program on fishing communities and other fisheries to the extent practical;
- Promote measurable economic and employment benefits through the seafood catching, processing, distribution elements, and support sectors of the industry;
- Provide quality product for the consumer; and,
- Increase safety in the fishery.

The trawl rationalization program is in its earliest stages; however, it may influence the exposure of listed species to the fishery by incentivizing fishermen to change their historical fishing patterns relative to gear type and the time and location where it is deployed. The trawl rationalization program is also expected to reduce the overall amount of groundfish trawl effort by 50% to 66%; however, this reduction may be unevenly distributed (Lian et al. 2009). The program components that are most likely to influence effort patterns are allocation, gear switching, qualifying years, and quota transfer between fishermen. These components are discussed below.

Allocation

Amendment 21 allocates fixed percentages of allowable harvest by species to sectors. Because sectors are defined primarily by gear type, allocation may have the general effect of increasing or decreasing listed species exposure to a specific fishing gear and its associated impact potential. For the most part however, this is not expected to be the case. In general, the allocations are based on catch history from 2003–2005. This time period is recent enough that no significant changes are expected. There are three exceptions: starry flounder; "other flatfish;" and chilipepper rockfish south of 40º10'N latitude, for which amendment 21 allocates a higher percentage to the non-trawl sector than accounted for during the qualifying period. This may result in an increase in pot and bottom-longline gear fishing effort; however, it is impossible to predict the magnitude of such an increase given available data. As described above, NMFS is actively monitoring changes in the fishery that result from the trawl rationalization program and producing reports that will be incorporated into the ESA consultation process as it unfolds.

Gear Switching

Within the trawl rationalization program, vessels are no longer required to use a specific gear type. Vessels that have been limited to trawl gear may now opt to use non-trawl gear. As with other elements of the trawl rationalization program, it is unknown how this will influence fishing effort profiles. Market analysis suggests it may be economically beneficial for some fishermen to harvest sablefish by bottom-longline instead of trawl; however, it is not yet known if this will occur or, if it does, the magnitude of change. As mentioned above, starry flounder, "other flatfish," and chilipepper rockfish south of 40º10'N latitude have been allocated to non-trawl fisheries in excess of historical amounts. Similar to sablefish, it is not possible to determine if this will result in a net increase in non-trawl effort. NMFS is actively monitoring changes in the fishery that result from the trawl rationalization program and producing reports that will be incorporated into the ESA consultation process as it unfolds.

Qualifying Years

Determination of "qualifying years" for trawl rationalization has the potential to create geographic shifts that may influence interactions with listed species. Qualifying years are the period of time that a permit must have been active to be eligible for participation in the trawl rationalization program. After considering several possible time periods to serve as the qualifying period, the Council recommended the years 1994–2003 for non-overfished species. These years represent the period of time from the beginning of the license limitation period through the announcement of the trawl rationalization control date. Dates prior to 1994 would not have permit histories because the Limited Entry system under which the permits were issued was not implemented until 1994. Other potential start dates between 1994 and 2003 were considered, including 1997 (the first year of fixed allocations among the three whiting sectors), 1998 (to exclude older histories), 1999 (the year of the first major reductions in response to overfished determinations), and 2000 (the year disaster was declared and fishing opportunities were significantly constrained and modified). The Council also considered 2004 as a later end date to the qualifying period, but determined that using 2004 would reward speculative entrants who chose to ignore the control date, create perceptions of inequity, and undermine the ability of the Council to use control dates in the future. The recommended range of years from 1994–2003 would include fishing patterns from under a variety of circumstances, would recognize long-time users of the fishery, and is intended to mitigate disruptive effects experienced by communities as a result of geographic effort shifts.

Quota Transfer

Permit holders with individual quotas may sell or transfer quota under the new program rather than harvest it themselves. Early research indicates this may reduce overall effort as quota is transferred to the most efficient and profitable operations and consolidate effort in areas with high relative catch rates (Toft et al. 2011). The extent to which these changes manifest are a function of monitoring and are tracked through the data collection programs described above.

Summary of Potential Shifts in Fishing Effort

Fishing patterns are a function of multiple variables, the most significant of which is a recent implementation of the trawl rationalization program. The program may incentivize fishermen to increase fixed gear effort in patterns that deviate from historical norms. The magnitude of this deviation is not predictable; however, NMFS and the Council actively monitor fishing effort and produce periodic reports that will be available as the ESA consultation process unfolds.

Chapter 3: Whales

Introduction

In this section we briefly describe several issues and approaches that are common to each whale species. For most species, there are three primary data sources describing known or potential interactions between whales and the WCGF fishery: 1) the A-SHOP and WCGOP observer programs (Chapter 2), 2) data from the NWR and SWR stranding networks (Chapter 2 and Appendix C), and 3) information on spatial and temporal overlap between the species and the fisheries (Appendix B).

The proportion of fishing activity observed by the observer programs varies considerably among sectors (see Table 6 -- Table 9) and ranges from essentially 100% (at-sea hake catcher/processor sector) to 0% (some parts of the fixed gear sector in some years). In addition, some components of the fixed gear fishery involve leaving gear unattended (see Chapter 2). Large whales can swim considerable distances after becoming entangled in such gear, so mortality or injuries may be unobserved in such fisheries even if observers are on board. The potential for unobserved mortality due to entanglement in pot/trap gear introduces considerable uncertainty into any evaluation of the impacts of these fisheries on large whales.

Over the period from 2002–2009, there was only a single fishery interaction with a large whale reported by the A-SHOP and WCGOP observer programs (collision between a fishing boat and a sperm whale; Jannot et al., 2011). The lack of observed interactions with those components of the fishery that have moderate to high observer coverage (at-sea hake catcher/processor and most parts of the bottom trawl fisheries) indicates that direct interactions between these components of the WCGF fishery and large whales are rare. However, most components of the open access fixed gear portion of the WCGF fisheries have very low observer coverage (Table 9), so the lack of reported interactions with fixed gear such as traps or pots does not indicate that such interactions do not occur. Indeed, the observation of stranded or dead whales with trailing gear or evidence of gear-related scaring indicates that some unobserved fishing mortality does occur, although few of these deaths can be directly linked to a specific fishery (Appendix C).

Estimates of impacts due to gear entanglement in fixed gear fisheries are therefore minimum estimates, due to the difficulty of observing these events, particularly for fisheries in which gear is left to fish unattended (see Chapter 2). In the Gulf of Maine, for example, the annual rate of new entanglement scarring of humpback whales has been estimated to be 12.1% (Robbins and Mattila, 2004), and the total mortality rate due to entanglement at roughly >3% annually (Robbins et al., 2009), a rate ~10X higher than has been directly observed (Waring et al., 2009).

In evaluating the risks for entanglement in fixed gear, we therefore must rely on more indirect information, such as the degree of spatial overlap with the fishery (Appendix B). In some cases we also evaluated the recently rate of population increase of a species and compared this to the rate expected in the absence of human-caused mortality. In cases where the observed rate of increase is similar to what would be expected in the absence of substantial external mortality, we concluded that fishery entanglement was unlikely to be substantially impacting the population. However, in the absence of more direct estimates of mortality, there will continue to be some uncertainty about the true impacts of unobserved fisheries and entanglement in unattended gear.

For whales (and all other marine mammals) another common method of evaluating the risk imposed by a particular level of mortality is the concept of Potential Biological Removal (PBR) (Barlow et al., 1995). The PBR concept is a key element in conducting assessments under the Marine Mammal Protection Act, and it is intended to represent the maximum level of anthropogenic mortality consistent with the unimpeded recovery of depleted stocks. PBR is calculated as N_{min}* 0.5 R_{max} * F, where N_{min} is the minimum current population size, R_{max} is the maximum annual rate of increase for the species or stock, and F is a recovery factor that ranges from 0.1 to 1 depending on the conservation status of the stock. We therefore review recent estimates of PBR and associated human-caused mortality for all of the marine mammal species we evaluated (Carretta et al. 2010).

*Humpback whale (*Megaptera novaeangliae*)*

General biology[5]

Humpback whales are a species of baleen whale characterized by long pectoral flippers, distinct ventral fluke patterning, dark dorsal coloration, a highly varied acoustic call, and a diverse repertoire of behavior. Coloring of the ventral surface varies from white to marbled to fully black. They are among the larger whales, weighing over 40 tons and with mature lengths of 13–15 m. In the Pacific Ocean, females bear their first calves at between 8–16 years of age, and the maximum life-span is at least 50 years, with an average generation time of 21.5 years. Calving intervals are from 2–3 years following an 11-month gestation period. Humpback whales feed on both krill and small schooling fish, employing both solitary and group foraging strategies.

Range, migratory behavior, and stock structure

Humpback whales are found in all oceans of the world with a broad geographical range from tropical to temperate waters in the northern hemisphere and tropical to waters near the ice edge in the southern hemisphere. All populations undertake seasonal migrations between their temperate and sub-tropical winter calving and breeding grounds and high latitude summer feeding grounds. Humpback whales typically occur on the feeding grounds during the summer and fall months.

In the North Pacific, the primary breeding grounds are located in coastal areas of Central America, Mexico, the Baja Peninsula (Mexico), the Revillagigedos Islands (Mexico), Hawaii, the Philippines, the islands of Ogasaware and Okinawa, and an unidentified additional Western Pacific breeding ground (Calambokidis et al., 2008; Fleming and Jackson, 2011). The breeding populations differ in their genetic characteristics (Baker et al., 1998; Baker and Steel, 2010), and photo-id-based mark/recapture studies indicate a high, but not complete, degree of individual fidelity to one of the four general breeding areas (Mexico, Central America, Hawaii, Asia; Calambokidis et al. 2008).

Feeding areas include coastal waters across the Pacific Rim from California to Japan. Humpback whales are commonly observed off the California, Oregon and Washington coasts during the spring, summer and fall months (Figure 6), and they have also been detected off California (Forney and Barlow 1998) and Washington (Oleson et al. 2009, NWFSC unpubl. data) during the winter. The whales feeding off of California and Oregon are primarily from the Mexican breeding area, with smaller contributions from Central America. The whales feeding off of Washington and Southern British Columbia (BC) are also from the Mexican and Central American breeding areas, but include in addition a significant number of individuals from the Hawaiian breeding area (Calambokidis et al. 2008).

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[5] Unless otherwise noted, all of the material in this section was drawn from the following recent review: Fleming A, Jackson J, 2011. Global review of the humpback whale (*Megaptera novaeangliae*). NOAA-NMFS-SWFSC Tech Memo NMFS-SWFSC-474.

Recent efforts indicate that there is relatively high site fidelity of individuals to broad feeding grounds (Calambokidis et al., 2008), but movements likely occur within these feeding areas. No direct information is available on the routes used by humpbacks from their West Coast feeding areas to breeding areas. However, it can be inferred from their known destinations, based on photo-id data, that in Oregon and California their movements are probably primarily coastal as they move to Mexico and Central America. Limited information is available on the routes of whales tagged on their Mexican breeding ground, but the movements of one whale to the BC feeding ground was generally near or westward of the continental slope (Lagerquist et al., 2008). This coastal migration pattern may be similar for the portion of the northern Washington animals that also breed in these areas, but a substantial proportion of the animals observed in this area winter in Hawaii, and these animals obviously must have a less coastal migration pattern.

Habitat use

West Coast humpback whales migrate from breeding grounds in Mexico and Hawaii to the West Coast of the United States and British Columbia to feed in the summer. Thus, while whales do occur throughout the shelf waters of the U.S. West Coast, they tend to aggregate off central California, Oregon, and the northwest coast of Washington State (Figure 6). In California, the whales tend to use the Monterey Bay and Gulf of the Farallons (Barlow et al., 2009; Benson, 2002; Benson et al., 2002; Forney, 2007; Kieckhefer, 1992). Off the northwest coast of Washington, whales have been primarily observed to occur east of the Barkley Canyon, between the La Perouse Bank and Nitnat Canyon, and on the shelf edge near the Juan de Fuca Canyon (Figure 6; Calambokidis et al., 2004; Dalla Rosa, 2010). In particular, the whales appear to occur primarily on the periphery of the Juan de Fuca Eddy (Dall Rosa 2010). In northern California and southern Oregon, humpbacks appeared to be associated with the inside edge of the coastal upwelling front (Tynan et al., 2005).

Critical habitat

Critical habitat has not been identified for this species. However, a NOAA National Marine Sanctuary was specifically established to protect this species' Hawaii wintering ground, and the Monterey Bay, Gulf of the Farallons/Cordell Bank, and Olympic Coast National Marine Sanctuaries all encompass important feeding grounds.

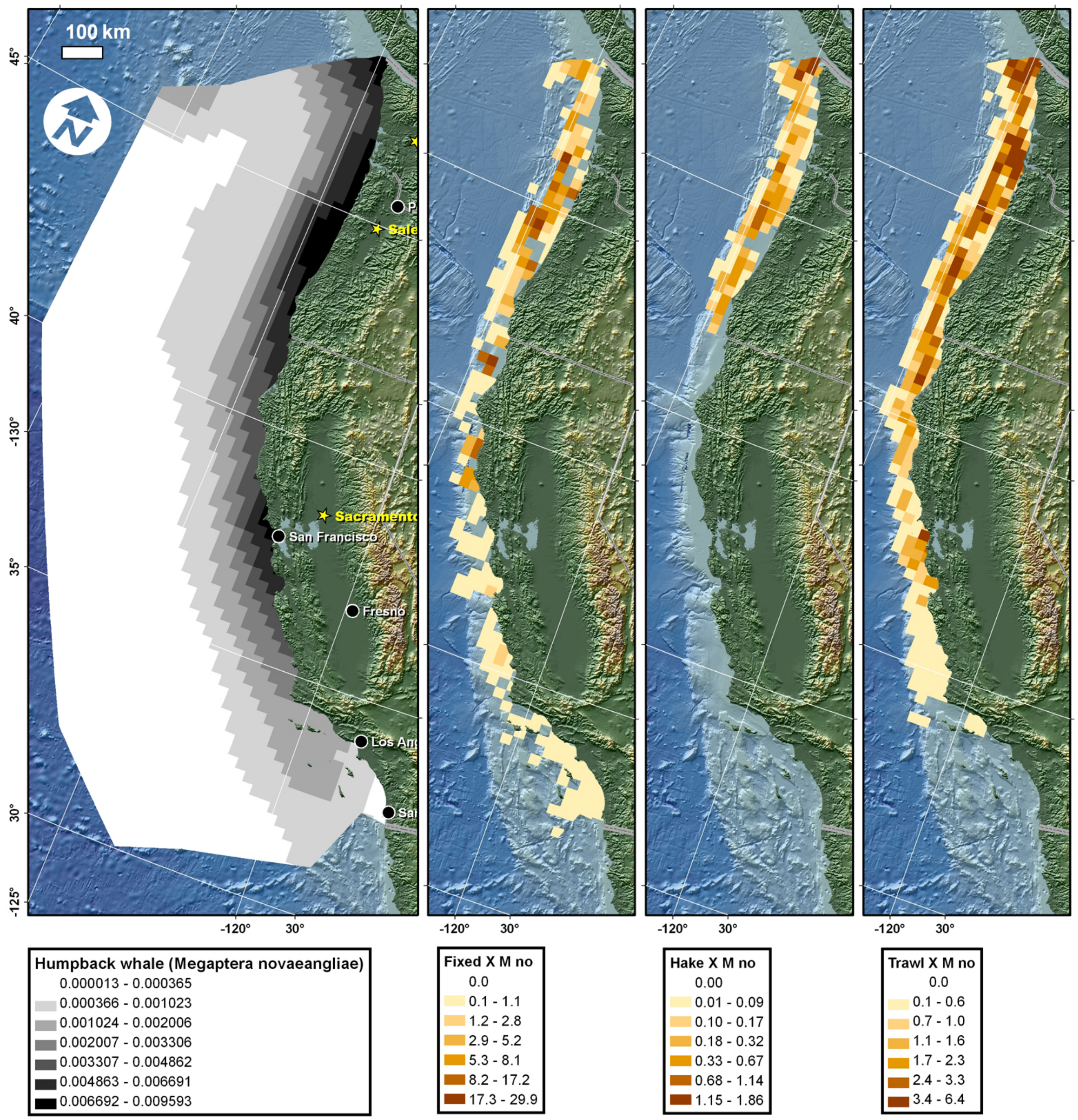

Figure 6: Left panel: Mean predicted humpback whale density (number of animals/km^2), based on surveys conducted from June through November, from 1991 – 2005 (data from Barlow et al. 2009). Ship-based cetacean and ecosystem assessment surveys of humpback sighting locations were extrapolated to a regular grid (25 km resolution) for each year and were smoothed with geospatial methods to obtain a continuous grid of density estimates for the California Current Ecosystem. Right panels: Overlap indices with three fishery sectors: fixed gear, hake trawl, and bottom trawl. Indices are in units of animal hours/km^2. See Appendix B for details.

Status

Humpback whales were listed as endangered under the ESA in 1970. A Recovery Plan was finalized for this species in 1991 (NMFS, 1991). NMFS is currently conducting a status review of the species (Federal Register: 74 FR 40568).

Abundance and trend

The most recent (2004–2006) population estimate of humpback whales in the North Pacific Ocean is 21,808 (CV=0.04) (Barlow et al., 2011), which is higher than the estimated pre-exploitation abundance of ~15,000, although there is a great deal of uncertainty about the latter estimate (Rice, 1978). Estimates of the breeding population sizes during the 2004–2006 time period are approximately 10,000 (Hawaii), 6,000-7,000 (Mexico, including Baja and the Revillagigedos Islands), 500 (Central America), and 1,000 (Western Pacific) (Calambokidis et al. 2008). For management under the Marine Mammal Protection Act, humpback whales stocks are defined based on feeding areas, with the whales feeding off of California, Oregon, and Washington currently considered one stock (Carretta et al., 2010). The estimated abundance of this feeding stock as of 2007/2008 was 2,043 (CV=0.10) (Carretta et al., 2010).

For the North Pacific populations as whole, Calambokidis et al. (2008) estimated an average annual increase of 6.8% over the period from 1966 to 2006, based on an estimated post-exploitation abundance of 1,400 in 1966. The same authors estimated a slightly lower rate of 4.9%, based on the only other North Pacific-wide abundance of estimate of 9,819 in 1991–1993. The Hawaiian breeding population was estimated to be increasing at 5.5–6.0% annually over the period from 1991–1993 to 2006. The annual growth rate for the CA-OR-WA feeding stock is estimated to be 7.5%, based on abundance estimates from the 1980s, 1990s, and 2000s (Carretta et al. 2010). The point estimates of the maximum expected rate of annual increase for the species based on its life-history pattern range from 7.3–8.6% (Zerbini et al., 2010), with a maximum plausible rate (upper 99% confidence interval of the expected maximum) of 11.8% annually.

Where they have been measured, most Southern Hemisphere populations have been increasing at annual rates of 7–9% since the early- to mid-1990s (reviewed by Fleming and Jackson 2011). The Gulf of Maine feeding population has been estimated to be increasing at a lower rate of ~3% annually from 1979 to 1993 (Stevick et al., 2003).

Threats (from Recovery Plan or listing documents)

Humpback whales face a variety of threats, depending on the region in which they occur. Threats listed in the Recovery Plan include entrapment and entanglement in fishing gear, collisions with ships, acoustic disturbance, habitat degradation, and competition for resources with humans (NMFS 1991).

Fishery impacts

Fisheries may affect humpback whales through several mechanisms, including vessel collisions, physical disturbance, acoustic disturbance, entanglement in nets or lines, pollution from exhaust or spills, and direct or indirect reduction of prey (NMFS 1991).

Impacts, all fisheries

California, Oregon, Washington – There were been 28 reported entanglements of humpback whales in fishing gear off the West Coast from 2000 to 2007 (SWR and NWR stranding network; Alison Agness, personal communication to M. Ford August 28, 2009). Of these, 15 involved pot gear, 6 involved net gear, and 7 involved gear of unknown type. In most of these cases, the final status of the entangled animal was unknown. Based on these data, Carretta et al. (2010) estimated that a minimum of 3.2 humpback whales per year were killed or seriously injured due to entanglement over the 2004–2008 time period. Carretta et al. (2010) also reported a minimum of 0.4 deaths per year in this area due to ship strikes.

Mexico*, Central America* – Carretta et al. (2010) summarized information on fishery interactions in Mexico as follows:

> Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and may take animals from the same population. Quantitative data are available only for the Mexican swordfish drift gillnet fishery, which uses vessels, gear, and operational procedures similar to those in the U.S. drift gillnet fishery, although nets may be up to 4.5 km long (Holts and Sosa-Nishizaki 1998). The fleet increased from two vessels in 1986 to 31 vessels in 1993 (Holts and Sosa-Nishizaki 1998). The total number of sets in this fishery in 1992 can be estimated from data provided by these authors to be approximately 2,700, with an observed rate of marine mammal bycatch of 0.13 animals per set (10 marine mammals in 77 observed sets; Sosa-Nishizaki et al. 1993). This overall mortality rate is similar to that observed in California driftnet fisheries during 1990–95 (0.14 marine mammals per set; Julian and Beeson, 1998), but species-specific information is not available for the Mexican fisheries. Previous efforts to convert the Mexican swordfish driftnet fishery to a longline fishery have resulted in a mixed-fishery, with 20 vessels alternately using longlines or driftnets, 23 using driftnets only, 22 using longlines only, and 7 with unknown gear type (Berdegué 2002).

Alaska and Hawaii – Angliss et al. (2010) estimated that the minimum commercial fishery-related mortality of the Central Pacific stock was 3 per year, based on observer data from Alaska and Hawaii and stranding information from Alaska. Based on photographic analysis of scarring patterns, Neilson et al. (2009) estimated that 71% of humpback whales in northern Southeast Alaska had been previously entangled, and that 8% (2/26) of the whales in a specific location received new scars between 2003 and 2004.

Impacts, WCGF fisheries

Humpback whales occur at highest densities near the coast, and therefore generally have a relatively high degree of spatial overlap with WCGF fisheries (Figure 6). Among the three fisheries categories, the highest overlap index was with the fixed gear fishery, followed by the mid-water trawl hake fishery and the bottom trawl fishery (see Figure CET16 in Feist and

Bellman (2011), Appendix B). For the fixed gear portion of the fishery, peak areas of overlap (>17 animals hours/km^2) occur north of Cape Mendocina, off the central Oregon coast, and off the Columbia River mouth (Figure 6). For the trawl fishery, the highest overlap indices occur along the north portion of the coast from Cape Mendocina to Cape Flattery, and areas of overlap are > 3 animals hours/km^2 (Figure 6). The highest overlap indices for the hake fishery occur near Cape Flattery, and are < 2 animal hours/km^2 (Figure 6).

Although there is clearly some spatial overlap between humpback whales and the WCGG fisheries, particularly the fixed gear sector, over the period from 2002–2009, there were no observed fishery interactions with humpback whales reported by the A-SHOP or WCGOP observer programs (Jannot et al., 2011). Note, however, that most components of the fixed gear portion of the WCGF fisheries have very low observer coverage (see Fisheries Description Section), so the lack of reported interactions in low-coverage fisheries does not indicate that such interactions do not occur. Of the entanglements reported by the NMFS Southwest Region and Northwest Region stranding programs, only one could definitively be identified as being caused by the WCGF fishery (entanglement in a sablefish pot). Most of the entanglements could not be associated with a specific fishery, but are mostly characterized as pot/trap gear from unidentified fisheries. Some of these may therefore have involved pot/trap gear associated with the WCGF fishery.

The estimated impact due to gear entanglement is a minimum estimate, due to the difficulty of observing these events, particularly for fixed gear fisheries in which gear is often left unattended for periods of hours to days (see Chapter 2). In the Gulf of Maine, for example, the annual rate of new entanglement scarring has been estimated to be 12.1% (Robbins and Mattila, 2004), and the total mortality rate due to entanglement at >3% annually (Robbins et al., 2009), a rate much higher than has been directly observed (Waring et al., 2009). Humpback whales in the North Pacific also have relatively high entanglement-associated scarring, with 40–50% observed whales in Mexico and Hawaii having entanglement scars compared to 48–57% in the Gulf of Maine (Robbins, 2010; Robbins and Mattila, 2004), suggesting that entanglement may also be common (and underreported) in the Pacific.

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Humpback whales feed on krill and small schooling fishes, such as anchovies and sardines, which are not impacted by the WCGF fisheries to any significant extent (NWFSC 2010). Indirect trophic effects of the WCGF fisheries are also expected to be minor and in fact may positively affect the abundance of krill through removal of predators (Appendix A).

Impact of WCGF fisheries on population growth rate

For the CA-OR-WA humpback stock, current (2008) N_{min} = 1878, R_{max} is assumed to 8%, and F = 0.3 (for an endangered species, with N_{min} > 1,500 and CV[N_{min}] < 0.50; Carretta et al. 2010; NMFS, 2005). This results in a PBR of 22.5, which is reduced to 11.25 if it is prorated for time spent in U.S. waters (Carretta et al. 2010).

The minimum estimate of total fishing mortality or serious injury (WCGF fisheries and other fisheries) is 3.2 per year over the 2004–2008 time period, due to entanglement in fixed gear (Carretta et al. 2010). If the true level of mortality associated with fisheries is close to the minimal estimate, this would suggest that takes from the WCGF fisheries have a very minor impact on the rate of population growth even under the very conservative assumption that all of this take could be attributed to WCGF fisheries. For example, at the current estimated growth rate (7.5%) and abundance (2,043), the population is growing at ~153 individuals annually. If one assumes that this would increase by 3.2 individuals in the absence of fishing, this translates into a reduction of the population growth rate of ~0.16%.

We took two different approaches for estimating the maximum upper bound mortality rate imposed by all fisheries on West Coast humpback whales. First, the difference between the estimated growth rate (7.5%) and maximum plausible growth rate for the species (11.8%) is 4.3%. Under the highly improbable assumption that fishing is the only source of non-natural mortality on the stock and that the stock is sufficiently below carrying capacity that it is increasing at its maximum rate, this value would be an upper bound on the maximum possible impact from fishing and would imply that in recent years, ~88 animals/year are killed due to fishing activities. The second approach was to assume that the estimated 3% mortality from entanglement for the Gulf of Maine stock (Robbins et al., 2009) is also representative of the CA-OR-WA stock. This would imply that in recent years, ~ 61 animals are killed annually due to fishing. Although there are currently no estimates of the annual rate of new scarring from entanglement for the CA-OR-WA stock, the proportion of all animals with scars is similar between the two stocks (Robbins and Matilla 2004, Robbins et al. 2009), which might imply that the rate of scarring from entanglement may be similar between the two areas. Both of the upper bound estimates are well above PBR and, if true, would suggest that total mortality from fishing is having a substantial impact on the population's growth rate.

The true level of impact is almost certainly between the upper and lower bounds, but it is probably much closer to the lower bound than the upper one. In particular, the maximum plausible growth rate of 11.8% is based on the 99th percentile of a distribution around a mean estimate (Zerbini et al. 2010). The authors of that estimate emphasize that "…such a high figure can be observed only with extreme and very optimistic life-history parameters" (Zerbini et al. 2010 p. 1233). The point estimates of the maximum plausible growth rate (7.3–8.6%) are in fact very close to the observed growth rate of the CA-OR-WA stock (7.5%), suggesting that this population is likely to be growing at close to its maximum rate and that mortality from fishing is therefore not substantially impacting its growth rate. The Gulf of Maine estimate of 3% mortality/year is also considered to be a "…crude, preliminary…" estimate by its authors (Robbins et al. 2009 p. 3), and becomes even more so when applied to an entirely different population.

Based on the information summarized above, we conclude that West Coast fisheries, including the WCGF fisheries, are imposing some additional (non-natural) mortality on humpback whales. The number of takes per year is likely to be somewhat higher than the observed number of 3.2 per year. However, the population has been increasing at a rate that is well within the bounds of the maximum intrinsic growth rate of the species, and its current abundance is arguably close to a level associated with recovery. From this, we conclude that recent impacts from fishing are not substantially impacting the population abundance or trend. The lack of substantial impacts on the CA/WA/OR stock, combined with generally increasing trends for humpback whales in the North Pacific and worldwide (Fleming and Jackson 2011), implies the WCGF fisheries are not having a significant impact on either the viability of the globally listed species or any of the Pacific feeding or breeding stocks.

*Sei whale (*Balaenoptera borealis*)*

General biology[6]

The sei whale is a typical sleek rorqual and is the third largest whale, following the blue and fin whales (Perry et al. 1999). At maturity, sei whales range from 12 to 18 m in length (Lockyer 1977, Martin 1983), and females are considerably larger than males (NMFS 2011). Sei whales in the Southern Ocean can be longer than 17 m and weigh up to 28,000 kg (Lockyer 1977). Those in the Northern Hemisphere are smaller than those in the Southern Ocean. Information on sei whale reproduction is based on data from various ocean basins. The mean age at attainment of sexual maturity is thought to be 8–10 years in both sexes (Lockyer and Martin 1983). Estimated sei whale gestation periods range from 10.75 months to just over one year, depending on the model of fetal growth that is selected and potentially, by population (NMFS 2011). The average calving interval is probably at least two years (Jonsgard and Darling 1977; Lockyer and Martin 1983).

In the North Pacific, sei whales feed along the cold eastern currents (Perry et al. 1999). Prey includes calanoid copepods, krill, fish, and squid. In addition to calanoid copepods and euphausiids, sei whales in the North Pacific are said to prey on "almost every gregarious organism occurring with large biomass," including pelagic squid and fish the size of adult mackerel (Kawamura 1982; Nemoto and Kawamura 1977). Some fish species in their diet are commercially important. Off central California, sei whales fed during the 1960s mainly on anchovies from June through August and on krill (*Euphausia pacifica*) during September and October (Clapham et al. 1997; Rice 1977). Flinn et al. (2002) found that copepods were the dominant prey type found in sei whales commercially harvested in British Columbia from 1963–1967. Euphausiids and a number of fish species, including saury, whiting, lamprey, and herring, were also present. Flinn et al. (2002) also found that utilization of some prey varied between years and by season (Flinn et al. 2002). Similarly, Tamura et al. (2009) found that sei whales sampled from 2000–2007 fed on 12 prey species, including three copepod, three euphasiid, five fish (including varieties of anchovy, saury, and mackerel), and one squid species. These authors also concluded that sei whales are opportunistic feeders with flexible diets; principal prey items differed between years and by area. Sei whales tend to prey principally on copepods in the northern part of the North Pacific and fishes and squids elsewhere.

Range, migratory behavior, and stock structure

Sei whales have a cosmopolitan distribution, but the population structure has not yet been well-defined (NMFS 2011). NMFS recognizes three Marine Mammal Protection Act (MMPA) stocks of sei whales: Eastern North Pacific Ocean, Western North Atlantic, and Hawaii (NMFS 2011). Rice (1998) identified two subspecies—the northern sei whale (*Balaenoptera borealis borealis*) and southern sei whale (*Balaenoptera borealis schleglii)*—whose ranges do not overlap. On a global scale, the populations in the North Atlantic, North Pacific, and Southern Hemisphere are almost certainly separate, and they may be further subdivided into geographical

[6] General Biology section largely drawn from (NMFS) National Marine Fisheries Service. 2011. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. December 2011.

stocks (NMFS 2011). However, to date there has been no effort to define subspecies or Distinct Population Segments (DPSs) for sei whales under the ESA.

Sei whales are found primarily in cold temperate to subpolar latitudes rather than in the tropics or near the poles (Horwood 1987). Sei whales spend the summer months feeding in subpolar higher latitudes and return to lower latitudes to calve in the winter. There is some evidence from whaling catch data of differential migration patterns by reproductive class, with females arriving at and departing from feeding areas earlier than males. For the most part, the location of winter breeding areas is unknown.

In the North Pacific Ocean, it is believed that sei whales occur mainly south of the Aleutian Islands (Leatherwood et al. 1982; Nasu 1974). In the eastern Pacific, sei whales range as far south as Baja California, Mexico, to Japan and Korea in the west (Andrews 1916; Horwood 1987), and have been observed in the Hawaiian Islands (Smultea et al. 2010). Sei whales have been observed off central California during the 1960s, mainly in the late summer and early fall (Rice 1974). They have also been observed off the west coast of Vancouver Island, British Columbia, from June through August (Pike and Macaskie 1969). Only five confirmed sightings of sei whales were made in California, Oregon, and Washington waters during extensive ship and aerial surveys between 1991–2005 (Hill and Barlow 1992, Carretta and Forney 1993, Mangels and Gerrodette 1993, VonSaunder and Barlow 1999, Barlow 2003, Forney 2007). Green et al. (1992) did not report any sightings of sei whales in aerial surveys of Oregon and Washington. Their offshore distribution along the continental slope (Gregr and Trites 2001) probably explains, at least in part, the infrequency of observations in shelf waters between northern California and Washington. The sei whale's tendency not to enter semi-enclosed marginal seas or gulfs, noted above for the North Atlantic, also applies in the North Pacific. They are much rarer than Bryde's whales in the Gulf of California, Mexico (Tershy et al. 1990), although they do occur there occasionally, usually in association with other rorqual species (Gendron and Rosales 1996). Few enter the Sea of Japan in spite of the very high primary production in portions of this sea (Nemoto and Kawamura 1977).

Habitat use

Sei whales are highly mobile, and there is no indication that any population remains in a particular area year-round. Sei whales undertake seasonal north/south movements, wintering at relatively low latitudes and summering at relatively higher latitudes (NMFS 2011). Yet, Sei whales do not tend to move to as high latitudes as do the other balaenopterids, and they also tend not to enter semi-enclosed water bodies, such as the Gulf of Mexico, the Gulf of St. Lawrence, Hudson Bay, the North Sea, and the Mediterranean Sea (NMFS 2011).

Throughout their range, sei whales occur predominantly in deep water; typically they are most common over the continental slope (e.g., CETAP 1982; Martin 1983; Mitchell 1975a; Olsen et al. 2009), shelf-breaks (COSEWIC 2003), or in basins situated between banks (e.g., Sutcliffe and Brodie 1977). Furthermore, studies suggest that sei whales are strongly associated with ocean fronts and eddies (Nasu 1966; Nemoto and Kawamura 1977; Skov et al. 2008). A similar affinity for oceanic fronts has been observed in sei whales in Antarctic waters (Bost et al. 2009). These whales may also use currents in large scale movements or migrations (Olsen et al. 2009).

Critical habitat

Due to the paucity of information on sei whale habitat use and data on environmental features that make areas important to sei whales, critical habitat has not yet been identified for this species.

Status

Most stocks of sei whales were reduced, some of them considerably, by whaling in the 1950s through the early 1970s (NMFS 2011). As a consequence, the sei whale has been listed as "endangered" under the Endangered Species Act (ESA) since its passage in 1973. A Recovery Plan for sei whales has recently been completed (NMFS 2011). Of the commercially exploited "great whales," the sei whale is one of the least well studied, and the current status of most sei whale stocks is poorly known (NMFS 2011). There is a need for improved understanding of the genetic differences among and between populations to determine stock structure, which is a prerequisite for assessing abundance and trends of specific stocks (NMFS 2011).

Abundance and trend

Ohsumi and Wada (1974) estimated the pre-whaling abundance of sei whales to be 58,000–62,000 in the North Pacific. Later, Tillman (1977) estimated the pre-whaling abundance to be 42,000 and reported that these whales were reduced to 20% (8,600 out of 42,000) of their pre-whaling abundance between 1963 and 1974. Because 500 to 600 sei whales per year were killed off Japan from 1910 to the late 1950s, the stock was presumably already below its carrying capacity level by 1963 (Tillman 1977).

The last assessment of North Pacific sei whales by the International Whaling Commission (IWC) Scientific Committee was in 1974 (IWC 1977). Abundance estimates from the two most recent line-transect surveys conducted in 2005 and 2008 off California, Oregon, and Washington waters out to 300 nmi are 74 (CV=0.88) and 215 (CV=0.71) sei whales, respectively (Forney 2007, Barlow 2010). The mean abundance (calculated as a geometric mean) of the 2005 and 2008 estimates is 126 (CV=0.53), and the estimated minimum abundance is 83 (Barlow 2010).

There are no data on trends in sei whale abundance in the eastern North Pacific. Although the population is expected to have grown since given protected status in 1976, the potential effects of unauthorized take (Yablokov 1994) and incidental ship strikes and gillnet mortality make this uncertain (Carretta et al. 2009). Furthermore, there are no estimates of the growth rate of sei whale populations in the North Pacific (Best 1993, as cited in Carretta et al. 2009).

Threats (from Recovery Plan or listing documents)

Stocks in the North Atlantic and North Pacific Ocean have been legally protected from commercial whaling for the last 10 or more years, and this protection continues. The current potential threats include collisions with vessels, reduced prey abundance due to overfishing and/or climate change, the possibility that illegal whaling or resumed legal whaling will cause removals at biologically unsustainable rates, and possibly, the effects of increasing anthropogenic ocean noise (NMFS 2011). Carretta et al. (2009) also identified the offshore drift gillnet fishery as the only fishery that is likely to take sei whales from the eastern North Pacific stock of sei whales, but reported that no fishery mortality or serious injuries have been observed. The draft Recovery Plan for sei whales also identified injury or mortality from gear entanglement related to the drift gillnet fishery as a potential threat but considered it to be low in severity, but with high uncertainty (NMFS 2011). The relative impact to recovery is also unknown but potentially low (NMFS 2011).

Fishery impacts

Fisheries may potentially affect sei whales through several mechanisms, including collisions with vessels, reduced prey abundance, and increased anthropogenic ocean noise (NMFS 2011). As stated previously, based on the species' distribution, the offshore drift gillnet fishery is the only fishery that is likely to directly impact sei whales from this stock, but no fishery mortality or serious injuries have been observed (Carretta et al. 2009). The average annual estimated take of sei whales is zero, but some gillnet mortality of large whales may be unobserved because whales can swim away with a portion of the net (Carretta et al. 2009). Total estimated fishery mortality is zero and therefore is approaching zero mortality and serious injury rate (Carretta et al. 2009). Ship strike from fishery-associated vessels is a potential impact. In fact, from 1980–2006, one sei whale death was attributed to blunt force trauma after being struck by a large seafood processing vessel from Dutch Harbor, Alaska (Douglas et al. 2008). Although sei whales appear in ship-strike databases (Laist et al., 2001), there is only a single record for that species recorded from California, Oregon, and Washington combined (Douglas et al. 2008). This may be due to the fact that sei whales are not commonly observed off the U.S. West Coast (Douglas et al. 2008). Although the occurrence is rare, it has the potential to impact the eastern North Pacific stock of sei whales. Carretta et al. (2009) reported that the total incidental mortality due to ship strikes (0.2 per yr) is greater than the calculated PBR (0.05).

Impacts, all fisheries

California, Oregon, Washington – There is potential for impact on eastern North Pacific Ocean stock of sei whales with fisheries in California, Oregon, and Washington. However, there have been no reported entanglements of these whales in fishing gear off these states (Carretta et al. 2009).

Mexico, Central America – There is no evidence that the western coasts of Mexico and Central America were ever highly frequented habitats by sei whales, and there are no data available to assess the impacts of those fisheries on sei whales.

Alaska and Hawaii – The Hawaiian stock of sei whales could be impacted by fisheries activities in Hawaii. There have been no reported entanglements of sei whales in fishing gear off the Hawaiian islands (Carretta et al. 2009), but there is very little data available, and it is insufficient to assess whether total fishery mortality is significant to the Hawaiian stock of sei whales. Fisheries in Alaska could also potentially impact the eastern North Pacific Ocean stock of sei whales, but there are no data available to assess those impacts. Given the low population size and unknown growth rate of sei whales, the impact of even low levels of interactions could be significant.

Impacts, WCGF fisheries

Throughout their range, sei whales occur predominantly in deep water; typically they are most common over the continental slope (e.g., CETAP 1982; Martin 1983; Mitchell 1975a; Olsen et al. 2009), shelf-breaks (COSEWIC 2003), or in basins situated between banks (e.g., Sutcliffe and Brodie 1977). Thus, there is a limited degree of overlap between the WCGF fisheries regions and current sei whale distribution, and consequently there is a limited potential for impacts on the eastern North Pacific Ocean stock of sei whales from ship strikes or entanglement associated with the shelf-oriented WCGF fisheries. Consistent with the low distributional overlap and the apparently very low densities of sei whales, there were no recorded fishery interactions with sei whales from 2002–2009 reported by the A-SHOP or WCGOP observer programs (Jannot et al. 2011). Note, however, that impacts in the low-coverage fixed gear components of the fisheries cannot be entirely ruled out.

Habitat and trophic effects

In the North Pacific Ocean, the trophic interactions of sei whales with other large marine vertebrates are complicated because of the diversity of prey taken by sei whales in this ocean basin (Kawamura 1980, 1982). Rice (1977) suggested that the euryphagous character of sei whales in the eastern North Pacific should allow them to take advantage of population declines of other mysticete whales by increasing and occupying vacated niches. It could also mean that they are more likely than their North Atlantic counterparts to be affected by, and to affect, commercial fisheries for finfish (NMFS 2011).

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Sei whales feed on calanoid copepods, krill, fish, and squid. The dominant food for sei whales off California during June through August is the northern anchovy, while in September and October they mainly eat krill. Although some squid may incidentally be caught by WCGF fisheries, the other prey items consumed by sei whales are not likely to be significantly impacted by the WCGF fisheries (NWFSC 2010). Indirect trophic effects of the WCGF fisheries are also expected to be minor and in fact may positively affect the abundance of krill through removal of predators (Appendix A).

In the case of intensive commercial fisheries that target larger species, it may be possible to alter the ecosystem structure in a manner that causes an increase in the abundance of other species that feed on zooplankton, particularly small fishes with lower economic value (Kenney 2002). This could potentially impact sei whales by increasing competition for their lower trophic level food resources. However, since sei whales appear to have a varied diet and feed in higher latitudes, this scenario, if it did occur, would not likely impact the feeding grounds of these whales.

Impact of WCGF fisheries on population growth rate

Due to the paucity of data on population abundance and reproductive rates, combined with the rarity of observing sei whales in the WCGF fisheries regions, it is not possible to quantify an estimated impact of WCGF on population growth rate. However, the lack of observed interactions combined with the limited degree of spatial overlap between the species and the WCGF fisheries suggest any impacts are likely to be negligible.

*North Pacific Right whale (*Eubalaena japonica*)*

General biology[7]

Right whales are large baleen whales which grow to lengths and weights between 45 and 55 feet (13.7–16.8 m) and 70 tons (63.5 metric tons), respectively (NMFS 2006). Females are larger than males. North Pacific right whales attain larger maximum sizes than the other species, up to 18 m and over 100 metric tons (Kenney 2002). The distinguishing features of right whales include a stocky body, generally black coloration (although some individuals have white patches on their undersides), lack of a dorsal fin, large head (about ¼ of the body length), strongly bowed margin of the lower lip, and callosities on the head region (NMFS 2006).

The North Pacific right whale (*Eubalaena japonica*) is closely related to the right whales that inhabit the North Atlantic and the Southern Hemisphere. Genetic data now provide unequivocal support to distinguish three right whale lineages as separate phylogenetic species (Rosenbaum et al. 2000): (1) the North Atlantic right whale (*Eubalaena glacialis*) ranging in the North Atlantic Ocean from latitudes 60°N to 20°N; (2) the North Pacific right whale (*Eubalaena japonica*), ranging in the North Pacific Ocean from latitudes 70°N to 20°N; and (3) the southern right whale (*Eubalaena australis*), historically ranging throughout the southern hemisphere's oceans.

In both the northern and southern hemisphere, females give birth to their first calf at an average age of nine years (Best et al. 1998; Hamilton et al. 1998). The gestation period ranges from 357 to 396 days in southern right whales (Best 1994), and it is likely to be similar in the northern species. At birth, calves from the southern hemisphere are 5.5–6.0 meters in length (Best 1994). Little is currently known about the age of maturity, the timing of reproduction, or the rate of reproduction for North Pacific right whales. There have been very few confirmed sightings of calves in the eastern North Pacific this century. Calves have been reported in the western North Pacific (Omura 1986; Brownell et al. 2001), but calculation of meaningful reproduction rates remains impracticable. Right whales elsewhere in the world are known to calve every three to four years on average (NMFS 2006). Very little is known about natural mortality in this species, though killer whales and large sharks are potential predators, particularly on calves and juveniles (Kenney 2002). There are also few data on the longevity of right whales. Some evidence suggests that females can live to at least age 70, but recent research on bowhead whales suggests that they may live even longer (Kenney 2002).

Right whales are skimmers; they feed by continuously filtering prey through their baleen while moving, mouth agape, through a patch of zooplankton (NOAA NMFS 2006). The few existing records of right whale feeding habits indicate that right whales feed almost entirely on copepods (Omura 1958, Omura et al. 1969, IWC 1986, Omura 1986), but small quantities of euphasid larvae have also been found in North Pacific right whale stomach contents (Omura 1958).

[7] General Biology section largely drawn from National Marine Fisheries Service. 2006. Review of the Status of the Right Whales in the North Atlantic and North Pacific Oceans. 62 pp.

Range, migratory behavior, and stock structure

The historical ranges of right whales in the North Pacific were much more extensive than they are today. Right whales occurred from Japan and northern Mexico north to the Sea of Okhotsk, Bering Sea, and Gulf of Alaska (Kenney 2002). Formerly abundant across much of the North Pacific in summer, mainly north of 40°N, the North Pacific right whale is now regularly seen only in the Okhotsk Sea and the southeastern Bering Sea, with occasional sightings along the east coast of Japan, off the Bonin Islands, and in the Gulf of Alaska.

Some evidence suggests that there are at least two stocks (western and eastern) of right whales in the North Pacific, though there is disagreement regarding the number and boundaries of right whale stocks in the North Pacific (Brownell et al. 2001). Nevertheless, populations on the Asian and American sides of the Pacific are regarded as discrete (Brownell et al. 2001). In the eastern North Pacific, North Pacific right whales are now only regularly seen in the southeastern Bering Sea. Sightings off Hawaii (e.g., Herman et al. 1980, Rowntree et al. 1980, Salden and Mickelson 1999), Washington (e.g., Rowlett et al. 1994), California (e.g., Scarff 1986, 1991; Carretta et al. 1994, Woodhouse and Strickley 1982) and Mexico (e.g., Rice and Fiscus 1968, Gendron et al. 1999) are relatively rare, and there is no evidence that the western coasts of the United States and Mexico were ever highly frequented habitat for this species (Brownell et al. 2001).

Habitat use

In general, right whale feeding takes place in the spring, summer, and fall months in higher latitude feeding grounds, while calving tends to occur in the winter months in lower latitudes (Kenney 2002). Little is known about habitat use by modern North Pacific right whales, but it appears that fewer regions are utilized by North Pacific right whales today compared to whales in the 19th and 20th centuries (Brownell et al. 2001, Clapham et al. 2004). Recent data from acoustic recorders and surveys suggest that eastern stock of North Pacific right whales primarily utilize habitat in the southeastern Bering Sea from May through December (Allen and Angliss 2010). Although survey effort in the Gulf of Alaska is lower, it seems that North Pacific right whales utilized this area less than the southeastern Bering Sea (Allen and Angliss 2010). There is clearly some migration northward in summer and southward in winter (Clapham et al. 2004), but the location of the wintering grounds is unknown. The rarity of coastal records in winter, either in historical or recent times, suggest that their breeding grounds may have been offshore (Clapham et al. 2004), but no North Pacific right whale calving grounds have ever been discovered (Kenney 2002).

Critical habitat

Critical habitat for the North Pacific right whale was originally designated when the Atlantic and Pacific stocks were grouped together as northern right whales (NOAA, 2006). This critical habitat included two areas off Alaska, one in the Bering Sea and the second in the Gulf of Alaska (Figure 7). After it was determined that the North Pacific right whale is a separate species from the North Atlantic Right whale, the areas above were listed as critical habitat for the North Pacific right whale, effective May 8, 2008 (NOAA, 2008b).

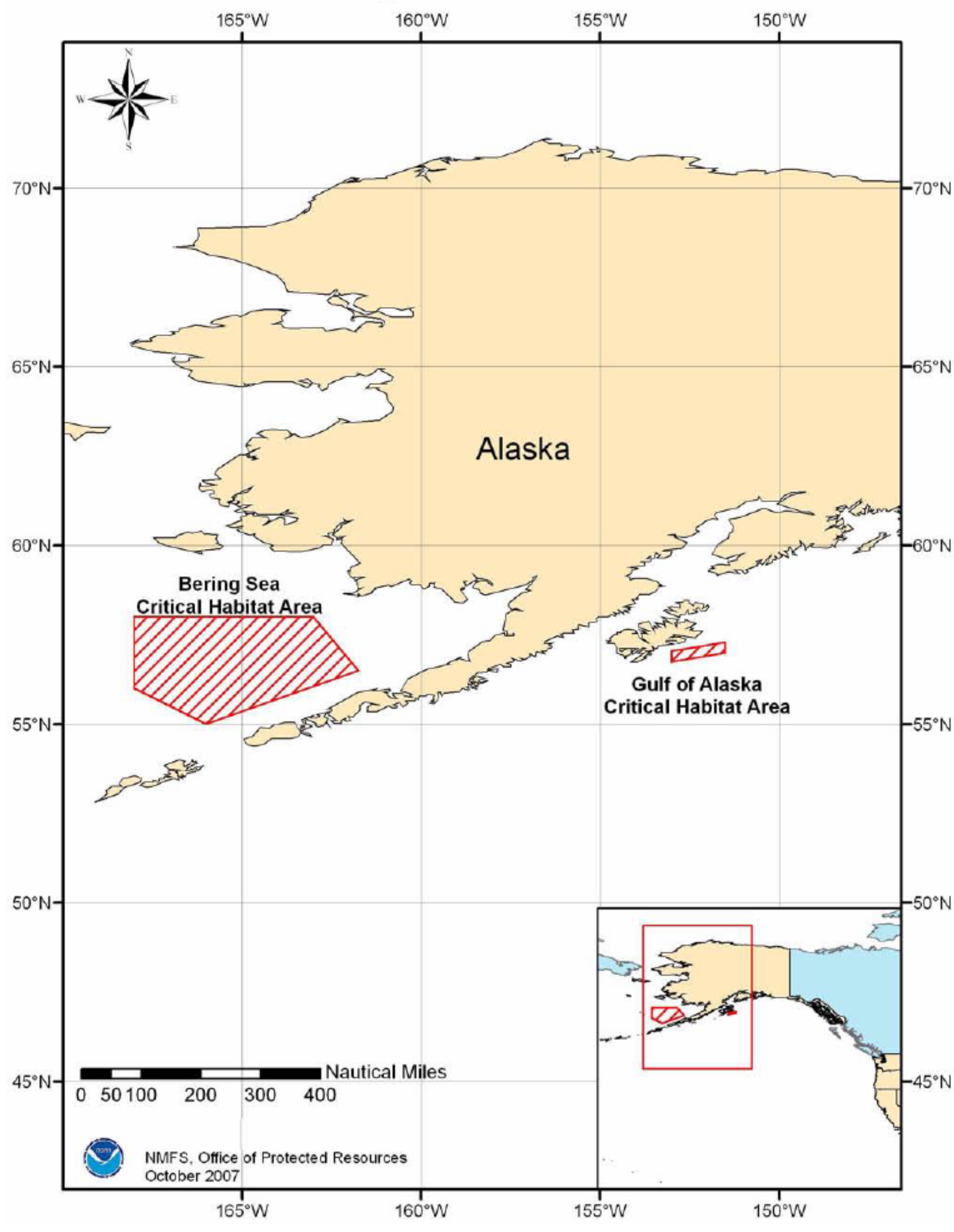

Figure 7: North Pacific Right Whale Critical Habitat (NMFS, 2006)

Status

The "northern right whale" was originally listed as endangered under the Endangered Species Conservation Act, the precursor to the ESA, in June 1970. In 1973 the "northern right whale" was listed as endangered under the ESA and depleted under the MMPA. In 2008, NMFS listed the endangered northern right whale (*Eubalaena spp.*) as two separate endangered species—North Pacific right whale (*E. japonica*) and North Atlantic right whale (*E. glacialis*) (NOAA 2008a). A Recovery Plan for the northern right whale, including both the North Atlantic and North Pacific right whales, was issued in 1991 (NMFS 1991). NMFS revised the plan in 2005 for the North Atlantic right whale. A separate Recovery Plan is being developed for the North Pacific right whale population.

Abundance and trend

Based on sighting data, Wada (1973) estimated a total population of 100–200 in the North Pacific. Brownell et al. (2001) suggested from a review of sighting records that the abundance of this species in the western North Pacific was likely in the "low hundreds." Rice (1974) stated that only a few individuals remained in the eastern North Pacific stock, and that for all practical purposes, the stock was extinct because no sightings of a mature female with a calf had been confirmed since 1900. Although there were no confirmed sightings of calves in this region in the 20th century, there have been three thus far in the 21st (Waite *et al.* 2003, Wade *et al.* 2006), which invalidates the view that the stock is extinct. A reliable estimate of abundance for the North Pacific right whale is currently not available, and consequently, there are no data on trends in abundance for either the eastern or western population (Allen and Angliss 2010). However, it is apparent that the population abundance of the eastern stock is very low. For example, of the 13 individual animals photographed during aerial surveys in 1998, 1999, and 2000, 2 have been re-photographed (LeDuc et al. 2001). This photographic recapture rate is consistent with a very small population size. This conclusion is supported by a preliminary genotype-based comparison of the 17 individuals biopsied in the Bering Sea in the summer of 2004, which also revealed at least 4 matches to animals biopsied in previous years (Wade et al. 2006). Recently, Wade et al. (2011) used photographic and genotype data to calculate the first mark-recapture estimates of abundance for right whales in the Bering Sea and Aleutian Islands. The estimates were very similar. Abundance was estimated to be 31 (95% CL 23-54) and 28 (95% CL 24-42) for the photographic and genotyping methods, respectively (Wade et al 2011). Wade et al. (2011) also estimated that the population contains eight females (95% CL 7-18) and 20 males (95% CL 17-37). It is probable that these estimates relate specifically to a subpopulation with strong site fidelity to the Bering Sea. However, the rarity of right whale sightings elsewhere make it very unlikely that the eastern North Pacific population is much larger than the estimates suggested by Wade et al. (2011).

The basic life history parameters and census data, including population abundance, growth rate, age structure, breeding ages, and distribution, remain undetermined for the North Pacific right whale (NOAA NMFS 2006). These data are necessary to perform quantitative population analyses or to develop surrogate models to evaluate the risk of extinction. However, there are a number of factors that put North Pacific right whales at considerable risk of extinction. These include, but are not limited to, the following: (1) life history characteristics, such as slow growth rate, long calving intervals, and longevity; (2) distorted age, size or stage structure of the population, and reduced reproductive success; (3) strong depensatory or Allee effects; (4) habitat specificity or site fidelity; and (5) habitat sensitivity (NOAA NMFS 2006). Due to insufficient information, it is recommended that the default cetacean maximum net productivity rate (RMAX) of 4% be employed for this stock (Wade and Angliss 1997). However, given the small apparent size and low observed calving rate of this population, this rate may be unrealistically high (Allen and Angliss 2010).

Threats (from Recovery Plan or listing documents)

Ship collisions and fishing gear entanglements are the most common anthropogenic causes of mortality in western North Atlantic right whales, judging from observations of stranded animals (NMFS 2005). Other potential threats identified in the North Atlantic right whale Recovery Plan are habitat degradation, noise, contaminants, underwater bombing activities, climate and ecosystem change, and commercial exploitation (NMFS 2005). A separate Recovery Plan for North Pacific Right whales is currently being developed. It is likely that the North Pacific right whales faces similar threats as the North Atlantic right whales, but since these whales are so rarely observed, the extent to which these whales are impacted by the above threats is unknown.

Fishery impacts

Fisheries may potentially impact North Pacific right whales through several mechanisms, including vessel collisions, physical disturbance, acoustic disturbance, entanglement in nets or lines, pollution from exhaust or spills, and direct or indirect reduction of prey. Ship collisions and fishing gear entanglements are the most common anthropogenic causes of mortality in western North Atlantic right whales, judging from observations of stranded animals (NMFS 2005). However, entanglements of North Pacific right whales in fishing gear appear to be uncommon. Only one case of entanglement (in gillnet) is known from the western North Pacific (Brownell et al. 2001), though the occurrence of right whales near pot fisheries in the Bering Sea indicates a potential for interactions. Given the low population size of the eastern North Pacific right whale stock, the impact of even low levels of interactions could be significant.

Impacts, all fisheries

California, Oregon, Washington – There is no evidence that the western coast of the United States was ever highly frequented habitat by North Pacific right whales, and there have also been no reported entanglements of these whales in fishing gear off these states (Brownell et al. 2001).

Mexico, Central America – There is no evidence that the western coasts of Mexico and Central America were ever highly frequented habitat by North Pacific right whales, and there have also been no reported entanglements of North Pacific Right whales in fishing gear off these areas (Brownell et al. 2001).

Alaska and Hawaii – There is no evidence that Hawaii is highly frequented habitat by North Pacific right whales, and there have also been no reported entanglements of North Pacific Right whales in fishing gear off the Hawaiian islands (Brownell et al. 2001). In contrast, there is a potential of impact with fisheries in Alaska. The majority of recent sightings of North Pacific right whales have been reported in the southeastern Bering Sea, with occasional sightings in the Gulf of Alaska. In fact, the designated critical habitat for this population includes two areas off

Alaska—one in the Bering Sea and the second in the Gulf of Alaska (Figure 7). Although the only observed entanglement of a North Pacific right whale was an individual from the western population entangled in gillnet on the Pacific coast of Lopatka, Kamchatka (Brownell et al. 2001), the occurrence of right whales near pot fisheries in the Bering Sea indicates a potential for interactions.

Impacts, WCGF fisheries

A very limited degree of overlap occurs between the WCGF fisheries regions and current North Pacific right whale distribution, so there is a very small potential for impacts due to ship strikes or entanglement. There were no recorded fishery interactions with North Pacific right whales from 2002–2009 reported by the A-SHOP or WCGOP observer programs (Jannot et al. 2011). Only one case of a North Pacific right whale entanglement is known from the western North Pacific, and it was attributed to a gillnet (Brownell et al. 2001). However, ship strikes and entanglements are common causes of mortality for North Atlantic right whales, so a small risk of ship strike and/or entanglement from West Coast commercial groundfish fishery activities can be reasonably assumed in the rare instances when North Atlantic right whales transit off the coasts of Washington, Oregon, and California.

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2). North Pacific right whales feed almost exclusively on copepods but can also consume small quantities of euphasid larvae. These primary prey species of North Pacific right whales are not impacted by the WCGF fisheries to any significant extent. Indirect trophic effects of the WCGF fisheries are also expected to be minor. In the case of intensive commercial fisheries that target larger species, it may be possible to alter the ecosystem structure in a manner that causes an increase in the abundance of other species that feed on zooplankton, particularly small fishes with lower economic value (Kenney 2002). This could potentially impact North Pacific right whales by increasing competition for food resources. However, since North Pacific right whales appear to feed in higher latitudes, this scenario, if it did occur, would not likely impact the feeding grounds of these whales.

Impact of WCGF fisheries on population growth rate

Due to the paucity of data on population abundance and reproductive rates combined with the rarity of observing North Pacific right whales in the WCGF fisheries regions, it is not possible to quantify an estimated impact of WCGF on population growth rate. However, based on the lack of any observed interactions and the very limited overlap between the species' range and the WCGF fisheries, current impacts from these fisheries on the species appear to be negligible.

*Blue whale (*Balaenoptera musculus*)*

General biology[8]

The blue whale is one of the rorquals, the family that also includes the humpback whale, fin whale, Bryde's whale, sei whale, and the minke whale. It is the largest animal ever known to live on earth, with some adults in the Antarctic reaching a body length of 33 meters. Blue whales in the Northern Hemisphere are generally smaller than those in the Southern Hemisphere, averaging 75 to 80 feet (23–24 m). Its body is long and slender with a small falcate dorsal fin located about three-fourths of the way back on the body. Blue whales are blue-gray in color with variable lighter gray mottling. In colder waters, these whales acquire diatoms that give their ventral surface a yellowish-green caste. Blue whales reach sexual maturity between the ages of 6–10 years, and calves are born at intervals of 2 to 3 years following a 12-month gestation period (Mizroch et al., 1984). Longevity is estimated to be 80–90 years. Blue whales feed almost exclusively on euphausiids by lunge feeding in large prey patches.

Range, migratory behavior, and stock structure

Blue whales are found in all oceans of the world. They inhabit and feed in both coastal and pelagic environments. Much of the population migrates to tropical-to-temperate waters in the winter months, presumably for mating and calving. While feeding has been observed at all latitudes, poleward movements in the spring allow the whales to take advantage of high zooplankton abundance in the summer months.

Within the species, three subspecies have been designated: *B.m. musculus* in the Northern Hemisphere, *B.m. intermedia* in the Southern Ocean, and *B.m. brevicauda*, the pygmy blue whale found in the subantarctic Indian Ocean and southwestern Pacific Ocean. In the North Pacific, the International Whaling Commission only recognizes one management stock (Donovan 1991), but it is thought that this ocean may include as many as five stocks (Reeves et al. 1998). Two distinct call types are produced in the North Pacific, termed the northeastern call type and the northwestern call type. It has been proposed that these call types represent two distinct populations with some degree of geographic overlap (Stafford et al. 2001). The eastern North Pacific Stock includes animals found from the northern Gulf of Alaska to the eastern tropical Pacific and is consistent with both the distribution of the northeastern call and the known range of photo identified individuals (Carretta et al. 2009).

The West Coast of the U.S. is one of the most important feeding grounds for the eastern North Pacific Stock of blue whales. The Gulf of Alaska and central North Pacific are also summer feeding grounds. Migration south to the high productivity areas off Baja California, the Gulf of California, and the Costa Rican dome is undertaken by most of this stock in the winter and spring. These destinations are areas of high productivity, and observations of feeding on them are not uncommon, so it is assumed that blue whales feed year-round.

[8] Unless otherwise noted, all material in this section was drawn from Reeves et al. (1998)

Habitat use

In fall and spring, blue whales can be found in the Gulf of California, Mexico and south to the offshore waters of Central America. By April and May, they migrate north to the West Coast of North America, where a large population is found in California waters (Figure 8). The presence and movements of blue whales off the coast of California is correlated with aggregations of their prey—*Euphasia pacifica* and *Thysanoessa spinfera* (Mate et al., 1999). In recent years, blue whales have shifted to a broader geographic distribution, including areas off British Columbia and in the Gulf of Alaska where they were common during commercial whaling, and this may be due to changes in prey driven by oceanographic conditions (Calambokidis et al. 2009, Barlow 2010).

Diving behavior of blue whales varies widely both regionally and temporally, but consistent feeding depths of 250–300 meters have been reported (Calambokidis et al. 2008).

Critical habitat

Critical habitat has not been identified for this species.

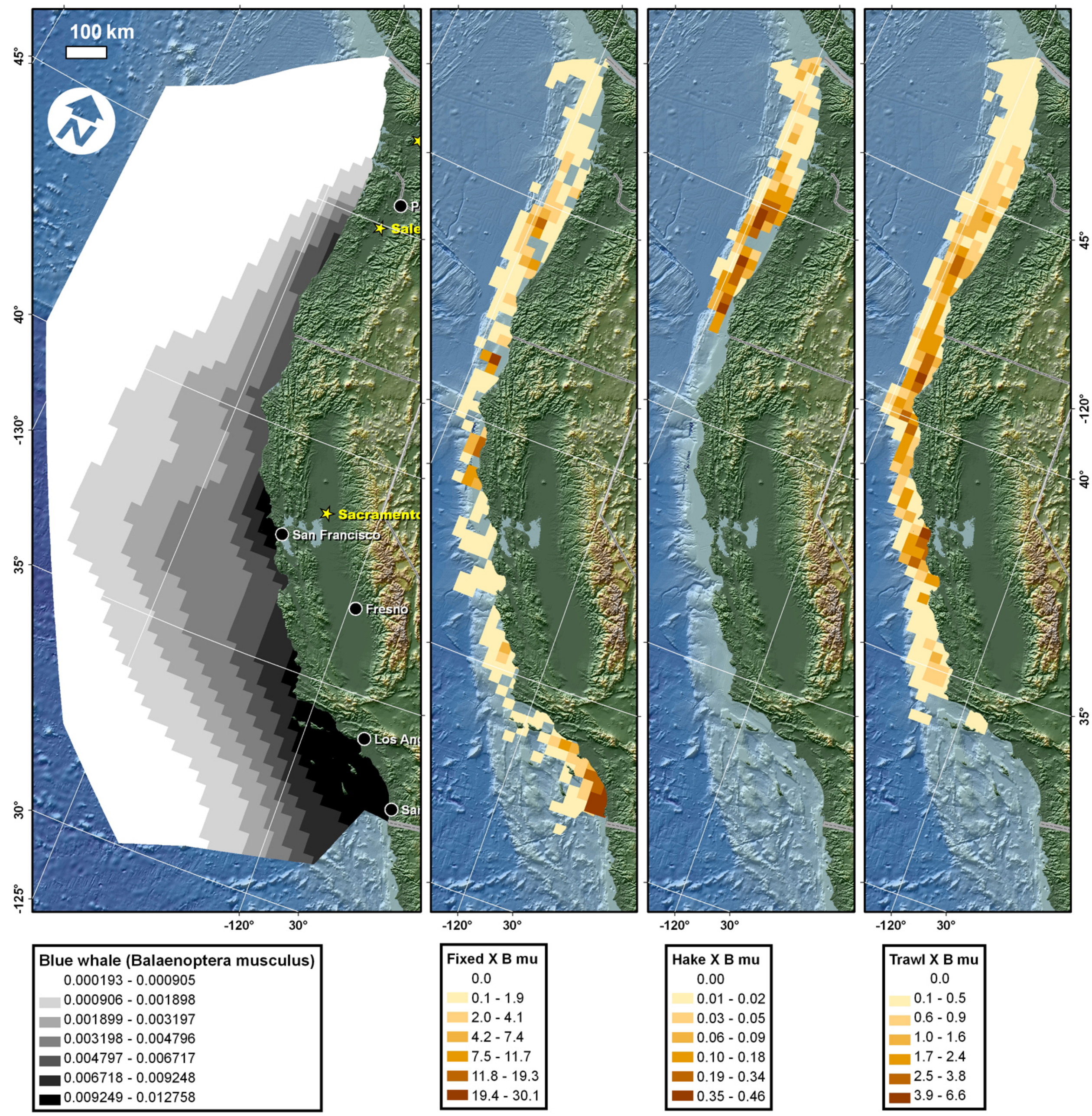

Figure 8: Left panel: Mean predicted blue whale density (number of animals/km^2), based on surveys conducted from June through November, from 1991 – 2005 (data from Barlow et al. 2009). Ship-based cetacean and ecosystem assessment surveys of blue whale sighting locations were extrapolated to a regular grid (25 km resolution) for each year and were smoothed with geospatial methods to obtain a continuous grid of density estimates for the California Current Ecosystem. Right panels: Overlap indices with three fishery sectors: fixed gear, hake trawl, and bottom trawl. Indices are in units of animal hours/km^2. See Appendix B for details.

Status

Blue whales were listed as endangered under the ESA in 1970. A Recovery Plan was finalized for this species in 1998 (Reeves et al. 1998). The eastern North Pacific stock is considered a "depleted" and "strategic" stock under the MMPA.

Abundance and trend

The size of the feeding stock of blue whales off the U.S. West Coast was estimated recently by both line transect and mark-recapture methods. Line transect ship surveys off of California, Oregon, and Washington produced estimates of 721 (CV=0.27) blue whales in 2005 and 442 (CV=0.25) in 2008 (Barlow 2010). Mean and minimum abundances were based on pooled results of the 2005 (Forney 2007) and 2008 surveys (Barlow 2010) and were estimated to be 565 (CV=0.18) and 485 respectively (Barlow 2010). Calambokidis et al. (2007) used photographic mark- recapture to estimate population size for 2004–2006. Population size estimates were calculated separately for right side and left side photographs (3,568 [CV=0.41] and 2,117 [CV=0.34] respectively). The average of the mark-recapture estimates is 2,842 (CV= 0.41). Line transect estimates reflect the average density and abundance of blue whales in the study area during the summer and autumn surveys, while mark-recapture estimates provide an estimate of the total population size. Therefore, the best estimate of blue whale abundance for the eastern North Pacific stock is the average of mark-recapture estimates or 2,843 (CV=0.41) (Carretta et al. 2009).

Although the eastern North Pacific stock of blue whales is expected to have grown since 1966 when it was given protected status by the IWC, there is no evidence that the stock is currently growing. There is some indication the blue whale abundance increased from 1979/80 to 1991 and from 1991 to 1996 (Barlow 1994, Barlow 1997). This may have been the result of increased use of the California feeding areas as opposed to an increase in the stock as a whole. Estimates in 2005 and 2008 from line-transect surveys were lower than those in 1996, which may represent inter annual variability in the fraction of the population utilizing California waters during the summer and autumn (Calambokidis et al. 2007, Barlow 2010).

Threats (from Recovery Plan or listing documents)

Blue whales face a variety of threats, depending on the region in which they occur. Threats listed in the Recovery Plan for blue whales in the North Pacific include collisions with ships, disturbance from vessels, entrapment and entanglement in fishing gear, habitat degradation, and military operations in and around feeding areas (Reeves et al. 1998). Ship strikes were implicated in the deaths of five blue whales from 2003–2007, with four of these occurring in 2007 (NMFS SWR Stranding database). Between 1988 and 2007, 21 blue whale deaths were reported along the California coast. These strandings were spatially associated with shipping lanes, especially those associated with the Ports of Los Angeles and Long Beach, and were most common in the fall (Berman-Kowalewski et al. 2010).

Fishery impacts

Fisheries may potentially impact blue whales through several mechanisms, including vessel collisions, physical disturbance, acoustic disturbance, entanglement in nets or lines, pollution from exhaust or spills, and direct or indirect reduction of prey.

No definite evidence of blue whales being killed or injured in fishing gear in the North Pacific is available (Carretta et al. 2009). Fishermen report that large blue and fin whales usually swim through the nets without entangling and with very little damage to the net (Barlow et al., 1997).

Impacts, all fisheries

California, Oregon, Washington – There have been no reported entanglements of blue whales in fishing gear off the West Coast (SWR and NWR stranding network; Appendix C). Carretta et al. (2009) concluded that because there have been no mortalities due to the California gillnet fishery, the total fishery mortality rate is approaching zero mortality and serious injury rate. The annual incidental mortality and serious injury rate from ship strikes (primarily attributed to shipping, not fisheries) of 1.2 whales per year is less than the PBR of 2.0 whales per year for this stock (Carretta et al. 2009). This rate does not include unidentified large whales, and therefore may be an underestimate.

Mexico, Central America – Carretta et al. (2009) summarized information on fishery interactions in Mexico as follows:

> Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and may take animals from the same population. Quantitative data are available only for the Mexican swordfish drift gillnet fishery, which uses vessels, gear, and operational procedures similar to those in the U.S. drift gillnet fishery, although nets may be up to 4.5 km long (Holts and Sosa-Nishizaki 1998). The fleet increased from two vessels in 1986 to 31 vessels in 1993 (Holts and Sosa-Nishizaki 1998). The total number of sets in this fishery in 1992 can be estimated from data provided by these authors to be approximately 2,700, with an observed rate of marine mammal bycatch of 0.13 animals per set (10 marine mammals in 77 observed sets; Sosa-Nishizaki et al. 1993). This overall mortality rate is similar to that observed in California driftnet fisheries during 1990–95 (0.14 marine mammals per set; Julian and Beeson, 1998), but species-specific information is not available for the Mexican fisheries. Previous efforts to convert the Mexican swordfish driftnet fishery to a longline fishery have resulted in a mixed-fishery, with 20 vessels alternately using longlines or driftnets, 23 using driftnets only, 22 using longlines only, and seven with unknown gear type (Berdegué 2002).

Impacts, WCGF fisheries

The highest degree of spatial overlap with WCGF fisheries occurs with the fixed gear sector, with some local overlap index values exceeding 20 animal hours/km^2 near San Diego just north of Cape Mendocino (Figure 8). Overlap with the trawl sector is much lower, with a few overlap indices exceeding approximately 4 animal hours/km^2 near Cape Mendocino and off of the San Francisco Bay (Figure 8). Overlap with the hake sector was very limited, and was <0.5 animal hours/km^2 in all locations (Figure 8).

Despite some overlap with the fishery, over the period from 2002–2009, there were no observed fishery interactions with blue whales reported by the A-SHOP or WCGOP observer programs (Jannot et al. 2011). Note, however, that impacts in the low-coverage fixed gear components of the fisheries cannot be ruled out. Of the ship strikes reported by the SWR and NWR stranding programs, none could definitively be identified as being caused by the WCGF fishery. Most of the ship strikes are believed to be associated with large commercial shipping traffic (Berman-Kowaleski 2010).

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Blue whales feed primarily on euphausiids, which are not impacted by the WCGF fisheries to any significant extent (Appendix A). Indirect trophic effects of the WCGF fisheries are also expected to be minor and in fact may positively affect the abundance of krill through removal of predators (Appendix A).

Impact of WCGF fisheries on population growth rate

The fishery is not expected to have an impact on the growth rate of this population. There have been no observed entanglements in fishing gear off the West Coast, and the incidental mortality and serious injury rate from ship strikes (none of which have been associated with this fishery) of 1.2 whales per year is less than the potential biological removal of 2.0 whales per year for this stock (Carretta et al. 2009).

*Fin whale (*Balaenoptera physalus*)*

General biology

Fin whales are the second largest rorqual after the blue whale and are characterized by a long, streamlined body with a V-shaped head. All fin whales have an asymmetrical pigmentation patter that is easily recognizable on the head region. The whale's underside, right lip, and right baleen plate are yellow-white, while their main body, left lip, and left baleen plate are a fairly uniform grayish-blue color (Silber et al. 1994). In the Northern Hemisphere, female fin whale length is about 22.5 meters and 21 meters for males (Aguilar 2009). Sexual maturity is reached for both sexes from 5 to 15 years (Lockyer 1972). Conception occurs during the winter months in both hemispheres, gestation is 12-months (Mizroch et al. 1984), and weaning occurs from 6–11-months after birth (Aguilar 2009). Fin whales feed on both krill and small schooling fish and are capable of bursts of speed of up to 23 miles per hour.

Range, migratory behavior, and stock structure

Fin whales inhabit oceans of both the Northern and Southern Hemispheres and are found at a wide range of latitudes between 20–75° (Department of Navy 2008). Migration occurs seasonally from the Arctic and Antarctic feeding areas to lower latitude breeding and calving areas in the winter. These whales tend to migrate in the open ocean; therefore, migration routes and the location of wintering areas are difficult to determine (Perry et al. 1999).

Two stocks of fin whales are recognized by the International Whaling Commission in the North Pacific—the East China Sea and the rest of the North Pacific (Donovan 1991). Mizrock et al. (1984) cites evidence, including whaling records, of additional fin whale populations in the North Pacific. For management purposes, three stocks of fin whales are recognized in U.S. waters—Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii (Allen and Angliss 2010).

Migratory behavior of fin whales in the eastern North Pacific is complex (NMFS 2010). Depending on their age, reproductive state, or stock, whales can occur in any one season at many different latitudes. Movements can either be inshore or offshore. Some individuals remain at high latitudes through the winter (Berzin and Rovnin 1966). In the northern North Pacific and Bearing Sea, fin whale concentrations form along frontal boundaries, which correspond roughly to the 200 meter isobath (Nasu 1974). Recently, satellite tag data from animals tagged in California and Washington suggest a general association with the continental shelf (Schorr et al. 2010).

Habitat use

Little is know about the movement patterns and habitat preferences of fin whales in the northeastern Pacific. Concentrations of fin whales can be found off the southern and central California coast year-round (Barlow 1995; Forney et al. 1995) (Figure 9). Acoustic signals from fin whales are detected year-round off Northern California, Oregon, and Washington with a concentration of vocal activity between September and February (Moore et al. 1998). Recent photo identification studies suggest that a higher degree of site fidelity may exist for some subareas along the U.S. West Coast during the summer and fall (Falcone et al. 2011).

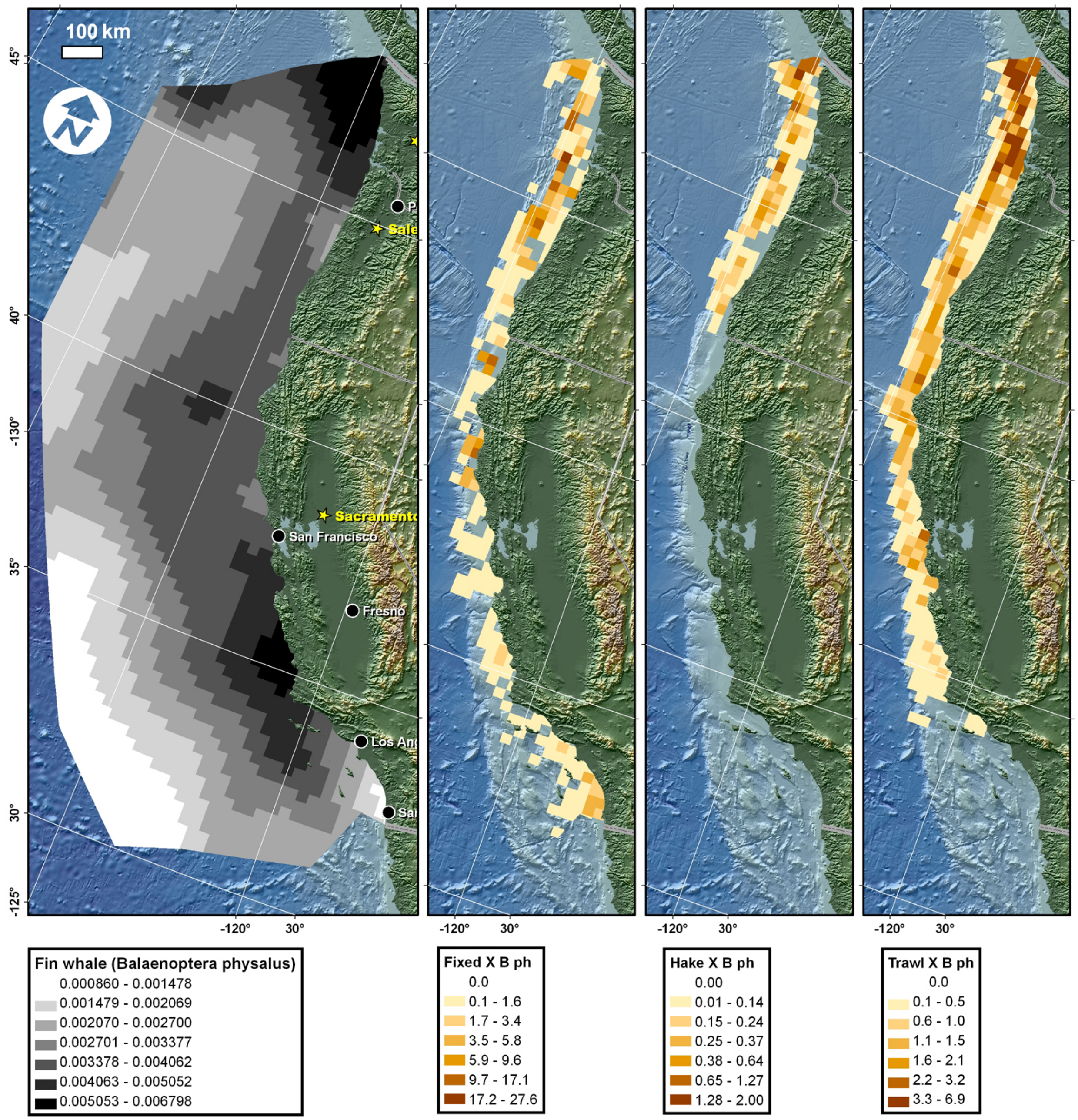

Figure 9: Left panel: Mean predicted fin whale density (number of animals/km^2), based on surveys conducted from June through November, from 1991 – 2005 (data from Barlow et al. 2009). Ship-based cetacean and ecosystem assessment surveys of humpback sighting locations were extrapolated to a regular grid (25 km resolution) for each year and were smoothed with geospatial methods to obtain a continuous grid of density estimates for the California Current Ecosystem. Right panels: Overlap indices with three fishery sectors: fixed gear, hake trawl, and bottom trawl. Indices are in units of animal hours/km^2. See Appendix B for details.

Critical habitat

Critical habitat has not been identified for this species.

Status

Fin whales were listed as endangered under the ESA in 1970. A Recovery Plan was finalized for this species in 2010 (NMFS 2010).

Abundance and trend (from Carretta et al. 2009)

The most recent abundance estimate for the California/Oregon/Washington area out to 300 nautical miles is 3,044 (CV=0.18), and is calculated as the geometric mean of the line transect estimate from summer/autumn ship surveys conducted in 2005 (Forney 2007) and 2008 (Barlow 2010). This is probably an underestimate because it excludes some fin whales that could not be identified in the field. Shipboard surveys in the summer and autumn of 1991, 1993, 1996, and 2001 produced estimates of 1,600–3,000 fin whales off California and 280–380 off Oregon and Washington (Barlow 2003). There is strong evidence of increasing fin whale abundance in the California/Oregon/Washington area from 1991-2008, and assuming no changes it is expected to continue to increase at the mean rate of about 3% a year (Moore and Barlow 2011).

Threats (from Recovery Plan or listing documents)

Fin whales face a variety of threats, depending on the region in which they occur. Threats listed in the Recovery Plan include fisheries interactions, ship noise, oil and gas activities, coastal development, military activities, ship strikes, disturbance from whale watching, contaminants and pollutants, disease, injury from marine debris, direct harvest, competition for resources, and loss of prey base due to climate and ecosystem change (NMFS 2010). In most cases, there is a medium to high level of uncertainty about these threats and their impact on fin whales in the North Pacific Ocean.

Fishery impacts

Fin whales may break through or carry away fishing gear, and whales carrying gear may die at a later time due to trailing gear, become debilitated or seriously injured, or have normal functions impaired, but with no evidence of the incident recorded (NMFS 2010). Off the eastern coasts of Canada and the United States, fin whales are occasionally killed or injured by inshore fishing gear, such as gillnets and lobster lines (Read 1994, Lien 1994, Waring et al. 1997). Very rarely, fin whales are entangled in inshore fishing gear in the North Pacific (Barlow et al. 1994, 1997).

Impacts, all fisheries

California, Oregon, Washington – The offshore drift gillnet fishery is the only fishery that is likely to directly affect fin whales from the California/Oregon/Washington stock, and one fin whale death has been observed since 1990 when NMFS began observing the fishery (Carretta et al. 2009). Based on the most recent observer data, the average fin whale bycatch in this fishery was approximately zero for the years 2002–2006 (Carretta et al. 2009). Carretta et al. (2009) also reported that a minimum of 1.6 deaths per year in this area due to ship strikes (unlikely to be fishery related).

Mexico, Central America – Carretta et al. (2010) summarized information on fishery interactions in Mexico as follows:

> Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and may take animals from the same population. Quantitative data are available only for the Mexican swordfish drift gillnet fishery, which uses vessels, gear, and operational procedures similar to those in the U.S. drift gillnet fishery, although nets may be up to 4.5 km long (Holts and Sosa-Nishizaki 1998). The fleet increased from two vessels in 1986 to 31 vessels in 1993 (Holts and Sosa-Nishizaki 1998). The total number of sets in this fishery in 1992 can be estimated from data provided by these authors to be approximately 2,700, with an observed rate of marine mammal bycatch of 0.13 animals per set (10 marine mammals in 77 observed sets; Sosa-Nishizaki et al. 1993). This overall mortality rate is similar to that observed in California driftnet fisheries during 1990–95 (0.14 marine mammals per set; Julian and Beeson, 1998), but species-specific information is not available for the Mexican fisheries. Previous efforts to convert the Mexican swordfish driftnet fishery to a longline fishery have resulted in a mixed-fishery, with 20 vessels alternately using longlines or driftnets, 23 using driftnets only, 22 using longlines only, and seven with unknown gear type (Berdegué 2002).

Alaska and Hawaii –Allen and Angliss (2010) reported one incidental mortality of a fin whale in the Bearing Sea/Aleutian Islands pollock trawl fishery between 2002–2006. There have been no interactions with fin whales observed in the Hawaii-based longline fishery (Forney 2004). The impact of West Coast fisheries to the recovery of fin whale populations is considered low (NMFS 2010). In Hawaii, the ranking of the threat posed by the incidental capture of animals from the longline and pot/trap fisheries was also based on the assertion that there is a low uncertainty with regard to impacts to individual animals, and the impact to the recovery of fin whale populations due to these fishing practices is considered low (NMFS 2010).

Impacts, WCGF fisheries

The highest areas of spatial overlap with the fishery occur from the Columbia River mouth area northward, with overlap indices for the fixed gear sector of >20 animal hours/km 2 near the Columbia River mouth, and indices for the trawl sector >3 animal hours/km2 along the Washington Coast (Figure 9). The highest overlap index with the hake sector was < 2 animal hours/km2, off the northern Washington Coast (Figure 9).

Despite some overlap with the fishery, over the period from 2002–2009, there were no observed fishery interactions with fin whales reported by the A-SHOP or WCGOP observer programs (Jannot et al. 2011). Of the entanglements reported by the SWR and NWR stranding programs, none could be attributed to the WCGF. Note, however, that impacts in the low-coverage fixed gear components of the fisheries cannot be ruled out (see Introduction to Chapter 3).

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2). Fin whales feed on krill and small schooling fishes, such as anchovies and sardines, which are not impacted by the WCGF fisheries to any significant extent (Appendix A). Indirect trophic effects of the WCGF fisheries are also expected to be minor and in fact may positively affect the abundance of krill through removal of predators (Appendix A).

Impact of WCGF fisheries on population growth rate

There is some overlap between the WCGF fisheries and fin whale distribution, indicated the interactions are possible. However, there have been no observed interactions from 2002-2009, indicating that at least those components of the fishery with moderate to high observer coverage are not impacting the population's growth rate.

*Sperm whale (*Physter macrocephalus*)*

General biology

Sperm whales, the largest of the odontocetes (toothed whales) have a unique morphology, characterized by a massive head (25-35% of total body length) and a single asymmetrical blowhole on the left side of the head near the tip (Rice 1989). This species is dark gray with a white mouth and sometimes white patches on the belly, and has wrinkled appearing skin, a small rounded dorsal fin, and triangular shaped flukes (Gosho et al. 1984). Sperm whales have 20–26 conical teeth on each side of the lower jaw; teeth in the upper jaw do not erupt (Rice 1989). They are sexually dimorphic, with adult males attaining up to 16 m and 57 tons and females 12 m and 24 tons (Rice 1989). Sperm whales are believed to live approximately 60 years, with some females potentially living as long as 80 years (Whitehead 2003). Females are sexually mature at 9 years of age and produce a calf (4m, Ohsumi 1965) approximately every five years following a 14–16-month gestation period. Mating is believed to take place in April and May, and calving is thought to occur in July and August in the eastern North Pacific (Gregr et al. 2000). Most females occur in groups with other related individuals and maintain stable long-term groups. Young males disperse from their natal group between 4 and 21 years of age and are subsequently found in "bachelor schools" with similarly aged males. As males age, they begin to migrate to higher latitudes on their own. Once sexually mature in their late 20s, they occasionally return to the tropics to breed.

Sperm whales are noted for performing long (60–90 minute) and deep (1,000–3,000 m) dives (Rice 1989). These deep dives are related to their preferred prey, medium to large squid in pelagic areas, and to a lesser extent fishes, sharks and skates (Rice 1989, Gosho et al. 1984). In the eastern North Pacific, sperm whales have been found to primarily consume North Pacific giant squid (*Moroteuthis robusta*), but secondary preferences differed between males and females—females consumed ragfish (*Icostues spp.*) and males also consumed rock fish (*Sebastes spp.*) (Flinn et al., 2002).

Range, migratory behavior, and stock structure

Sperm whales occur in all oceans of the world, from tropical, temperate waters in the northern hemisphere to waters near the ice edge in the southern hemisphere. Females generally occur only in tropical regions, but they are also in temperate regions in the North Pacific. Adult males make seasonal pole-ward movements in summer, but the seasonal movements of females are less predictable. All sperm whales inhabit pelagic waters with productive oceanographic features (Jaquet 1996) or continental slope areas that tend to enhance or concentrate their primary cephalopod prey (Rice 1989, Smith and Whitehead 1993, Gannier and Praca 2007).

In the North Pacific, sperm whales are widespread with no defined breeding or feeding grounds. Discovery marks have shown widespread movement of individuals within the North Pacific basin (Omura and Ohsumi 1964, Ivashin and Rovnin 1967, Ohsumi and Masaki 1975, Wada 1980, Kasuya and Miyashita 1988 in Allen and Angliss 2010; Rice (AFSC-NMML, retired, pers. comm.)).

Sperm whales occur in all months of the year off California (Dohl et al. 1983, Barlow 1995, Forney et al. 1995), reaching their peak abundance from April to June and again from the end of August to mid-November (Rice 1974). Similarly, they are found off Washington and Oregon in all months except December to February (Green et al. 1992). Acoustic monitoring found that although sperm whales were year-round residents of the Gulf of Alaska, they were more common in summer than winter (Mellinger et al. 2004). These changes in monthly occurrence suggest seasonal movement patterns. However, satellite tagging of a small number of male sperm whales off Southeast Alaska showed that some tagged males moved south in the summer. While generally following the continental shelf slope, each whale that moved had unique movements (Andrews et al. 2011). Movements between southern California and British Columbia have been documented from discovery tags (Rice 1974). Based on catch records off BC, these appear to be segregation of area by sex with males occurring closer to shore than females (Gregr and Trites 2001).

The stock structure was summarized in the recent Recovery Plan (NMFS 2010):

> Stock structure in the North Pacific was a focus of intense discussion in the IWC Scientific Committee during the 1970s, a time when sperm whales were being heavily exploited by Japanese and Soviet pelagic whalers (IWC 1980). Masaki (1970) used tagging results, blood types, catch distributions, sighting patterns, and size compositions to establish the concept of three stocks: one west of 170°E (Asian stock), one between 180° and 160°W (mixed or Central stock), and one east of 150°W (American stock) (Tillman 1977). Ohsumi and Masaki (1977) emphasized that the "mixing" area in the central North Pacific was used primarily by males, and they proposed a two-stock scheme (east and west) for females, while retaining the previous three-stock scheme for males.
>
> Kasuya and Miyashita (1988) evaluated biological, bio-chemical, oceanographic, whaling, tagging, and sighting data, and concluded that there were three populations, but with boundaries different from those suggested by earlier authors. Their analysis suggested that the eastern North Pacific (or American) population is widely distributed north of 20°N, with breeding schools circulating between Mexican waters in the southeast, the historical whaling grounds centered around the Hawaiian Islands, the Alaskan Gyre, and waters on the south side of the Aleutian Chain. The boundaries for this population are approximately the Aleutians in the north, the North American coast in the east, and a line connecting 52°30'N, 175°E and 20°N, 160°W. Adult males of this population tend to be segregated longitudinally (toward the west) rather than latitudinally (toward the north) from the females and juveniles. For the western North Pacific population, Kasuya and Miyashita (1988) proposed northwestern and southwestern populations with the boundary shifting seasonally (Donovan 1991). The IWC recognizes 2 management units of sperm whales in the north Pacific (eastern and western although these boundaries have not been reviewed in recent years (Donovan 1991).

The U.S. recognizes three separate stocks under the MMPA: California-Oregon-Washington, Alaska, and Hawaii (Carretta et al. 2010, Allen and Angliss 2010). However, recent genetic analysis by Mesnick et al. 2011 indicates that the Alaska stock is actually comprised of whales (only males) from three genetically unique groups: California Current, Hawaii, and Eastern Tropical Pacific. A recent summary of Discovery mark data indicated widespread movement in the North Pacific (NMFS 2010):

> Discovery Mark data from the days of commercial whaling (260 recoveries with location data) show extensive movements of both males and females from U.S. and Canadian coastal waters into the Gulf of Alaska and Bering Sea and the coast of Japan Ground and Bonin Islands Ground (Omura and Ohsumi 1964; Ivashin and Rovnin 1967; Ohsumi and Masaki 1975; Wada 1980; Kasuya and Miyashita 1988, Mizroch, pers. comm. 2008). Rice (AFSC-NMML, retired, pers. comm. in Angliss and Allen 2009) marked 176 sperm whales during U.S. survey cruises from 1962–1970, mostly between 32° and 36°N off the California coast. Seven of those marked whales were observed in locations ranging from offshore California, Oregon, and British Columbia waters to the western Gulf of Alaska. A whale marked by Canadian researchers moved from near Vancouver Island, British Columbia to the Aleutian Islands near Adak. A whale marked by Japanese researchers moved from the Bering Sea just north of the Aleutians to waters off Vancouver Island, British Columbia (Mizroch pers. comm. 2009). Based on these data, there appear to be movements along the U.S. West Coast into the Gulf of Alaska and Bering Sea/Aleutian Islands region.

Satellite tag deployments on males by Andrews et al. (2011) off southeast Alaska show that the boundaries between Alaska and California-Oregon-Washington and Eastern Tropical Pacific are crossed.

Habitat use

Sperm whales generally inhabit deep pelagic areas or continental slopes, and this is where they are also at highest densities off the U.S. West Coast (Figure **10**). Sperm whales are widely distributed within deep, ice-free marine waters from the equator to the edges of polar pack ice (Rice 1989). Sperm whales are present in many warm-water areas throughout the year, and such areas may have discrete "resident" populations (Watkins *et al*. 1985; Gordon *et al.* 1998; Drout 2003; Jaquet *et al.* 2003; Engelhaupt 2004). While their aggregate distribution is certainly influenced by the patchiness of global marine productivity (Jaquet and Whitehead 1996), no physical barriers, apart from land masses or shallow seas, appear to obstruct their dispersal (Berzin 1972; Jaquet 1996).

In the North Pacific Ocean, seven areas of sperm whale concentration were described based on 19th century whaling records: (l) the Panama, Galapagos, and Offshore grounds in the eastern tropical Pacific; (2) the "On-the-Line Ground," an almost continuous equatorial belt extending a few degrees north and south of the Equator in the central Pacific; (3) the Hawaiian Ground centered between approximately 20°N and 35°N; (4) areas off Baja California and mainland Mexico; (5) the Japan Ground (28–35°N, 150–179°E); (6) the Coast of Japan Ground (34–40°N, 142–149°E); and (7) the Bonin Islands Ground southeast of southern Japan (Townsend 1935).

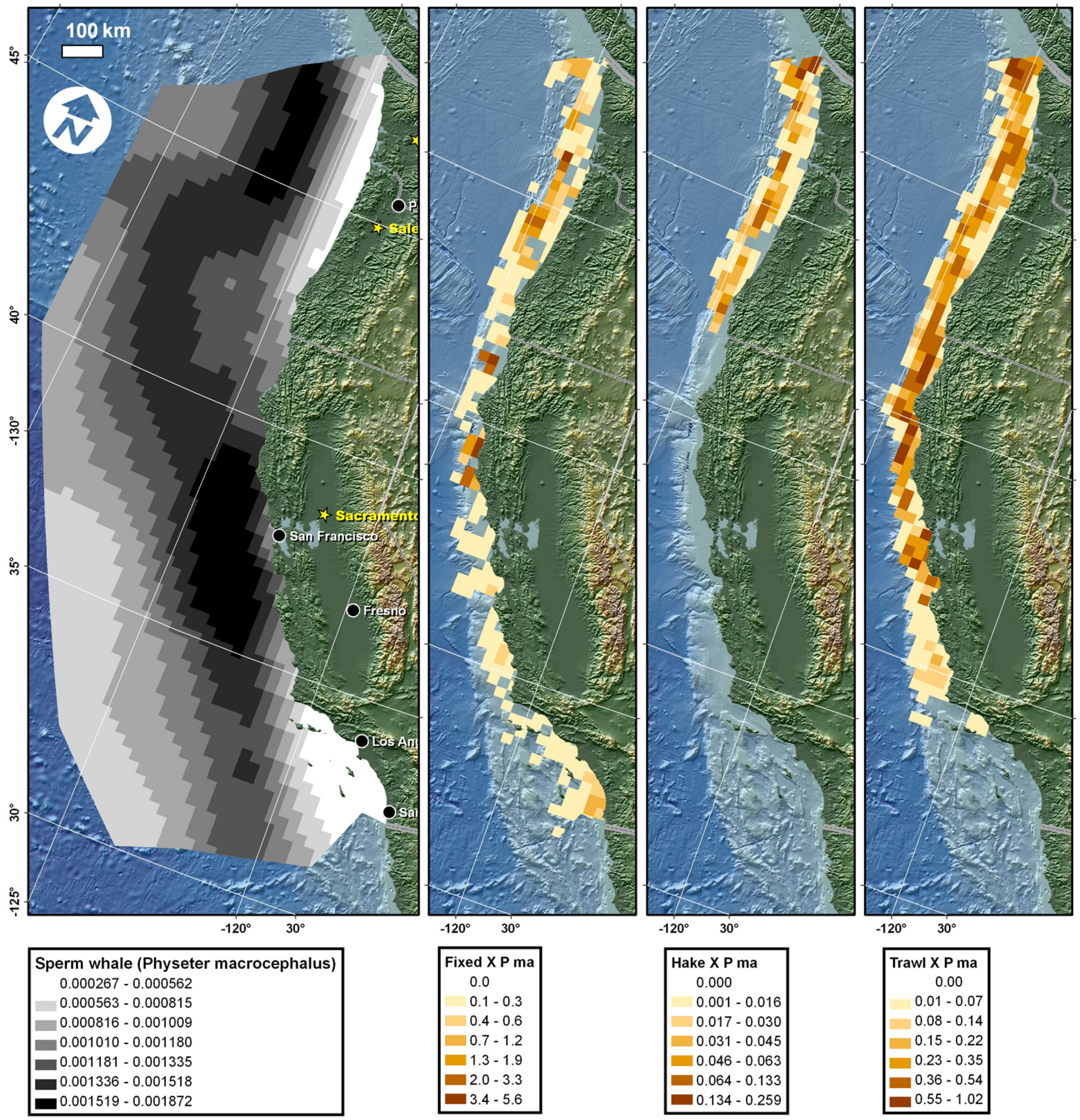

Figure 10: Left panel: Mean predicted fin whale density (number of animals/km^2), based on surveys conducted from June through November, from 1991 – 2005 (data from Barlow et al. 2009). Ship-based cetacean and ecosystem assessment surveys of humpback sighting locations were extrapolated to a regular grid (25 km resolution) for each year and were smoothed with geospatial methods to obtain a continuous grid of density estimates for the California Current Ecosystem. Right panels: Overlap indices with three fishery sectors: fixed gear, hake trawl, and bottom trawl. Indices are in units of animal hours/km^2. See Appendix B for details.

Sperm whales, including females and young males, were abundant on the whaling grounds up to 200 miles offshore from Vancouver Island and the Queen Charlotte Islands, British Columbia from spring through fall (Pike and MacAskie 1969). Although Townsend's (1935) charts show little evidence of sperm whales in the Gulf of Alaska and around the Aleutians, modern shore and pelagic whalers took adult males regularly in summer in deep offshore waters of the eastern Aleutians and Kodiak Island (Reeves *et al.* 1985). Large concentrations of breeding schools were reported by modern pelagic whalers along a line from 38°N, 142°W to 45°N, 135°W, thence northwestward to 50°N, 138°W and westward to 52°N, 148°W (Berzin 1972). The largest concentrations were centered around 50°N, 138°W and in a strip from 42°N, 140°W to 50°N, 154°W. Large numbers of females were observed along 41°N latitude (Berzin 1972).

Sperm whale distributions are presumably influenced by oceanographic features that themselves influence prey concentrations. In several ocean basins, sperm whales aggregate near frontal features (Biggs et al. 2000, Davis et al. 2002, Waring et al. 2001, Hamazaki 2002, Gannier and Praca 2007). In the Pacific Ocean, Jaquet (1996) noted that sperm whales were associated with primary productivity zones, particularly the Pacific equatorial zones.

Critical habitat

Critical habitat has not been identified for sperm whales.

Status

Sperm whales were listed in 1969 under the Endangered Species Conservation Act, and remained on the list of threatened and endangered species following passage of the Endangered Species Act in 1973 (35 FR 18319, 2 December 1970). A Recovery Plan was finalized for this species in 1991 (NMFS 1991). NMFS recently completed a new Recovery Plan for this species (see NMFS 2010).

Abundance and trend

The current world-wide estimate of the sperm whale population is 300,000–450,000 (Whitehead 2002), and the North Pacific population is estimated to be 152,000–226,000 (NMFS 2010). This abundance is thought to be less than 32% of the pre-exploitation population size (NMFS 2010). In the eastern North Pacific, a shipboard line-transect survey for sperm whales, using combined visual and acoustic methods, was conducted in a 7.8 million km^2 area between the West Coast of the continental United States and Hawaii in March–June 1997 (Barlow and Taylor 2005). The acoustic and sighting data were analyzed separately, yielding estimates of 32,100 (CV=0.36) and 26,300 (CV=0.81), respectively, and the two estimates were not significantly different (Barlow and Taylor 2005). Barlow (2006) estimated sperm whale abundance in the U.S. EEZ waters surrounding Hawaii as 6,900 (CV=0.81). Wade and Gerrodette (1993) estimated that there were 22,700 (CV=0.224) sperm whales in the eastern tropical Pacific. These whales are thought to belong to a different population from those off California, Oregon, Washington, and northward. The most recent (2008) estimate for the California-Oregon-Washington stock is 300 (CV=0.51) (Barlow 2010). However, two recent estimates from 2001 and 2005 were 2,593 and 3,140, respectively. The current population estimate, developed for this population using the 2005 and 2008 surveys, is 971 (CV=0.31). Although the 2008 estimate is sharply lower than the 2001 or 2005 estimates, it is not believed that the population has declined; rather, this change likely reflects inter-annual variability in the region (Carretta et al. 2010). There is no estimate of sperm whales in the Alaska stock (Allen and Angliss 2010) Only one estimate has been developed for Baja California, 1,640 (CV=0.33) (Barlow and Taylor 2005).

Threats (from Recovery Plan or listing documents)

Sperm whales are exposed to a variety of threats depending on the region in which they occur. Primary threats listed in the Recovery Plan include collisions with vessels, direct harvest, and possibly competition for resources, loss of prey base due to climate change, and disturbance from anthropogenic noise (NMFS 2010). Other potential (but likely low impact) threats include entanglement in fishing gear, habitat degradation, disturbance from vessels and tourism, contaminants and pollutants, disease, disturbance due to research, predation and natural mortality, and cable laying (NMFS 2010).

Fishery impacts

Fisheries interactions are a potential source of injury and mortality for many cetacean species, particularly those on the continental shelf or slope waters. In particular, entanglement in fishing gear (including nets and lines) is a significant source of injury or mortality for some species. Interactions of sperm whales with gillnets and long line fisheries have been documented in several regions, although impact level is estimated to be low (NMFS 2010)

The following information from the most recent Recovery Plan (NMFS 2010) summarizes the potential for sperm whale fishery interactions:

> The vulnerability of sperm whales to incidental capture in fishing gear, especially gillnets set in deep water for pelagic fish (*e.g.*, sharks, billfish, and tuna) and bottom-set longline gear, is well documented (Di Natale and Notarbartolo di Sciara 1994; Haase and Felix 1994; Felix *et al.* 1997; Hill *et al.* 1999; Straley *et al.* 2005; Warner *et al.* 2005). Sperm whales may break through or carry away fishing gear. Whales carrying gear may die at a later time due to trailing fishing gear, become debilitated or seriously injured, or have normal functions impaired, but with no evidence of the incident recorded. Sperm whales may also become entangled while attempting to depredate fish off fishing gear. Thus, it is possible that the increased strandings frequency in the Atlantic could be related to fishery bycatch (whales having drowned in gear) (Evans 1997). Direct action taken by fishermen to protect their catch and gear from depredation by sperm whales could result in serious injuries or mortality.
>
> Sperm whales may become entangled in fishing gear (recorded most often in demersal longline gear) while attempting to depredate fish off of the gear (Warner *et al.* 2005). Southern Pacific Ocean interactions involve demersal longline fisheries for Patagonian toothfish (*Dissostichus eleginoides*). There are records of depredation or possible depredation occurring in Chile (Oporto and Brieva 1994; Ashford *et al.* 1996; González 2001; González *et al.* 2001; Olivarría 2002; Hucke-Gaete *et al.* 2004). In Chile (Hucke-Gaete *et al.* 2004), aggressive competition between sperm and killer whales for a spot at

the hauling station of longliners were reported. Entanglements in longline fishing gear have been observed in Chile (Ashford *et al.* 1996). Although the magnitude of these interactions is infrequently documented, there are reports of sperm whales that have been shot by guns or harpoons and the use of explosives to keep animals away from fishing gear (González 2001). In addition, Haase and Felix (1994) recorded two instances in which sperm whales were killed after becoming trapped in tuna purse-seine nets off Ecuador. The ranking of the threat posed by the incidental capture of animals by these fishing practices to sperm whale recovery was listed under the global population/stock, reference G.1 (Table 1). Reports of fishermen shooting whales with guns and harpoons in the artisanal fishery off Southeast Chile represent potentially fatal threats provoked by frustration with reduced catches due to sperm whale depredation (González and Olivarría 2002).

Impacts, all fisheries

California, Oregon, Washington – The following information (Carretta et al. 2010) summarizes fishery interactions:

> The offshore drift gillnet fishery targeting swordfish and sharks off Oregon, California, and Baja California (Mexico) is a recognized threat to sperm whales. While the California/Oregon drift gillnet fishery killed/seriously injured several sperm whales in the 1990s, since the creation of a leatherback sea turtle (*Dermochelys coriacea*) conservation area was implemented in 2001 off central California and Oregon (66 FR 44549), no sperm whales have been observed taken in this fishery. One sperm whale stranded dead in 2004 with 5- to 6-inch mesh nylon netting found in its stomach and two sperm whales stranded dead in 2008 with a variety of netting in their stomachs (U.S. Department of Commerce 2009, J. Cordaro, NMFS-SWR, pers. comm., 2009). The fishery source of those nets is unknown, but is currently being analyzed to determine the type and source (country/area). Mean annual takes for these "unknown" fisheries are based on 2002–2006 data (Carretta and Chivers 2004; Carretta et al. 2005a, 2005b; Carretta and Enriquez 2006, 2007). This results in an average estimate of 0.2 (CV = not available) sperm whale deaths per year attributed to all fisheries. The threat posed by the drift gillnet fishery was ranked as low based on the assertion that there is a low uncertainty with regard to the extent of impact the fishing practice may have on sperm whales and that the severity of the threat to the overall population was low.

Mexico, Central America – The following information (Carretta et al. 2010) summarizes fishery interactions: "No estimates of mortality/serious injury are available for the Mexican drift gillnet fisheries (Carretta et al. 2009). Palacios and Gerrodette (1996) noted that sperm whales are at least occasionally killed in artisanal gillnet fisheries targeting sharks and large pelagic fishes off the Pacific coasts of northwestern South America, Central America, and Mexico."

Alaska – The following information (Allen and Angliss et al. 2010) summarizes fishery interactions:

> In the North Pacific, longline depredation is a localized phenomenon, occurring mainly in the central and eastern Gulf of Alaska, occasionally in the western Gulf of Alaska and

Aleutian Islands, and absent in the Bering Sea (Sigler et al. 2008). In this region, depredation occurs in December 2010 I-24 NMFS the sablefish (black cod) (*Anoplopoma fimbria*) and Pacific halibut fishery (*Hippoglossus stenolepis*) (Hill et al. 1999; Straley et al. 2005; Sigler et al. 2008). Investigations have been conducted to document rates of depredation, to understand how sperm whales manage to find vessels and remove fish from the gear, and to quantify the amount of prey removed and record the frequency of resulting mortality or serious injury due to entanglement. For instance, in 2006, the "Symposium on Fisheries Depredation by Killer and Sperm Whales: Behavioural Insights, Behavioural Solutions," was held in British Columbia. Reports of depredation were first noted in 1978, in the Gulf of Alaska, and from 1989–2003, 38 surveyed stations recorded sperm whale predation on longline catch (Angliss and Outlaw 2005). However, from 1998 to 2004, neither sperm whale presence nor depredation rate increased significantly (Sigler et al. 2008). In collaboration with fishermen, research using genetic, acoustic, and fishing behavior studies has been conducted in the Sitka area to gain insight into what may attract sperm whales to longlining activity (Sigler et al. 2003; Straley et al. 2005). Preliminary analyses found that during a typical encounter when sperm whales are present during the haul, about 3%–6% of the catch was estimated to be removed, but sometimes over 50% of the catch has been lost by individual fishermen. As the frequency of depredation events increases, there are growing concerns about the potential for sperm whale entanglements and the prospect of growing economic losses. In Alaska, there are reports of fishermen throwing seal bombs in the water and yelling at the whales when they depredate their gear.

Based on information documented from 1999–2003 (observer data), one sperm whale was observed with trailing gear from the Gulf of Alaska sablefish longline fishery; however, from 2001–2005, there have been no observed serious injuries or mortalities in federally observed Alaska fisheries (Angliss and Outlaw 2007). However, in 2006, there were three observed serious injuries in the Gulf of Alaska sablefish longline fishery, which extrapolates to 10 estimated serious injuries for that fishery for that year. Total estimated total annual takes is 2.01 (CV=0.49) animals (Angliss and Allen 2009).

The threat by North Pacific fishing practices in Alaska from the sablefish fishery to sperm whale recovery was ranked as low since only a small proportion of the population, when compared to the global population, depredates the sablefish fishery in Alaska. The severity and uncertainty of this threat are ranked as low. The average 5-year estimate within the Hawaiian Islands of annual mortality and serious injury is zero (between 1998–2002). Since 2001, the Hawaii-based long line fishery has undergone a series of regulatory changes, primarily to protect sea turtles, but the potential impacts of these regulatory changes on the rate of sperm whale interaction in unknown. The Hawaii-based longline fishery was ranked as low since few whales have interacted with these fisheries, and the severity and uncertainty of these interactions is low (the one animal that was observed caught in longline gear was apparently able to free itself and not considered seriously injured) (Forney 2004).

Hawaii – The following information (Carretta et al. 2010) summarizes fishery interactions: "One sperm whale has been reported entangled in a longline fishery near Hawaii (Carretta et al. 2006), but that animal freed itself and was not considered to be seriously injured (Forney 2004)."

Impacts, WCGF fisheries

Overlap indices between the sperm whale distribution and the fishery are generally lower than for other whales. For the fixed gear sector, the maximum values are < 6 animal hours/km^2 and occur in only a few places north of Cape Mendocino (Figure 10). Overlap indices for the trawl sector are fairly low and uniform from San Francisco to Cape Flattery, and are generally < 1 animal hours/km^2 (Figure 10). Overlap indices for the hake sector are all < 0.3 animal hours/km^2 (Figure 10).

Of the potential types of interactions—entanglement, catch depredation, and ship strikes—only one ship strike by a fishing vessel has been observed (with no serious injury or mortality) over the period from 2002–2009 (Jannot et al. 2011). Although three dead stranded sperm whales have been reported to have netting in their stomachs (U.S. Department of Commerce 2009, J. Cordaro, NMFS-SWR, pers. comm., 2009), it is unclear if the netting was associated with any of the WCGF fisheries or if mortalities were associated with the netting.

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2). Sperm whales feed primarily on squid in the north Pacific, but males have been documented to also consume rockfish (Flinn et al. 2002). Consequently, although overlap in target species and diet is limited, it is possible that competition for resources could occur with WGCF fisheries. Indirect trophic effects of the WCGF fisheries are also expected to be minor (Appendix A).

Impact of WCGF fisheries on population growth rate

Based on the information summarized above, we conclude that West Coast fisheries (including the WCGF fisheries) may be imposing some additional (non-natural) mortality on sperm whales. The number of takes per year may be higher than the estimated value 0.2 in California-Oregon-Washington. In addition, there is some overlap of individuals between the CA-OR-WA stock and the Alaska stock, so some of the interactions that occur in Alaska may also impact the CA-OR-WA stock and vice verse (Mesnick et al. 2011). Although the population is expected to have been recovering since cessation of whaling in 1980 (Whitehead 2002), the effects of unreported catches (Yaklokov 1994) and ongoing incidental ship strikes and gillnet mortalities (Carretta et al. 2010) remain somewhat uncertain. The only trend analysis for U.S. stocks was for the CA-OR-WA stock; although the most recent estimate was substantially lower than the two previous estimates, this was not thought to be a true expression of the population trend, given that the majority of this sperm whale stock inhabit areas near the EEZ boundary, and analysis of marked animals indicates widespread movement throughout the Pacific Basin. There has been no statistical analysis of trends in other U.S. sperm whale stocks or for the other areas of the North Pacific Ocean. Although precise estimates of the total sperm whale population in the North Pacific are lacking and available data are dated, the best estimate of the number of whales estimated to occur here (930,000; Rice 1989) is substantially higher than most other large cetaceans in this region, suggesting the species is unlikely to be severely impacted. Despite the paucity of specific data, we conclude that recent impacts from the WCGF fisheries are not likely to have a substantial impact on the population abundance or trend of sperm whales either locally or in the Pacific as a whole. The absence of any observed mortality of sperm whales from the WCGF fisheries, the low level of observed non-lethal interactions, and the general lack of any other anthropogenic sources of mortality, combined with the relatively large population size in the North Pacific and high degree of mobility in this population, indicates that the WCGF fisheries are unlikely to have a significant impact on the viability of this globally listed species.

*Southern Resident Killer whale (*Orcinus orca*)*

General biology[9]

Killer whales are the world's most widely distributed cetacean species, with solid black and white markings and a characteristic white or grey "saddle patch" located adjacent to the dorsal fin. Killer whale adults typically weigh 4–6 tons, with mature lengths of 4–6 m. In the Pacific Ocean, females bear their first calves at 10–12 years of age, reproduce until age 42–43, and may live to be more than 90 years old. Males typically have a shorter lifespan, potentially reaching up to 60 years of age. Calving intervals are from 3–5 years following an 18-month gestation period. Depending on the population ecotype, killer whales may feed on fish or marine mammals. Population structure is highly cohesive, with strong social structure extending across multiple generations (see Krahn et al. 2004 and references cited therein).

Range, migratory behavior, and stock structure

Three distinct ecoytypes of killer whales are found in the eastern Pacific: fish eating 'residents', marine mammal eating 'transients', and 'offshore' whales, whose diet is primarily fish. These ecotypes are distinct, with independent populations not inter-breeding. Recently, mitochondrial DNA has suggested that the three ecotypes have been separated for at least 150,000 years and should be considered separate killer whale species (Morin et al. 2010).

In the North Pacific, at least five populations of resident killer whales are recognized as utilizing portions of the U.S. coast: Northern Residents, Southern Residents, Prince William Sound Residents, Southeast Alaska Residents, and Western Alaska Residents (Krahn et al. 2004). Each of these populations is thought to be independent, with at most limited dispersal or inter-breeding occurring between populations.

The Southern Resident distinct population segment (DPS) ranges from central California to the Queen Charlotte Islands (British Columbia). The population is composed of three pods ('J', 'K', 'L'), each pod being an aggregation of matrilines (a matriline representing a female, and any offspring, spanning two or more generations). Relatively little information is known about the detailed migration routes or duration of migrations. Unlike other whales, killer whales do not have separate breeding and feeding grounds; migrations are thought to be driven by a search for prey (Krahn et al. 2004).

Globally, killer whales are generalist predators, but populations specialize on fish that are regionally abundant. These regionally important prey include herring in the north Atlantic (Similä et al. 1996), rays and elasmobranchs in New Zealand (Visser 1999), cod in the Antarctic (Pitman & Ensor 2003), and salmon in the northeast Pacific (Ford & Ellis 2006; Hanson et al. 2010).

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[9] General biology summary largely drawn from Krahn et al. (2004), Wiles (2004), and NMFS (2008).

Habitat use

All three pods that form the Southern Resident population occur in inland Washington waters during summer months, with J pod occurring the most frequently (Table 10). Habitat use outside of summer months, or outside of inland Washington waters, is largely unknown. In winter months, J pod is still seen the most frequently. Sightings of K and L pods are less frequent in these months, and in recent years, both pods have been seen as far south as Monterey, California (Wiles 2004; Krahn et al. 2004, Table 1).

Table 10: Average number of days spent by Southern Resident killer whales in inland waters by month, 2003-2009 (Hanson & Emmons, unpublished).

Months	Jpod	Kpod	Lpod
January	2	6	3
February	5	1	1
March	5	1	1
April	10	0	0
May	25	3	1
June	24	11	13
July	24	18	16
August	18	16	17
September	19	16	18
October	13	9	11
November	13	6	5
December	8	10	1

Critical habitat

Critical habitat for the Southern Resident killer whale population has been identified (NMFS 2006; Fed Register, v. 71, no. 229, p. 69054-69070). This area includes the summer core area (San Juan Islands), in addition to the Puget Sound and Strait of Juan de Fuca regions (Figure 11).

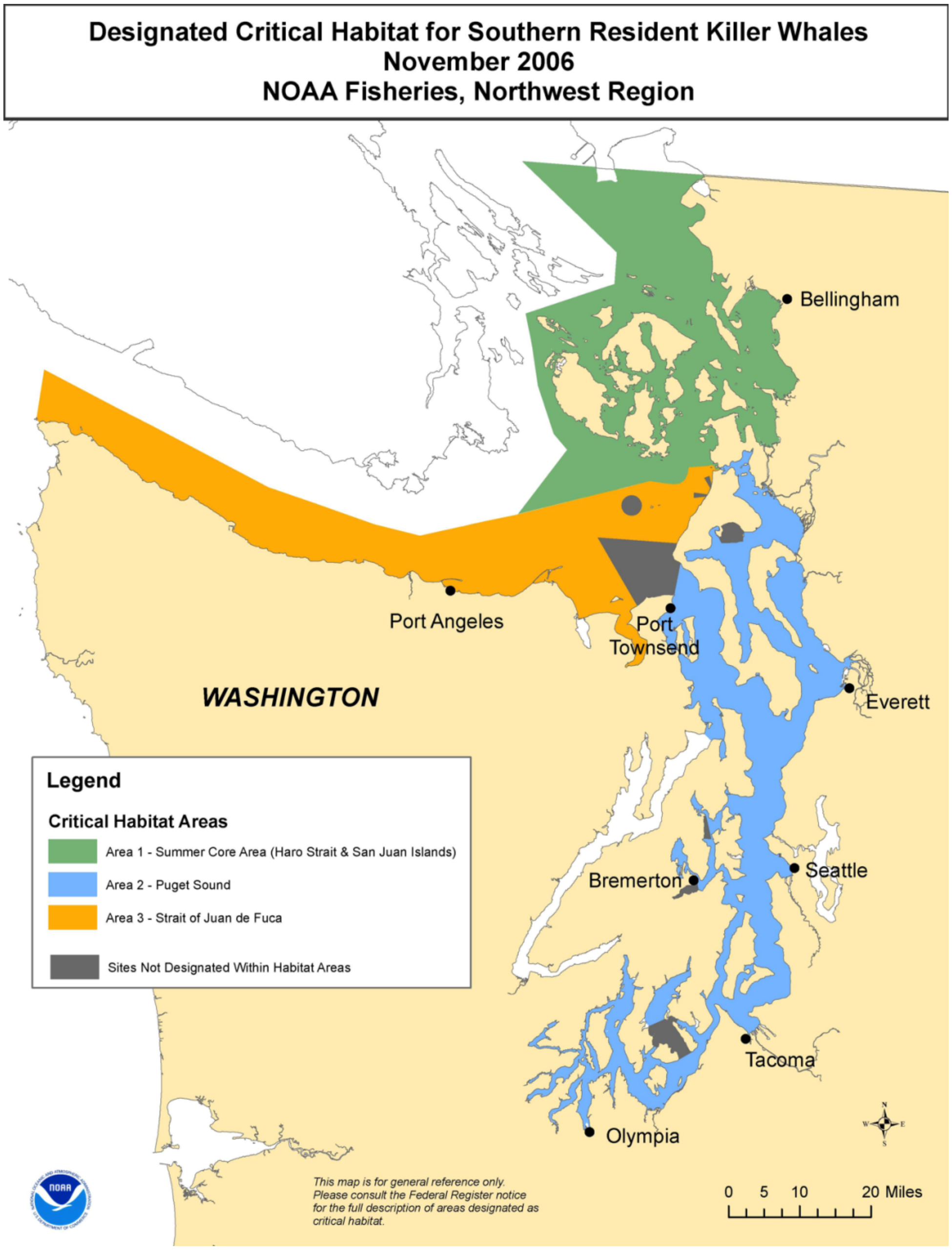

Figure 11: Critical habitat designation for Southern Resident killer whales. Reprinted from NMFS 2006.

Status

The Southern Resident population of killer whales was listed as endangered under the ESA in 2005 (NMFS 2005, 70 FR 69903). A Recovery Plan was finalized for this species in 2008 (NMFS, 2008), and a 5-year Status Review of the species was completed in May 2011 (NMFS 2011).

Abundance and trend

Prior to 1976, the Southern Resident DPS was subjected to a relatively large number (n = 47) of removals for marine parks. Nearly all of these captured animals were immature, and the 1971 population size was reduced to an estimated 67 individuals (Olesiuk et al. 1990). Photo-ID methods developed in the early 1970s have been used every year since, creating a detailed catalog of individual births, deaths, and reproductive performance.

As of 2011, the Southern Resident population has increased at a rate of 0.4% per year over the last several decades (NMFS 2011). While growth has been positive, it is less than the growth of the Northern Resident population over the same period, and less than the mean growth rate that is required for delisting (2.3% per year; NMFS 2008).

Threats (from Recovery Plan or listing documents)

NMFS has identified three primary threats to the viability of Southern Resident killer whales: reduced prey availability, contaminants in the food web, and direct or indirect disturbances from vessel interactions and sound (NMFS 2011). Because the current population size of Southern Residents is so small, this population is also more susceptible to risks of chance events. As the Southern Resident population is closed to breeding with other populations, an additional risk associated with small populations is lowered genetic diversity.

Fishery impacts

Fisheries may potentially impact killer whales through several mechanisms, including vessel collisions, physical disturbance, acoustic disturbance, entanglement in nets or lines, pollution from exhaust or spills, and direct or indirect reduction of prey (NMFS 2011).

It is extremely rare for killer whales to become entangled in fishing gear. Of all gear types, killer whales may most often be associated with longline fisheries, where they are known to remove fish caught on longline hooks (Visser 2000). Interactions between resident killer whales and gillnets were monitored in an expanded observer program in Washington State in 1993; during this period, killer whales were seen approaching gillnets, but no entanglements were reported (NMFS 2009, 75 FR 12498).

Impacts, all fisheries

California, Oregon, Washington – The total direct fishery induced mortality due to entanglements in gillnets or other gear has been zero since 1988 (Carretta et al. 2009). No serious injuries or mortalities have been observered or recorded in other fisheries within the species' range, such as Canadian gillnet fisheries.

Impacts, WCGF fisheries

There are no reported interactions between the WCGF and killer whales (Jannot et al. 2011). Because the fecundity and survival rates of the Southern Resident killer whales appear to respond to changes in the abundance of Chinook salmon (their primary prey), one mechanism by which the WCGF fisheries could impact the whales is through bycatch of Chinook salmon.

Chinook salmon bycatch in the WCGF fisheries has been summarized by the Northwest Regional Office and the West Coast Observer Program (Table 11). Since 2004, the methodology used to estimate bycatch has been consistent (Bellman et al. 2010). While Chinook salmon bycatch has decreased in both sectors of the fishery, the hake sector continues to represent the largest fraction of bycatch (over 90% of bycatch 2007–2009). Of the non-hake sector, the most bycatch occurs in the limited entry groundfish bottom trawl (Bellman et al. 2010; Bellman et al. 2011).

Table 11: Estimated Chinook bycatch for the hake and non-hake sectors of the groundfish fishery (Bellman et al. 2010; Bellman et al. 2011; Bellman & Hastie 2008; Hastie 2005; Heery et al. 2009; NMFS 2007). The non-hake component is further stratified by the limited entry groundfish bottom trawl. Totals are not available in all years due to unaccounted for mortality in other WCGF fishery sectors.

	Non-hake sector		Hake sector	Total
Year	LE groundfish trawl			
2004	2203		8751	N/A
2005	799		11916	N/A
2006	96		3975	N/A
2007	187		6186	6420
2008	344		3380	3769
2009	296		2712	3087

Of the total Chinook bycatch, it is likely that only a small portion overlaps with the Southern Resident prey base with respect to size. Many of the individuals included as bycatch are smaller than 60 cm (younger than 2 years old). In 2007, an estimated 45% of the coastwide Chinook bycatch was less than 60 cm (Jesse 2008). In 2008, the fraction was closer to 85% (Bellinger et al. 2009). In contrast, data collected from killer whale foraging events suggests that killer whales exhibit strong size-selectivity, preferring older and larger Chinook salmon (Ford & Ellis 2006; Hanson et al. 2010), particularly 4-5 year old salmon that are returning to natal streams to spawn.

Spatially, there may be only a small amount of overlap between stocks commonly found in Southern Resident killer whale diet and stocks included as bycatch in the WCGF fisheries. Chinook stocks that are included bycatch tend to be southern stocks, originating south of the Columbia River (Bellinger et al. 2009). Stocks originating from Puget Sound, British Columbia, and Alaska represent < 10% of total bycatch. These same northern stocks represent the largest contribution to Southern Resident diet, based on feeding events in inland waters (Hanson et al. 2010).

The Fishery Regulation Assessment Model (FRAM; http://www.pcouncil.org/salmon/background/document-library/) has been used as a tool to assess the overall impact of fishing on Southern Resident killer whales. In coastal waters, the average ratios of Chinook biomass to Chinook required by Southern Resident killer whales are higher than similar ratios in inland waters; in coastal waters, the mean ratio ranges from 10-35x (PS Chinook RMP; A. Agness, unpublished).

Output from the FRAM model can also be used to quantify how bycatch may reduce prey available to killer whales. The age structure of Chinook in the FRAM model is dominated by 2-year olds (58% 2-year olds, 23% 3-year olds, 15% 4-year olds, 4% 5-year olds), while the biomass is skewed toward older fish (1% 2-year olds, 12% 3-year olds, 57% 4-year olds, 30% 5-year olds). Assuming bycatch occurs relative to their relative abundance, the largest impact can be calculated by focusing on the FRAM period with lowest relative Chinook abundance (July–September).

Table 12: Estimated reduction in prey, July-September in coastal waters, under 2 alternative levels of salmon abundance (~ 3.72 million 2-5 year Chinook in 1994, ~ 10.5 million Chinook in 2002; PS Chinook RMP, L. LaVoy unpublished). Values in the table represent the reduction of Chinook numbers and kilocalories available to killer whales (kilocalorie values impose size-selectiviy from the PS RMP). Values are calculated as 100 x (abundance after bycatch removed / abundance before bycatch removed). In all scenarios, bycatch values would reduce available prey by less than 1%.

Bycatch removed	High salmon (2002)	Low salmon (1994)
2000	0.019% (0.019%)	0.054% (0.039%)
4000	0.038% (0.038%)	0.108% (0.077%)
6000	0.057% (0.058%)	0.162% (0.116%)
8000	0.076% (0.077%)	0.216% (0.155%)
10000	0.095% (0.096%)	0.270% (0.193%)
12000	0.114% (0.115%)	0.324% (0.232%)

Even in years with relatively low Chinook salmon abundance, the relatively high bycatch would only cause a reduction of 0.33% of available Chinook across the whales' coastal range. Because all calculations (Table 12) are based on the period (July-Sept) with relatively low prey availability to need ratios (PS Chinook RMP), these impacts are likely overestimates (ratios are higher in winter months, when the whales are more likely to encounter southern stocks). Given the relatively small impact of bycatch on either numbers or biomass (Table 12), values of bycatch in the range observed are likely to have a negligible impact.

Habitat and trophic effects

Indirect trophic effects of the WCGF fisheries are also expected to be negligible on forage fish species (Appendix A), and effects on killer whales would only occur indirectly through alteration of the food web.

Impact of WCGF fisheries on population growth rate

Southern Resident killer whales are a slow growing population, and although the species is capable of maintaining a 2.3% growth rate (Olesiuk et al. 1990), this population has achieved a growth rate of only 0.4% since the mid-1970s. Previous work has demonstrated links between prey availability (Chinook abundance) and killer whale fecundity and survival (Ward et al. 2009; Ford et al. 2009). The linear relationship between Chinook abundance and probability of calving can be used to evaluate a reduction of 0.25% (Table 12); under this scenario, the probability of a female calving would be reduced by 0.06%. Given that births occur infrequently, and the population is subject to both demographic and environmental stochasticity, such a change would be undetectable. We therefore conclude that the WCGF are likely to have, at most, a negligible effect on the population growth rate of the Southern Resident killer whales.

Chapter 4: Pinnipeds

*Guadalupe Fur Seal (***Arctocephalus townsendi***)*

General Biology[10]

Guadalupe fur seals are a member of the family Otariidae along with other fur seal and sea lion species. They have a dark brown to black coloration and are sexually dimorphic. Adult males are longer (average length of 7 ft) and heavier (average weight of 400 lb) than females (average length of 5 ft and weight of 110 lb). Adult males also typically have a yellow or lighter brown mane on the back of their head and neck as a secondary sexual characteristic. They are terrestrial breeders. During the breeding season of June through August, males form small territories, especially near caves and crevices that they defend through threat aggressive vocal displays from other males (Peterson et al. 1968, Gallo-Reynoso 1994). The mating system is polygynous. Females generally give birth a few days after arriving on the breeding rookery and mate within a week after the pup is born. Mothers must forage during the lactation period, leaving pups on the beach. Mother and pup reunions are mediated by vocal dueting in which both produce individually unique vocalizations. Identity seems to be confirmed by scent. Pups are typically weaned at around nine-months of age. Based on stomach contents of stranded animals, Guadalupe fur seals eat rockfish, mackerel, lantern fish, flatfish, and squid (Hanni et al. 1997).

Range and stock structure

The general range of Guadalupe fur seals extends from the southern tip of Baja California, Mexico to the southern coast of California, USA. Individuals have been sighted as far south as Zihuatanejo, Mexico and as far north as Washington State (Etnier 2002, Aurioles-Gamboa and Hernandez-Camacho 2006). Rare sightings outside the typical range and especially to the north almost always involve juvenile seals during El Nino events (Hanni et al. 1997, Etnier 2002). Most breed on Guadalupe Island, Mexico with much smaller breeding colonies on East San Benito Island, Mexico. Guadalupe fur seals were hunted to near extinction as a result of intense commercial sealing in the 18th and19th century. They have a single stock designation because all individuals are believed to be descendants from a single breeding colony on Guadalupe Island. Archeological and historical evidence indicates that the former breeding range of this species was probably from San Miguel Island, California to Socorro Island, Baja California (NMFS 1985, FR 50 51252).

Habitat use

Guadalupe fur seals prefer rocky islands and caves for terrestrial breeding habitat. Foraging habitat is less well defined. Guadalupe fur seal foraging ecology is believed to be similar to other *Arctocephalus* species. Most species in this genus forage in upwelling zones, oceanic fronts, or

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[10] Unless otherwise noted, most information about Guadalupe fur seals was obtained from the most recent Stock Assessment Report (included in Carretta et al. 2009).

continental shelf-edge regions and mainly in the surface mixed layer (<50–60 m) at night (Arnould 2009). Guadalupe fur seals are thought to typically stay in the tropical waters off the coast of Baja California at least during the summer breeding months. Diving behavior has been reported from adult females tagged with time-depth recorders and satellite transmitters. In one study, a few females were tagged on the breeding colony on Guadalupe Island and fed in the California Current south of the island, making round trips from the breeding colony that averaged 2,375 km and ranged from 704 to 4,092 km (n=3, Gallo-Reynoso 1994). Dive data were only successfully collected from one female on a foraging trip that lasted 14 days. Mean dive depth was 16.9 m (range: 3–82 m), mean dive duration was 2.6 min (range: 0.5–18), mean surface interval between dives was 2 min (range: 0.5–26), and mean bottom time was 1.4 min (range: 0–15.5, Gallo-Reynoso 1994). In another study, a stranded female released at Point Piedras Blancas, California was tagged with time-depth recorders and satellite transmitters to track movement after rehabilitation (Landers et al. 2000). Average dive depths and durations in the stranded female were similar to those previously reported in Gallo-Reynoso (1994). In both studies, almost all dives were recorded at night or during crepuscular hours (Gallo-Reynoso 1994, Landers et al. 2000).

Critical habitat and protected area designations

Critical habitat has not been designated for the Guadalupe fur seal under the ESA since current breeding colonies are only located in Mexico (NMFS 1985, FR 50 51252). In Mexico, Guadalupe Island has been designated as a pinniped sanctuary since 1975.

Status

Guadalupe fur seals were listed as threatened under the Endangered Species Act in 1985 and are also listed as a Depleted and Strategic species under the Marine Mammal Protection Act (NMFS 1985, FR 50 51252).

Abundance and trend

Guadalupe fur seal abundance is relatively small compared to other U.S. West Coast pinniped populations. In 1993, the population was estimated to be 7,408 animals (Gallo-Reynoso 1994). The population on San Benito Island increased at a rate of 13.7% per year from the mid-1950s to 1993 (Gallo-Reynoso 1994). Guadalupe fur seal populations on San Benito Islands also experienced a population growth of 18.9% from 1997 to 2006, but this likely represented expansion of the breeding colony from Guadalupe Island (Aurioles-Gamboa et al. 2010). The current population size is estimate to be around 10,000 individuals (Aurioles-Gamboa et al. 2010).

Threats (from Recovery Plan or listing documents)

There is no Recovery Plan prepared for Guadalupe fur seals. Potential threats in the listing document include oil spills, sonic boom exposure from Vandenberg A.F.B., disturbance by tourists and fishing vessels, and potential expansion of gillnet fisheries off of Baja California (NMFS 1985 FR 50 51252).

Fishery Impacts

Fisheries may potentially impact Guadalupe fur seals through several mechanisms, including physical disturbance, acoustic disturbance, entanglement in nets or lines, and direct or indirect reduction of prey. Drift and gillnet fisheries may result in incidental mortality or serious injury to Guadalupe fur seals in the United States and Mexico. Three of nine Guadalupe fur seals stranded in central and northern California in the late 1980s to mid-1990s showed evidence of entanglement in fishing gear or marine debris (Hanni et al. 1997). It is unclear if these injuries were a result of interactions with active fishing sets or a result of fishing gear debris (i.e., ghost fishing).

Impacts, all fisheries

California, Oregon, Washington - There are no U.S. reports of Guadalupe fur seal injury or mortality for any fisheries with onboard observers. This is based on available data from the California commercial fisheries and the West Coast groundfish fishery (Carretta et al. 2004, Carretta and Enriquez 2006, 2007, 2008, 2009a,b, 2010; Jannott et al. 2011). Some reports include unidentified pinnipeds as bycatch mortalities in the California commercial fisheries (Carretta and Enriquez 2009b, Carretta et al. 2004).

The concept of Potential Biological Removal (PBR) is one method of evaluating risk imposed by a particular level of take, which is a key approach in conducting assessments under the Marine Mammal Protection Act. The total U.S. fishery mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate (Carretta et al. 2009).

Mexico, Central America – There is no information on Guadalupe fur seal injury or mortality for any fisheries in Mexico. The last assessment on potential impacts was included in the 2000 stock assessment report of the species. In the Mexican swordfish and shark fisheries, similar drift gillnets are used as in the Californian swordfish and shark fisheries. The overall bycatch mortality rate is similar to that observed in the California driftnet fisheries during 1990–1993, but this information is not species-specific for Mexican fisheries. Thus, there is insufficient information to determine whether the fishery mortality in Mexico exceeds the PBR for this stock (Carretta et al. 2009).

Impacts, WCGF fisheries

No Guadalupe fur seal injury or mortality has been reported for any WCGF fishery activities. From 2002–2009, one unidentified pinniped was reported off the coast of Oregon (Jannott et al. 2010). Based on the extremely rare occurrence of this species along the Oregon coast, it is highly unlikely that the unidentified pinniped was a Guadalupe fur seal.

Habitat and trophic effects

WCGF fisheries target commercially valuable fish species that include a variety of rockfish, flatfish, roundfish, skates, and sharks (see Chapter 2 Description of the Fisheries). Little is known about what Guadalupe fur seals eat, but they are thought to be generalists, eating a variety of fish and squid that include rockfish and flatfish. Given the potential overlap with prey, it is possible that Guadalupe fur seals will be impacted from direct reduction in prey by WCGF fisheries. However, the geographic range overlap is restricted since Guadalupe fur seals are non-migratory—all breeding grounds are in Mexico, and sightings in U.S. waters are rare.

Impact of WCGF fisheries on population growth rate

The total U.S. fishery mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. There are no reports of Guadalupe fur seal bycatch from the WCGF fishery, and habitat and trophic effects are likely small. Thus, impacts on population growth rate are likely to be negligible.

*Steller sea lion (*Eumetopias jubatus*)*

General biology[11]

The Steller sea lion is the largest member of the Otariid (eared seal) family. Males may be up to 325 cm (10–11 ft) in length and can weigh up to 1,100 kg (2,400 lb). Females are smaller than males, 240–290 cm (7.5–9.5 ft) in length and up to 350 kg (770 lb) in mass. Bulls become mature between 3 and 8 years of age, but typically are not massive enough to hold territory successfully until 9 or 10 years old. Females reproduce for the first time at 3 to 8 years of age, and the average age of reproducing females is approximately 10 years. Females bear at most a single pup each year between late May through early July, with peak numbers of births during the second or third week of June. Weaning takes place gradually during the winter and spring prior to the following breeding season, and it is not uncommon to observe 1- or 2-year-old sea lions suckling from an adult female. Females normally ovulate and breed annually after maturity, although because of a high rate of reproductive failures and early pup mortality, estimated birth rates have ranged from 55% to 63%.

Range, migratory behavior, and stock structure

Steller sea lions are found across the North Pacific Ocean rim from northern Japan, the Kuril Islands and Okhotsk Sea, through the Aleutian Islands and Bering Sea, along Alaska's southern coast, and south to California. Pupping and breeding occurs on rookery sites during May to July; most (sexually mature) adult Steller sea lions are found on the rookeries at this time, while most juveniles and non-breeding adults are found on haulouts where pupping rarely occurs. Seal Rocks, at the entrance to Prince William Sound, Alaska, is the northernmost rookery (60°09'N). Año Nuevo Island off the central California coast is the southernmost rookery (37°06'N), although some pups were born at San Miguel Island (34°05'N) up until 1981. At present, the only active rookeries along the Asian coast are in Russia. Prior to the large declines in the western stock of Steller sea lions in the 1980s, the largest rookeries and pup numbers were in the Gulf of Alaska and Aleutian Islands. After the decline, rookeries in the west became progressively smaller; consequently, the largest rookeries are now in Southeast Alaska and British Columbia.

Although Steller sea lions do not make regular migrations, they do move considerable distances. Animals marked as pups on rookeries in the Gulf of Alaska have been sighted in Southeast Alaska and British Columbia; some marked in British Columbia have been seen at Cape Saint Elias, Alaska; some marked in the eastern Aleutians have been seen in eastern Bristol Bay, Alaska; and some marked in Oregon have been seen in northern California, Washington, British Columbia, Southeast Alaska, and the northern Gulf of Alaska (Calkins and Pitcher 1982, Calkins 1986, Loughlin 1997). In their first year, most animals stay within 500 km of their natal rookery. After the first year, juveniles move much greater distances from their natal rookery (up to 1785 km) and may stay distant for 3–7 years. However, when they reach sexual maturity, most animals return to their natal rookery to breed. After the breeding season, adult females remain

[11] This section on general biology is adapted from the following sources, unless a specific citation is given: http://www.afsc.noaa.gov/nmml/alaska/sslhome/biology.php, NMFS (2008), and Allen and Angliss (2011).

generally less that 500 km from their natal rookery, while adult males have been seen over 1,000 km from the rookery where they held a territory (Raum-Suryan et al. 2002, 2004).

Although most adults return to their natal rookery to breed, dispersal of animals from their natal rookeries to establish new rookeries or expand existing ones does occur. In southeast Alaska, new rookeries were established as population size increased. The new rookeries were formed by animals dispersing from nearby rookeries and from rookeries in the Gulf of Alaska and Aleutians (NMFS 2008).

In 1997, NMFS classified Steller sea lions as distinct western and eastern population segments under the ESA based on genetic studies and phylogeographical analyses from across the sea lion's range (62 FR 24345). The eastern distinct population segment (DPS) includes sea lions born on rookeries from California north through southeast Alaska; the western DPS includes those animals born on rookeries from Prince William Sound westward (Bickham et al. 1996, Loughlin 1997). The regulatory division between DPSs is Cape Suckling (144º west longitude) in the northeast Gulf of Alaska (Figure 12). However, frequent movement is seen across this boundary by animals from both populations, particularly juvenile animals (Raum-Suryan et al. 2002). Later genetic studies (Baker et al. 2005, Hoffman et al. 2006) also supported the separation of the eastern and western populations and suggested a third, Asian, population segment.

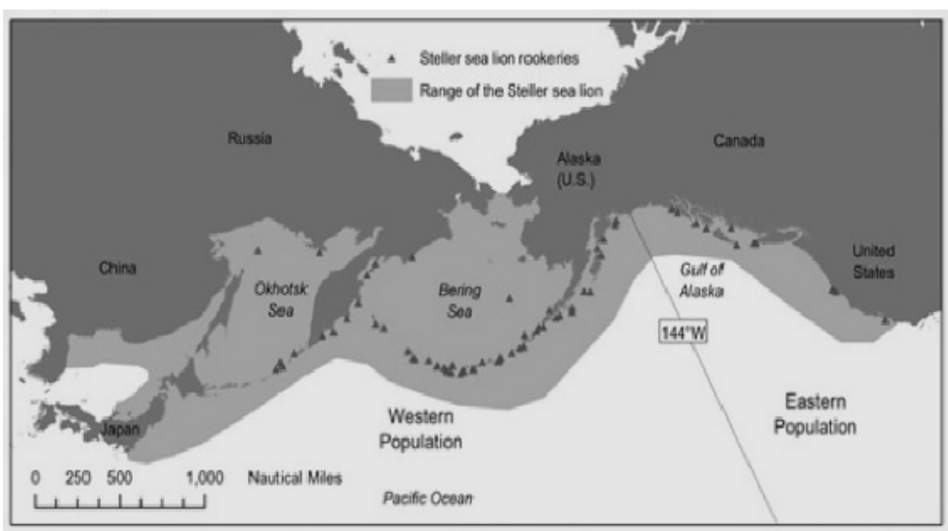

Figure 12: Steller sea lion geographic distribution and demarcation line between the eastern and western DPSs. (Figure from AFSC/NMML)

Habitat use

Steller sea lions use both terrestrial and marine habitat. Terrestrial habitat is categorized as haulouts and rookeries. Haulout is the term used to describe terrestrial areas used by adult sea lions during times other than the breeding season and by non-breeding adults and juveniles throughout the year. During the breeding and pupping season, females use rookery sites to give birth, and they select places that are gently sloping and protected from waves. Pups stay on land for approximately two weeks and then begin swimming close to shore. When pups are approximately 2.5-months old, females begin dispersing with their pups away from rookeries to haulouts. These haulouts may be considerably rockier and more exposed. During the breeding and pupping season, territorial adult males also spend considerable amounts of time on rookeries while they defend harems and breed. Individual Steller sea lions, especially adults, display strong site fidelity to specific haulouts and rookeries from year to year.

Studies using satellite telemetry in Alaska have provided detailed information on the use of marine habitat by adult and juvenile Steller sea lions. Overall, available data suggest two types of marine habitat use. Juveniles, pups, and lactating females normally stay less than 20 km from rookeries and haulout sites. Foraging trips by lactating females are typically less than 24 hours, but sea lions which are not longer tied to land, due to sufficient age or less of a need to return to land to nurse or reproduce, will forage over much larger areas (greater than 20 km) to find optimal foraging conditions. During longer range foraging trips, animals are commonly found near and beyond the 200 m depth contour (NMFS 2008). They may also be found farther out to sea in water greater than 1,000 m deep (Merrick and Loughlin 1997). In California, animals have been observed to forage up to 85 miles off-shore (Fiscus and Baines 1966). Large seasonal differences in foraging ranges have been observed in Steller sea lions (Loughlin 1993, Merrick 1995), and these seasonal changes appear to be related to seasonal movements of prey.

Critical habitat

On 27 August 1993, NMFS published a final rule to designate critical habitat for the threatened and endangered populations of Steller sea lions (58 FR 45269). Two kinds of marine habitat were designated as critical: "aquatic zones" around rookeries and haulouts and three special aquatic feeding areas in Alaska. Aquatic zones extend 3,000 feet (0.9 km) seaward in state and federally managed waters from each major rookery and major haulout in Alaska that is east of 144°W longitude and each major rookery in California and Oregon (Figure 13). Aquatic zones in the U.S. breeding range of the western DPS extend 20 nm (37 km) seaward in state and federally managed waters from each major rookery and major haulout in Alaska that is west of 144°W longitude. The three special aquatic foraging areas in the critical habitat are in the western DPS range: Shelikof Strait, the southeastern Bering Sea north of the Aleutian Islands from Unimak Island past Bogoslof Island to the Islands of Four Mountains, and Seguam Pass.

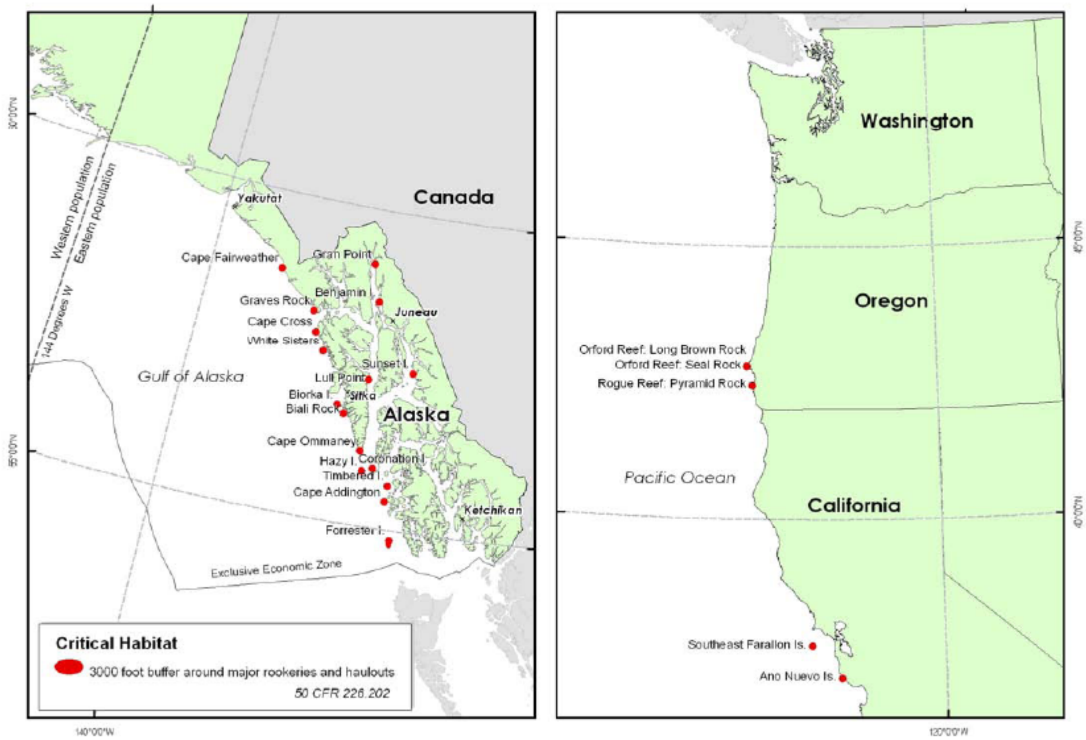

Figure 13: Designated critical habitat for the eastern DPS (50 CFR 226.202) (reprinted from NMFS 2008). The designated critical habitat includes three major rookeries in Oregon and three in California. The third Californian rookery is not marked but is just above the 40deg line in the figure. There are no major rookeries in Washington.

Status

Under the MMPA, all Steller sea lions are classified as strategic stocks and are considered depleted. In 1990, after large range-wide declines, the Steller sea lion was listed under the ESA as threatened throughout its range (55 FR 12645, 5 April 1990; 55 FR 50005, 4 December 1990). This listing included animals from Alaska, California, Oregon and Washington in the U.S., as well as Canada, Japan, and Russia. On 4 June 1997, the population west of 144°W longitude was listed as an endangered DPS (the western DPS) under the ESA; the population east of 144°W (the eastern DPS) remained listed as threatened as the eastern DPS. A Recovery Plan was developed for Steller sea lions in 1992. A revised Recovery Plan, which discusses separate recovery actions for the threatened and endangered DPSs, was issued in 2008. On 13 December 2010, NMFS announced a decision to review the status of the eastern DPS in response to two petitions to delist the eastern DPS (75 FR 77602).

Abundance and trend

The western DPS, comprising animals in the Asian, Aleutian Islands, and Gulf of Alaska regions, steadily decreased from an estimated 220,000–265,000 animals in the late 1970s to fewer than 50,000 in 2000 (NMFS 2008). However, the rate of decline steadily decreased, and by 2000, increases in adults and juveniles were observed in the eastern and western Gulf of Alaska and in the eastern and central Aleutian Islands. Overall, a 3% per year increase was observed during the 2000–2004 period across the entire western DPS despite stable or declining numbers in the central Gulf of Alaska and the western Aleutian Islands. The region-wide increases did not continue after 2004, however. Instead, between 2004 and 2008, numbers were stable (not increasing) overall with regional differences. In the eastern Aleutians, numbers increased while they decreased in the central and western Aleutians. Numbers were stable in the western and central Gulf of Alaska and increased in the eastern Gulf of Alaska due to movement of animals into the region from southeast Alaska. The most recent counts in 2010 have found similar trend patterns (Fritz and Gelatt 2010). The number of Steller sea lions in the western DPS in 2005 was estimated at approximately 61,000 (NMFS 2008); subsequent surveys in the Gulf of Alaska, Aleutians, and Russia suggest that the western DPS has increased by approximately 4% since 2005 (Allen and Angliss 2011, Burkanov 2009).

In contrast, the eastern DPS, comprised of animals in Southeast Alaska, British Columbia, Washington, Oregon, and California, did not experience large declines in the early 1980s and has increased at over 3% per year since the late 1970s (Allen and Angliss 2011). Numbers have more than doubled in southeast Alaska, British Columbia, and Oregon, and counts on the Saint George Reef rookery and Sugarloaf rookery in northern California are near levels recorded early in the 20^{th} century. However, numbers of animals at the southernmost California rookeries are at historically low levels (Sydeman and Allen 1999; Allen and Angliss 2011); the Año Nuevo rookery and the Farallon Islands in central California are substantially reduced (90% lower) from those reported early in the 20^{th} century, and the former haulout/rookery at San Miguel Island is now extinct, as are several other sites previously used in California. The reasons for the large declines in southern and central California are not known; however, more recently, the numbers in California have been relatively stable albeit low. Despite declines in California, overall the eastern DPS (CA, OR, WA, BC, and SE AK together) is increasing due to positive trends in the northern regions of the DPS. Total population size of the eastern DPS in 2002 was estimated to range between 45,000 and 51,000 animals of all ages (NMFS 2008). Additional surveys in California, British Columbian and southeast Alaska after 2002 suggest the population has continued to increase since the 2002 survey. Based on the 2006-2009 pup counts, the population is currently estimated to be between 58,334 and 72,223 (Allen and Angliss 2011). Southeast Alaska and British Columbia together account for over 80% of total pup production occurring in the eastern population, and four new rookeries have been founded in the last 25 years in southeast Alaska at the northern extent of the population range. During the 1970s, the eastern DPS contained approximately 10% of the total number of Steller sea lions in the U.S., but currently over half of U.S. Steller sea lions now belong to the eastern DPS, and Pitcher et al. (2007) reported that 55% of the pup production of Steller sea lions in the U.S. currently occurs in the eastern population.

Threats (from Recovery Plan or listing documents)

The threats discussed in the Steller Sea Lion Recovery Plan (NMFS 2008) include both natural factors, which may not be controllable, and mitigable human-related factors:

- Large-scale fishery removals that reduce the availability or quality of prey species;
- Large-scale environmental changes that affect the abundance or distribution of prey species;
- Predation from killer whales, especially, and sharks;

- Nonlethal diseases that affect survival or fecundity and/or reduce the foraging efficiency of sea lions;
- Pollutants concentrated through the food web that contaminate fish eaten by sea lions, possibly reducing their fecundity or increasing mortality;
- Incidental takes of sea lions through capture or entanglement in fishing gear that increased as a result of the expansion of commercial fisheries;
- Takes of sea lions in the subsistence harvest; and
- Shootings of sea lions unrelated to the subsistence harvest.

Fishery impacts

Fisheries may potentially impact Steller sea lions through several mechanisms, including physical disturbance, injury or mortality from entanglement in nets or lines, and direct or indirect reduction of prey (NMFS 2008). Due to limited movement of Steller sea lions in the western DPS into Washington, Oregon, or California waters and minimal movement of Washington, Oregon, and California animals into the western DPS, the discussion of fishery impacts will focus exclusively on the impacts of the West Coast fisheries on the eastern Steller sea lion DPS. The stock assessment report (Allen and Angliss 2011) divides estimates of fishery-related mortality into those derived from fishery observer programs and those derived from data on entanglement with fishing gear. Serious injury and mortality for entanglement from fishing gear is listed under impacts for all fisheries, using both entanglement data in the 2010 stock assessment and additional data reported in west coast standing and entanglement surveys. Impacts from the WCGF fisheries are estimated from data in the West Coast Groundfish and At-Sea Hake Observer Programs.

Impacts, all fisheries

Strandings of Steller sea lions provide information on the level of fishery-related mortality due to entanglement with gear from all fisheries. The latest stock assessment report (Allen and Angliss 2011) includes data on "flasher" entanglement from the salmon troll fishery. During a 5-year period, three flasher entanglements were observed giving an observed mortality of 0.6 animals per year from the salmon troll fishery. This is a minimum estimate from one fishery. Data from entanglement surveys and the NOAA Marine Mammal Stranding network give us a more comprehensive estimate of entanglement rates.

Entanglement of Steller sea lions in the eastern DPS has been estimated at 0.26% based on surveys of 69 sites in southeast Alaska and British Columbia (Raum-Suryan et al. 2009). The majority of observed entanglements were fishing gear or debris related and were around the neck. Using the 2009 N_{min} abundance (52,847; Allen and Angliss 2011), this translates to an estimated 115 entangled animals in the population at any one time (52847 x 0.0026 = 137). The entanglement rate observed in SE Alaska and British Columbia is used for the whole eastern DPS, since Steller sea lion-specific entanglement data are not available in other regions but the rate observed in SE Alaska and British Columbia is similar to that observed in California across all pinnipeds (0.07–0.22%). Mortality rates due to entanglements is unknown; of 14 branded individuals with entanglements, 5 disappeared and 9 were still known to be alive at the end of the 7-year study (Raum-Suryan et al. 2009). If we assume 36% mortality of entangled individuals (5 out of 14), this translates to an estimated 49 (137 x 0.36) deaths due to entanglement over a 7-year period, or approximately 7 animals per year in the eastern DPS.

A second estimate of the total number of entangled individuals can be obtained from the NOAA Marine Mammal Stranding network. The numbers of stranded Steller sea lions reported by the NOAA Marine Mammal Stranding network between 1999 and 2010 are shown in Table 13. The proportion of strandings that are fishing related have only been reported for southeast Alaska, and proportions have ranged from 10 to 50%. In Washington and Oregon, California, on total strandings are reported; the numbers of standings that are fishery related are not reported. To estimate the total fishing-related strandings (Table 13), an estimate of the total strandings across all regions was multiplied by the proportion of strandings that were fishing-related in the southeast Alaska data. The number of stranded Steller sea lions has increased in recent years, as has the proportion of these strandings that were attributed to fishing interactions (entanglement with fishing debris or ingestion of gear, typically). Taken together with the entanglement study by Raum-Suryan et al. (2009), the data from the NOAA stranding reports suggest a minimum mortality of 5–40 animals per year in Washington and Oregon, California, and southeast Alaska may be attributable to entanglement with or ingestion of fishing gear of some type. Some of the human-related mortalities were gunshot wounds, but these numbers were very small. This is a minimum estimate since observed strandings represent only a fraction of the actual strandings.

Table 13: Numbers of stranded Steller sea lions reported by the NOAA Fisheries Marine Mammal Stranding Network for Washington and Oregon, California, and southeast Alaska. In southeast Alaska, strandings due to human interaction (typically fishing) are reported and are shown in parentheses where available. Strandings for 1999-2002 in southeast Alaska are the average over 4 years. Estimated fishing-related strandings are computed using total strandings across all regions (or 2 x SE AK when WA/OR and CA numbers are unavailable) times the observed proportion of strandings that are fishing related in SE AK (= number in parentheses in SE AK column divided by the number outside parentheses in SE AK column).

	WA/OR	**CA**	**SE AK**	**Estimated fishing related strandings (WA/OR+CA+SE AK)**
1999	3	11	17	---
2000	5	10	17	---
2001	4	13	17	---
2002	5	6	17	---
2003	16	9	23 (3)	6
2004	16	7	9 (2)	7
2005	NA	13	12 (3)	6
2006	NA	15	25	---
2007	NA	NA	28 (13)	26
2008	NA	NA	36 (10)	16
2009	NA	NA	49 (8)	20
2010	NA	NA	45 (18)	36

Impacts, WCGF fisheries

In the eastern DPS, Steller sea lion serious injuries and mortalities have been reported by fisheries observers in the California (CA)/Oregon (OR) thresher shark and swordfish drift gillnet, the West Coast groundfish, the Northern Washington (WA) marine set gillnet, and the Gulf of Alaska sablefish longline fisheries (Allen and Angliss 2010). However in recent years (after 2000), fisheries observers have only reported serious injuries and mortalities in the West Coast groundfish fishery, although no data are available after 1998 for the Northern Washington marine set gillnet fishery (Allen and Angliss 2011). The latest stock assessment report (Table 5; Allen and Angliss 2011) gives a serious injury and mortality estimate of 0.8 animals per year based on the Pacific whiting component of the WCGF fisheries. We can obtain estimates of annual serious injury and mortality across all components of the fishery from reports of the West Coast Groundfish and At-Sea Hake Observer Programs (Jannot 2011).

Over the period from 2002–2009, a total of 8 Steller sea lion serious injuries or mortalities were observed in the West Coast Groundfish Program, and 11 serious injuries or mortalities were observed in the At-Sea Hake Observer Program (Table 7i, Jannot 2011). The estimated total (as opposed to observed) serious injuries or mortalities in the two fisheries together for the 2002–2009 period was 44 Steller sea lions with upper and lower 90% confidence intervals of 18 and 111 serious injuries or mortalities (estimates and confidence intervals are those reported in Jannot 2011). The numbers of serious injuries or mortalities has varied across years and has been increasing the last five years (Figure 14).

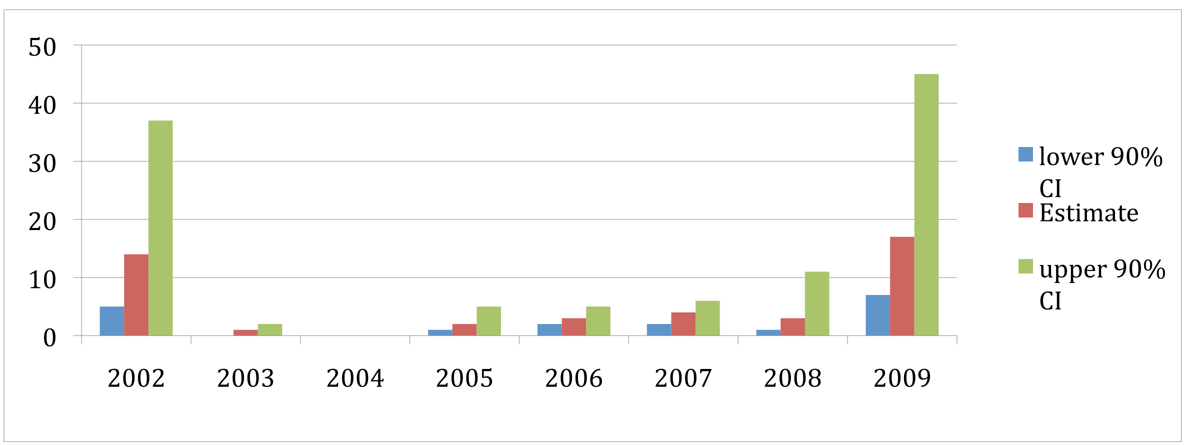

Figure 14: Estimated total Steller sea lion serious injuries or mortalities from the combined At-Sea Hake fishery and West Coast Groundfish fishery (from Table 7i, Jannot 2011).

Habitat and trophic effects

The most commonly identified prey in southeast Alaska includes walleye pollock, Pacific cod, flatfishes, rockfishes, herring, salmon, sand lance, skates, squid, and octopus (Calkins and Goodwin 1988, Trites et al. 2007). Principal prey in British Columbia includes hake, herring, octopus, Pacific cod, rockfish, and salmon (Spalding 1964, Olesiuk et al. 1990). In California and Oregon, Steller sea lion prey is known to include rockfish, hake, flatfish, salmon, herring, skates, cusk eel, lamprey, squid, and octopus (Fiscus and Baines 1966, Jameson and Kenyon 1977, Jones 1981, Treacy 1985, Brown et al. 2002), with the primary prey items being, in order of frequency of occurrence in scat, Pacific hake (in 78.6% of scat), Pacific salmon (28.6%), skate (23.4%), Pacific lamprey (20.8%), clupeid (herring, shad, sardine) species (18.7%) and rockfish (17.4%) (Riemer et al. 2010).

Steller sea lion diet includes commercially valuable fish species, and the WCGF fisheries target many of the same species found in Steller sea lion diet, especially hake (Pacific Whiting), rockfish, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). The Atlantis simulations described in Appendix A suggest that current levels of fishing are having impacts on the predominant prey of Steller sea lions (hake aka Pacific Whiting). Under case study 2, the unfished biomass of hake was projected to be 10.46 times higher, and under case study 3, the unfished biomass of hake was projected to be 1.94 times higher. Note in Appendix A, the impact of the WCGF fisheries on pinnipeds is simulated; however, Steller sea lions are the largest of the pinnipeds on the U.S. west coast and their diet is skewed towards larger fish relative to that shown in Table 1 of Appendix A where cephalopods (squid) are listed as comprising approximately 45% of pinniped diet and hake as ca. 20%. In contrast, hake are the dominant prey in Steller sea lion diet and cephalopods are much less common (Riemer et al. 2010). Thus the Altantis results for pinnipeds as a whole are not necessarily indicative of results for Steller sea lions.

The WCGF fisheries target important Steller sea lion prey and there exists the potential for fishery-induced prey depletion (as suggested by the Atlantis simulations in Appendix A). Quantifying the impact of fishery-induced prey depletion has been the object of much research in the western DPS (summarized in NMFS 2008). However, establishing direct links has proven to be very difficult. Nonetheless, the clear potential for impacts has led to the conclusion that the potential for impacts on Steller sea lions is high (NMFS 2008), and this has led to extensive regulations on fisheries operating within Steller sea lion foraging areas in the western DPS (which in contrast to the eastern DPS has been declining or, more recently, stable). Likewise, in the eastern DPS, establishing the effects of prey depletion on survival and fecundity of Steller sea lions is likely to be quite difficult, but these effects can reasonably be assumed to be present due to the spatial overlap of the fisheries with the species' foraging areas. Nonetheless, at current levels of fishing-induced prey depletion (to the extent that it is occurring), the Steller sea lion population in the eastern DPS has been increasing by 3% per year for approximately 20 years (Allen and Angliss 2011). This suggests that any fishing-induced prey depletion, at least over the last 20 years, has not prevented steady population increases in the eastern DPS.

Impact of WCGF fisheries on population growth rate

Because we have no way to quantify the effects of (possible) prey depletion on Steller sea lion population growth rate, we estimate the impact of WCFC fisheries on population growth rate based only on serious injuries and mortalities due to fisheries operations (reported by the fishery observer programs) and due to entanglements with fishing gear (estimated).

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = N_{min}* 0.5 R_{max} x F. The default recovery factor (F) for stocks listed as "threatened" under the Endangered Species Act (ESA) is 0.5 (Wade and Angliss 1997). However, in the 2011 stock assessments, the recovery factor was set at 0.75—midway between 0.5 (recovery factor for a "threatened" stock) and 1.0 (recovery factor for a stock within its optimal sustainable population level)—because the eastern DPS numbers have remained stable or have increased over the last 20 years. For the eastern Steller sea lion DPS, current (2010) N_{min} = 52,847 (Allen and Angliss 2011) and R_{max} is assumed to be 12% using the maximum theoretical pinniped net productivity rate. The result is a PBR of 2,378 animals (52,847 x 0.5 x 0.12 x 0.75). In comparison, the estimated total fishery takes over the 8-year period of 2002–2009 were 44 animals (= 5.5 animals per year), and the estimate for 2009 was between 7 to 45 animals (Figure 14).

The estimate of total fishing bycatch take (West Coast Groundfish fishery and At-Sea Hake fishery together) in 2009 was 17 (90% CI 7-45) (Figure 14; Table 7i, Jannot 2010). Our rough estimate of mortality related to entanglement in 2010 is 36. If the true level of take associated with fisheries is close to these estimates, this would suggest that mortality from bycatch and entanglement from the WCGF has a minor impact on the rate of population growth. For example, at the current estimated growth rate of 3.1% and 2010 N_{min} abundance (52,847), the population is growing at ~1,638 individuals annually. If one assumes that this would increase by a maximum of 81 individuals (17 from 2009 in in Figure 14 + 36 from 2010 in Table 10) in the absence of fishing, this translates into a population growth rate of ~3.3%. This is a difference of only 0.2%. This calculation assumes that all estimated estimated mortality from entanglement with fishing gear (Table 10) is due to the fishing gear from the WCGF fisheries, which is unlikely to be the case since other fisheries, recreational and commercial, also operate in the region.

Summary

Based on the information summarized above, we conclude that the West Coast Groundfish fisheries are imposing some minor additional (non-natural) mortality on Steller sea lions. However, the population has been increasing steadily, and the current estimated serious injuries and mortalities from the fishery are far below the PBR level. From this, we conclude that recent impacts from fishing are not substantially impacting the eastern DPS abundance as a whole. It should be kept in mind, however, that the southernmost portion of the eastern DPS has contracted, and the southernmost active rookery, at Año Nuevo Island, although apparently stable, is at a historically low population size. Population growth in the eastern DPS is due to population growth in the northern regions of the DPS (Allen and Angliss 2011).

Chapter 5: Fish

*Eulachon (*Thaleichthys pacificus*)*

General Biology

Eulachon, *Thaleichthys pacificus*, is an anadromous smelt in the family Osmeridae that ranges from northern California to the southeastern Bering Sea coast of Alaska (Hay and McCarter 2000, Willson et al. 2006, Moody and Pitcher 2010). Adult eulachon spawn in the lower portions of rivers that have prominent spring peak flow events or freshets, typically at age 2–5, when they are 160–250 mm in length (fork length) (Hay and McCarter 2000, Willson et al. 2006). Many rivers within the range of eulachon have consistent yearly spawning runs; however, eulachon may appear in other rivers only on an irregular or occasional basis (Hay and McCarter 2000, Willson et al. 2006). The spawning migration typically begins when river temperatures are between 0°C and 10°C, which usually occurs between December and June. Run timing and duration may vary interannually, and multiple runs occur in some rivers (Willson et al. 2006). Most eulachon are semelparous. Fecundity ranges from 7,000–60,000 eggs, which are approximately 1 mm in diameter. Milt and eggs are released over sand or coarse gravel. Eggs become adhesive after fertilization and hatch in 3 to 8 weeks depending on temperature. Newly hatched larvae are transparent, slender, and about 4 to 8 mm total length. Larvae are transported rapidly downstream by spring freshets to estuaries (Hay and McCarter 2000, Willson et al. 2006), and juveniles disperse onto the continental shelf within the first year of life (Hay and McCarter 2000, Gustafson et al. 2010). In research trawl surveys, most juvenile eulachon are taken at around 100 m depth in British Columbia (Hay and McCarter 2000) and between 137 and 147 m off the U.S. West Coast (defined as Washington, Oregon, and California) (see references in Gustafson et al. 2010). In the western Gulf of Alaska, eulachon (58 to 205 mm standard length) concentrate over the shelf in proximity to sea valleys (Wilson 2009) where, in contrast to other small neritic fishes, they feed almost exclusively on euphausiids (Wilson et al. 2009).

Marine Habitat Use

Although they spend 95–98% of their lives at sea (Hay and McCarter 2000), little is known concerning the marine existence of eulachon. They are reported to be present in the "food rich" and "echo scattering layer" of coastal waters (Barraclough 1964, p. 1,337), and "in near-benthic habitats in open marine waters" of the continental shelf between 20 and 150 m depth (Hay and McCarter 2000, p. 14). Hay and McCarter (2000, their Figure 5) mapped the offshore distribution of eulachon in British Columbia as determined in research trawl surveys, and indicated that most eulachon were taken at around 100 m depth, although some were taken as deep as 500 m and some at less than 10 m. Schweigert et al. (2007, p. 11) stated that "the marine distribution of adults in British Columbia includes the deeper portions of the continental shelf … generally at depths of 80–200 m." Smith and Saalfeld (1955, p. 12) reported the occasional capture of eulachon in the offshore "otter trawl fishery," particularly in November to January near the mouth of the Columbia River "as the mature smelt approach the Columbia River." Emmett et al. (2001) reported the capture of small numbers of eulachon by nighttime surface trawls targeting pelagic fishes off the Columbia River in April to July of 1998 and 1999. About

10% of hauls in 1999 contained between one and eight eulachon (Emmett et al. 2001). Eulachon also occur as bycatch in some U.S.-based groundfish fisheries (Bellman et al. 2011) off the U.S. West Coast and more commonly in the California and Oregon ocean shrimp (*Pandalus jordani*) fisheries (NWFSC 2008, Bellman et al. 2011). Eulachon are not an actively managed or monitored species (PFMC 2008); therefore, there is a paucity of data on at-sea distribution of eulachon off the U.S. West Coast.

Fishery-independent surveys conducted off the U.S. West Coast that provide data on distribution or abundance of eulachon in the ocean are very limited (Gustafson et al. 2010, their Table A-4). The Northwest and Alaska Fisheries Center (NWAFC, before it split into NWFSC and Alaska Fisheries Science Center (AFSC)) and AFSC conducted groundfish trawl surveys on the continental slope (at depths of 184–1,280 m) periodically from 1984 to 1987 and annually beginning in 1988. Continental shelf (at depths of 55–183 m) surveys were conducted triennially from 1977 to 2001 by the NWAFC and AFSC. The NWFSC assumed responsibility for the slope portion of the groundfish survey starting in 1998 and expanded the depth coverage to include the continental shelf as well as the continental slope in 2003. These groundfish surveys report landings from one of five International North Pacific Fisheries Commission (INPFC) statistical areas. These INPFC areas from north to south are: (1) Vancouver (U.S.-Canada border to 47°30′N latitude); (2) Columbia (47°30′ to 43°00′N latitude); (3) Eureka (43°00′ to 40°30′N latitude); (4) Monterey (40°30′ to 36°00′N latitude); and (5) Conception (36°00′N latitude to the U.S.-Mexico border).

Eulachon were reported in the triennial groundfish bottom trawl surveys on the U.S. West Coast continental shelf in 1977 (Gabriel and Tyler 1980), 1980 (Coleman 1986), 1983 (Weinberg et al. 1984), 1986 (Coleman 1988), 1989 (Weinberg et al. 1994a, 1994b), 1992 (Zimmermann 1994, Zimmermann et al. 1994), 1995 (Wilkins 1998, Wilkins et al. 1998), 1998 (Shaw et al. 2000, Wilkins and Shaw 2000), and 2001 (Weinberg et al. 2002, Wilkins and Weinberg 2002) (Gustafson et al. 2010, their Table A-4). These surveys targeted rockfish from 1977 to 1986, and they were subsequently designed to estimate Pacific hake (*Merluccius productus*) and juvenile sablefish (*Anoplopoma fimbria*) abundance, as well as other commercially important groundfish (Weinberg et al. 1994a). However, these groundfish surveys were designed to sample bottom dwelling species and capture only a small and erratic portion of the distribution of eulachon.

The 1977 shelf groundfish survey recorded eulachon in six of nine assemblages off the Washington and Oregon coasts, being most abundant within the Nestucca Intermediate Assemblage (90–145 m) off Oregon (Gabriel and Tyler 1980). Trawl surveys in 1980–1986 occurred between Monterey Bay, California, and either Northern Vancouver Island (1980), Estevan Point, Vancouver Island (1983), or the U.S.-Canada border (1986) at depths of 55–366 m (Coleman 1986, 1988, Weinberg et al. 1984). From 1989 to 2001, triennial groundfish bottom trawl surveys covered all West Coast INPFC areas from Vancouver to Monterey, inclusive. In 1980, eulachon were recorded as the fifteenth most common fish encountered at depths of 55–183 m in the INPFC Eureka area, but they were not recorded within the top 20 species encountered in the INPFC Vancouver, Columbia, or Monterey areas (Coleman 1986). Latitudinal and longitudinal range and minimum, maximum, and mean depth distribution of eulachon captured in the triennial surveys from 1989 to 2001 are provided in Gustafson et al. (2010, their

Table A-4). Eulachon were found into the far south Monterey INPFC area in the 1989 survey but were not recorded in either the Monterey or Eureka INPFC areas in surveys conducted between 1992 and 2001. Mean depth of occurrence of eulachon in these surveys varied between 137 and 147 m, with minimum depths of 59–79 m and maximum depths of 322–466 m (Gustafson et al. 2010, their Table A-4).

Eulachon were occasionally sampled in West Coast upper continental slope groundfish trawl surveys conducted between 1984 and 1999 by the NWAFC and AFSC (Raymore and Weinberg 1990, Parks et al. 1993, Lauth et al. 1997, Lauth 1997a, 1997b, 1999, 2000) and between 1999 and 2002 by the NWFSC (Builder Ramsey et al. 2002, Keller et al. 2005, 2006a, 2006b). These surveys covered habitat between 183 and 1,280 m from the U.S.-Canada border to 30°30′N latitude (Lauth et al. 1997, Lauth 1997a, 1997b, 1999, 2000, Keller et al. 2005, 2006a, 2006b), although annual surveys prior to 1997 covered only a portion of the area each year (Gustafson et al. 2010, their Table A-4). Minimum, maximum, and mean depths of eulachon captured during the 1989–2002 survey years are given in Gustafson et al. (2010, their Table A-4); however, eulachon were seldom encountered at these depths (below 183 m) and their reported occurrence in trawl hauls ranged from 6% of trawls conducted between 1989 and 1993 to fewer than 1% of all trawls in 2001. Presumably, eulachon were not encountered during the NWFSC 1999 bottom survey of the U.S. West Coast continental slope, as this species is not included in the comprehensive list of species encountered (Builder Ramsey et al. 2002). Eulachon were captured as deep as 608 m during the 2001 survey (Keller et al. 2005).

Starting in 2003, the NWFSC conducted combined slope and shelf surveys for groundfish between depths of 55 and 1,280 m (Keller et al. 2007a, 2007b, 2008) off the U.S. West Coast (Gustafson et al. 2010, their Table A-4). Sampling in these slope and shelf surveys, in contrast to the NWAFC and AFSC triennial bottom trawl surveys (discussed above), did not extend into the Canadian portion of the Vancouver INPFC area where the triennial surveys had encountered the majority of eulachon. Eulachon were found at depth extremes of 51 to 237 m in the NWFSC surveys, with mean depths of 119 to 130 m during the three survey years (Gustafson et al. 2010, their Table A-4) (Keller et al. 2007a, 2007b, 2008); however, eulachon biomass estimates were not presented in these survey documents. Some eulachon were found as far south as 34°N in the INPFC Conception area in 2003 and 2004 (Keller et al. 2007a, 2007b), a southern distribution that had not been recorded in groundfish surveys since 1989 (Weinberg et al. 1994a) (Gustafson et al. 2010, their Table A-4). Pacific hake trawl surveys in U.S. and Canadian waters off the Pacific Coast have also reported incidental catch of eulachon (Fleischer et al. 2005, 2008), although details on catch location were not provided.

The at-sea distribution of eulachon as encountered as bycatch in the West Coast ocean shrimp (aka, pink shrimp) fishery were mapped in Bellman et al. (2011, their fig. 6). Furthermore, Bellman et al. (2011) showed that eulachon were most likely to be encountered as bycatch in tows observed by West Coast Groundfish Observer Program (WCGOP) fisheries from about 91–183 m in depth, although the greatest numbers of eulachon were caught between about 110 and 155 m depth.

Status

Listing status/history

On 27 November 2007, the National Marine Fisheries Service (NMFS) received a petition (Cowlitz Indian Tribe 2007) seeking to list southern eulachon (*Thaleichthys pacificus*) as a threatened or endangered species under the Endangered Species Act (ESA) of 1973. NMFS determined that the 27 November 2007 petition did present substantial scientific and commercial information, or cited such information in other sources, that the petitioned action may be warranted; subsequently, NMFS initiated a status review of eulachon in Washington, Oregon, and California and formed the Eulachon Biological Review Team (BRT)—consisting of scientists from the Northwest Fisheries Science Center, Alaska Fisheries Science Center, Southwest Fisheries Science Center, U.S. Fish and Wildlife Service, and U.S. Forest Service. The BRT determined that eulachon spawning in Washington, Oregon, and California rivers are part of a DPS, composed of numerous sub-populations, that extends beyond the conterminous United States and that the northern boundary of the DPS occurs in northern British Columbia south of the Nass River (most likely) or in southern British Columbia north of the Fraser River (less likely). The BRT found it difficult to establish a clear northern terrestrial or river boundary for this DPS in light of the fact that the BRT believed the northern boundary to be determined by oceanographic processes (Gustafson et al. 2010). NMFS (2010) listed the southern DPS of eulachon—consisting of sub-populations spawning in rivers south of the Nass River in British Columbia, Canada, to, and including, the Mad River in California—as threatened. This listing became effective on 17 May 2010.

Abundance and trends

Although eulachon populations have been exploited for centuries, the historically high abundance of the resource and its low commercial value resulted in limited regulation of past commercial and recreational fisheries, limited recording of past catches, and until recently, a lack of assessment surveys of spawning abundance. Spawning stock biomass (SSB) has been estimated since 1995 for the Fraser River subpopulation, but earlier population sizes in the Fraser and abundance of most other subpopulations can only be inferred from catch statistics and anecdotal information. This lack of fishery-independent surveys makes it very difficult to quantify trends in eulachon abundance. Inferring population status or even trends from yearly changes in catch statistics requires assumptions that are seldom met, including similar fishing effort and efficiency, assumptions about the relationship of the harvested portion to the total portion of the stock, and statistical assumptions, such as random sampling. However, in many parts of the DPS, catch statistics provide the only available quantitative data source that defines the relative abundance of eulachon. Although the magnitude of past commercial fisheries landings in the Columbia River and its tributaries establish that this basin once supported the largest eulachon run in the world (Hay and McCarter 2000), scientific estimates of SSB or number of spawning fish are unavailable.

The Fraser River SSB is the longest running (since 1995) fisheries-independent abundance estimator of spawning biomass for any subpopulation in the DPS. The SSB is generated from counts of eggs and larvae in plankton tows, combined with river discharge rates, sex ratio, and relative fecundity (eggs produced per gram of eulachon) to estimate metric tons of spawning adults (Hay et al. 2002). Spawner biomass for the 2010 eulachon run in the Fraser River was estimated at 4 mt (data and methodology online at: [http://www.pac.dfo-mpo.gc.ca/sci/herring/herspawn/pages/river1_e.htm]) (see Gustafson et al. 2010, their fig. 28). Over the most recent three-generation time of approximately 10 years, these data indicate that the overall biomass of the Fraser River eulachon population has declined by over 97% (2000, 130 t; 2010, 4 t). Given mean weight estimates of Fraser River eulachon (40.6 g; Hay et al. [2002]), these biomass declines represent a reduction in the number of adult eulachon spawning in the Fraser River from about 3.2 million to less than 100,000 over the past ten years. The Fraser River eulachon spawner abundance trend over the time period of the available data (1995–2010) shows a trend of 0.75 (95% CI = 0.66–0.84), indicative of a downward trend in population abundance.

Two fisheries-independent indices of juvenile biomass were available that indicate status of current offshore stock mixtures: (1) a West Coast Vancouver Island eulachon biomass index, and (2) a Queen Charlotte Sound eulachon biomass index (see Gustafson et al. 2011, their fig. 4). The biomass indices of juvenile eulachon in the above two offshore surveys are one to two orders of magnitude greater than known or suspected freshwater eulachon spawning stock biomass in the DPS. The reasons for this apparent discrepancy are not fully understood; however, (1) these offshore estimates are "indices" based on bycatch of eulachon in fishery-independent shrimp trawl surveys and not absolute biomass estimates; (2) production from two or more year classes of eulachon are incorporated into the index estimates; and (3) these two (or more) cohorts (age 1+, age 2+, etc.) may experience substantial mortality prior to their freshwater spawning migration. Although biomass estimates of eulachon off the U.S. West Coast, as estimated from the AFSC triennial groundfish bottom trawl surveys on the continental shelf (55–500 m), have been published for 1995, 1998, and 2001 (see Gustafson et al. 2010), data for eulachon from more recent fisheries-independent surveys in this area not available at this time. As mentioned above, these groundfish surveys were designed to sample bottom dwelling species and capture only a small and erratic portion of the distribution of eulachon.

Threats

In 2008, the Eulachon BRT quantitatively ranked the severity of each of 16 potential threats to eulachon as either very low, low, moderate, high, or very high in four sub-areas (Klamath, Columbia, Fraser, and other British Columbia rivers) of the southern DPS of eulachon (see details in Gustafson et al. 2010). Results of this qualitative threats assessment indicated that climate change impacts on ocean conditions was the most serious threat to persistence of eulachon in all areas of the DPS. Climate change impacts on freshwater habitat and eulachon bycatch in offshore shrimp trawl fisheries were also ranked among the top four threats in all areas of the DPS. Dams and water diversions in the Klamath and Columbia rivers and predation impacts on the Fraser and British Columbia coastal river subpopulations filled out the last of the top four threats. Summaries of the impacts of these major threats to eulachon are presented in detail in the status review (Gustafson et al. 2010).

Critical habitat

NMFS (2011) has proposed to designate approximately 470 km (292 mi) of riverine and estuarine habitat occupied by the southern DPS of eulachon in California, Oregon, and Washington as critical spawning, incubation, and migratory habitat. However, due to lack of knowledge, critical nearshore and offshore ocean habitat has not been proposed. NMFS (2011, p. 522) stated that:

> Nearshore and offshore marine foraging habitat is essential for juvenile eulachon to survive and grow to adulthood, and for adults to survive and reproduce. At this time we have little information on eulachon distribution in marine waters and no information on where eulachon foraging habitat might occur. For these reasons, we are unable to identify any specific areas in marine waters that meet the definition of critical habitat under the ESA. Although we cannot presently identify any specific marine areas where foraging takes place, we will continue to gather information and will consider revising the designation in future rulemaking if new information supports doing so.

Fishery impacts

Recent groundfish fishery eulachon bycatch

Several recent reports (NWFSC 2008, 2009a, 2009b, 2010a, 2010b; Bellman et al. 2008, 2009, 2010, 2011) provide data on estimated bycatch of eulachon in U.S. West Coast commercial fisheries, which were derived from the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP). Eulachon were observed as bycatch in the: (1) limited entry bottom trawl fishery; (2) at-sea Pacific hake/whiting mothership fishery; (3) at-sea Pacific hake/whiting tribal mothership fishery; (4) at-sea Pacific hake/whiting catcher-processor fishery; and (5) Oregon and California commercial shrimp trawl fishery (Bellman et al. 2011) (Table 14, Table 15, and Table 16). Bellman et al. (2011) provided estimated bycatch of eulachon from 2002–2009 as number of individual fish in the limited entry groundfish trawl and at-sea Pacific hake fisheries, and these data are copied from Bellman et al. (2011, p. 25) as Table 16.

Within the limited entry bottom trawl fishery, observer data (Table 14, Table 15, and Table 16), indicates that eulachon were rarely, or not all, encountered in the Washington and California portions of this fishery from 2002 to 2009. More eulachon encounters occurred in the Oregon portion of the limited entry bottom trawl fishery; however, total estimated bycatch from 2002 to 2009 was estimated at 1,009 total individual eulachon (Table 15). Bycatch in the Oregon limited entry bottom trawl fishery occurred in four of the eight observed years, with no bycatch occurring in 2004, 2005, 2006, or 2008 (Table 15). Bycatch in this fishery appears to be driven by both eulachon distribution and cyclic abundance. Peak yearly bycatch (819 eulachon) occurred in the Oregon portion of the limited entry bottom trawl fishery in 2002, which is also the year of recent peak abundance in the West Coast Vancouver Island offshore eulachon biomass index (Gustafson et al. 2010, their fig. 16). Landings in the Columbia River commercial fishery (Gustafson et al. 2010, their fig. 22) and estimates of eulachon larvae/m^3 in the Columbia River (Gustafson et al. 2010, their fig. 26) peaked in 2003, which is also consistent with high offshore abundance of eulachon during 2002.

The offshore fishery for Pacific hake occurs along the coasts of northern California, Oregon, and Washington from April–November. The fishery is conducted almost exclusively with mid-water trawls over bottom depths of 100–500 m. Bellman et al. (2011, p. 13) noted that eulachon in the at-sea hake groundfish fishery appear: "… to be encountered as bycatch in the catcher processor sector of the fishery more than other sectors [see Table 3, herein]. The highest eulachon bycatch in this mid-water trawl fishery was in 2006 with 145 individuals. In contrast, no eulachon were observed as bycatch in the bottom trawl fishery during 2006."

Based on the overall magnitude of bycatch in the limited entry trawl and at-sea hake fisheries, there is limited interaction with eulachon, especially in comparison to the commercial ocean shrimp trawl fishery. The Oregon commercial ocean shrimp trawl fishery had by far the largest amounts of eulachon bycatch (Bellman et al. 2011), and as this is not technically a groundfish fishery these data are discussed separately below in the "Other sources and levels of human caused mortality" section.

Probability of undocumented bycatch

It is uncertain if all observed smelt (family Osmeridae) bycatch in the limited entry bottom trawl and at-sea Pacific hake/whiting fisheries have always been identified to the species level. Due to sampling conditions and time constraints, it is likely that some portion of observed eulachon bycatch may have been recorded as "other non-groundfish," especially in the early years of the two observer programs. However, based on the reportage of eulachon as bycatch, starting in 2002 when the observer programs first began in the limited entry groundfish trawl and at-sea Pacific hake fisheries (Bellman et al 2011), and the overall limited interaction of these fisheries with eulachon, the likelihood that significant numbers of eulachon were included in the "other non-groundfish" category is small.

Table 14: Copied from Table 6 of Bellman et al. (2011). WCGOP coverage rates, number of eulachon observed, and eulachon bycatch ratios from limited entry bottom trawl vessels landing in Washington, Oregon, and California from 2002–2009. Coverage rates were computed as the proportion of FMP groundfish landings that were observed (see NWFSC 2010a for more details). Bycatch ratios were calculated for each state of landing and season as the observed catch of eulachon (in numbers) divided by the observed weight (mt) of retained groundfish (except Pacific hake). Winter season is January–April and November–December and summer season is May–October.

		Washington			Oregon			California		
Year	Season	Coverage rate	Number observed	Bycatch ratio	Coverag e rate	Number observed	Bycatch ratio	Coverag e rate	Number observed	Bycatch ratio
2002	winter	23%	0	0	14%	78	0.1289	12%	0	0
	summer	5%	0	0	15%	39	0.0735	13%	0	0
2003	winter	10%	0	0	19%	10	0.0111	11%	0	0
	summer	9%	0	0	12%	0	0	14%	0	0
2004	winter	39%	0	0	27%	0	0	33%	0	0
	summer	20%	0	0	19%	0	0	21%	1	0.0013
2005	winter	17%	0	0	26%	0	0	20%	0	0
	summer	21%	0	0	22%	0	0	19%	0	0
2006	winter	18%	0	0	20%	0	0	19%	0	0
	summer	23%	0	0	18%	0	0	20%	0	0
2007	winter	24%	0	0	14%	0	0	18%	0	0
	summer	7%	0	0	18%	13	0.0110	19%	0	0
2008	winter	2%	0	0	18%	0	0	18%	0	0
	summer	35%	0	0	24%	0	0	19%	0	0
2009	winter	26%	0	0	24%	0	0	19%	0	0
	summer	31%	0	0	24%	16	0.0084	18%	0	0

Table 15: Copied from Table 7 of Bellman et al. (2011). Total estimated seasonal bycatch of eulachon by state in the limited entry bottom trawl fishery from 2002–2009. Winter season is January–April and November–December and summer season is May–October.

		Estimated eulachon bycatch (number of individual fish)			
Year	**Season**	**Washington**	**Oregon**	**California**	**Total U.S. West Coast**
2002	winter	0	552	0	552
	summer	0	267	0	267
2003	winter	0	51	0	51
	summer	0	0	0	0
2004	winter	0	0	0	0
	summer	0	0	4	4
2005	winter	0	0	0	0
	summer	0	0	0	0
2006	winter	0	0	0	0
	summer	0	0	0	0
2007	winter	0	0	0	0
	summer	0	72	0	72
2008	winter	0	0	0	0
	summer	0	0	0	0
2009	winter	0	0	0	0
	summer	0	67	0	67

Table 16: Estimated yearly bycatch of eulachon (number of individual fish) in the limited entry bottom trawl fishery observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) from 2002–2009. Data copied from Table 10 of Bellman et al. (2011, p. 25).

	Limited Entry Trawl			At-Sea Hake			
Year	**WA**	**OR**	**CA**	**Tribal Mothership**	**Non-tribal Mothership**	**Catcher Processor**	**Total eulachon**
2002	0	819	0	0	0	0	819
2003	0	51	0	0	0	0	51
2004	0	0	4	0	0	0	4
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	145	145
2007	0	72	0	0	4	6	82
2008	0	0	0	0	6	37	43
2009	0	67	0	32	6	30	135

Other Sources and Levels of Human Caused Mortality

The eulachon status review evaluated the potential roles that 16 current threats may play in the decline of the southern DPS of eulachon (Gustafson et al. 2010). The BRT ranked climate change impacts on ocean conditions as the most serious threat to persistence of eulachon in all four subareas of the DPS: Klamath River, Columbia River, Fraser River, and British Columbia coastal rivers south of the Nass River. Climate change impacts on freshwater habitat and eulachon bycatch in offshore shrimp fisheries were also ranked in the top four threats in all subareas of the DPS. Dams and water diversions in the Klamath and Columbia rivers and predation in the Fraser and British Columbia coastal rivers filled out the last of the top four threats. Most human impacts on eulachon involve habitat alteration, and in the case of eulachon, these impacts have not been quantified, and comparisons of these threats with the impact of WCGF fisheries on eulachon are difficult. However, other fishery impacts are quantifiable, and where data are available, these sources of human caused mortality are reviewed.

Bycatch in shrimp trawl fisheries

Eulachon occur as bycatch in shrimp trawl fisheries off the coasts of Washington, Oregon, and California, (NWFSC 2008, 2009a, 2010b). Offshore trawl fisheries for ocean shrimp (*Pandalus jordani*) occur from the west coast of Vancouver Island to the U.S. West Coast off Cape Mendocino, California (Hannah and Jones 2003). *Pandalus jordani* is known as the ocean pink shrimp or smooth pink shrimp in Washington, simply pink shrimp in Oregon, and Pacific ocean shrimp in California. Herein we use the common name "ocean shrimp" in reference to *P. jordani,* as suggested by the American Fisheries Society (see Gustafson et al. 2010).

Prior to the mandated use of bycatch reduction devices (BRDs) in the ocean shrimp fishery, 32–61% of the total catch in the ocean shrimp fishery consisted of nonshrimp biomass, including various species of smelt (Hannah and Jones 2007). Beginning in 2003 in Washington, Oregon, and California, mandated use of BRDs in offshore shrimp trawl fisheries has substantially reduced bycatch of fin fish in these fisheries (Hannah and Jones 2007, Frimodig 2008). Reducing bycatch in this fishery has been an active field of research (Hannah et al. 1996, 2003, 2011; Hannah and Jones 2007; Frimodig 2008), and great progress has been made in reducing bycatch, particularly of larger-bodied fishes. As of 2005, following required implementation of BRDs, the total bycatch by weight had been reduced to about 7.5% of the total catch, and osmerid smelt bycatch was reduced to an estimated average of 0.73% of the total catch across all BRD types (Hannah and Jones 2007).

Based on WCGOP data in NWFSC (2008, its Table 3), observed eulachon bycatch in the Oregon and California ocean shrimp trawl fishery in the combined years of 2004, 2005, and 2007 was calculated to be 0.0005 and 0.0002, respectively. These bycatch ratios were calculated by dividing the observed total catch weight in mt of eulachon by the observed retained weight of ocean shrimp provided in NWFSC (2008, its Table 3). However, NWFSC (2008, its Table 6) provided a different estimate of the eulachon bycatch ratio for 2004, 2005, and 2007 in the

Oregon fishery, 0.0018 (SE = 0.0030), but a similar bycatch ratio to that estimated above for the California fishery; 0.0002 (SE = 0.0011).

Based on the above calculated bycatch ratios from NWFSC (2008, its Table 3), the estimated biomass of eulachon taken as bycatch in the Oregon and California ocean shrimp fisheries for the combined years 2004, 2005, and 2007 was calculated at about 10.9 and 0.43 mt, respectively—based on applying these ratios to the total ocean shrimp catches in those three years of 21,809 mt (48,080,482 lbs) in the Oregon trawl fishery and 2,136 mt (4,709,460 lbs) in the California trawl fishery. Similar application of the eulachon bycatch ratio in the Oregon trawl fishery of 0.0018 for these three years from NWFSC (2008, its Table 6) gave an estimated biomass of eulachon taken as bycatch of 39.3 mt.

NWFSC (2008, p. 24) calculated a eulachon bycatch rate of 0.0004 (SE = 0.0030) in the 2007 ocean shrimp trawl fishery north of 40°10′N latitude. Bellman et al. (2008, p. 38) used the ratio from NWFSC (2008) and total fleet landings of pink shrimp (mt, based on fish tickets) to calculate a bycatch of 4.7 mt of eulachon in the pink shrimp fishery north of 40°10′N latitude in 2007. The depressed abundance of the southern DPS of eulachon may be contributing to the above estimated levels of eulachon bycatch.

The eulachon bycatch rate in the ocean shrimp fishery with BRDs installed north of 40°10′N latitude was 0.0008 (SE = 0.0008) in 2008 and 0.0008 (SE = 0.0010) in 2009 (NWFSC 2009a, 2010b; Bellman et al. 2010). Given landings of ocean shrimp north of 40°10′N latitude (15,364 mt; NWFSC 2009a, its Table 1), there was a reported total bycatch in this fishery of 12.1 mt of eulachon in 2008 (Bellman et al. 2009, their Table 15). Bellman et al. (2010, their Table 7) estimated that the total bycatch of eulachon in the ocean shrimp trawl fishery north of 40°10'N latitude in 2009 was 10.8 mt.

Bellman et al. (2011) provided estimates of the number of individual eulachon caught in the Oregon and California ocean shrimp (aka, pink shrimp) trawl fishery as bycatch from 2004 to 2009 derived from WCGOP data (Table 17). Although "the WCGOP began coverage of Washington pink shrimp licenses in 2010, with the same criteria used for Oregon and California State pink shrimp coverage," these data are not yet available (Bellman et al. 2011). According to Bellman et al. (2011, p. 13):

> The largest amounts of eulachon bycatch were estimated in the Oregon pink shrimp trawl fishery. The largest estimate of eulachon bycatch occurred in 2009, when 861,888 individuals were estimated to have been caught [see Table **17** herein]. In 2009, the largest numbers of eulachon (63,174 individuals) were observed in the fishery, though fleet-wide landings were down slightly from the prior year [see Table **17** herein]. The lowest number of eulachon observed was in 2004 (11,290 individuals). … Fleet-wide pink shrimp landings in the California pink shrimp fishery are much lower than in the Oregon fishery [Table **17** herein] and eulachon bycatch is also lower. The range of eulachon bycatch in California extends from the highest number of eulachon individuals observed in 2008 (5,907 individuals), down to zero eulachon observed in 2005 and 2009.

The distribution and severity of eulachon bycatch encounters in the West Coast ocean shrimp (aka, pink shrimp) fishery were mapped in Bellman et al. (2011, their fig. 6). Furthermore, Bellman et al. (2011) showed that eulachon were most likely to be encountered as bycatch in shrimp tows observed by WCGOP fisheries from about 91–183 m in depth, although the greatest numbers of eulachon were caught between about 110 and 155 m depth.

Comparison of the three years (2007–2009) when estimates of the metric tonnage (Table 18) and the number of individual eulachon (Table 17) observed as bycatch in the ocean shrimp trawl fisheries north of 40°10´N latitude were available, indicates that the average weight of observed eulachon was 19.7, 23.9, and 10.3 g in 2007, 2008, and 2009, respectively. Thus, even though many more individual eulachon were observed in 2009 (over 63,000), than in 2008 (about 28,500), the weight of retained eulachon was larger in 2008 (0.68 mt) than in 2009 (0.65 mt) (Table 17 and Table 18). Eulachon at sea consist of a number of year classes (at least age 1+ and age 2+), and these data may indicate that a large portion of the eulachon bycatch observed in the ocean shrimp trawl fishery in 2009 consisted of the smaller age 1+ cohort than was present in 2008.

Degree of observer coverage

Unfortunately, no data are available yet on the level of eulachon bycatch in the Washington State ocean shrimp trawl fishery (Bellman et al. 2011). WCGOP began coverage of Washington pink shrimp licenses in 2010, but these data are not yet available. In Oregon and California, observer coverage in shrimp trawl fisheries has ranged from a low of 4% (2005) to a high of 7% (2007, 2009) of total ocean shrimp landings (Table 18). No ocean shrimp trawl fishery landings were observed in 2006.

Probability of undocumented eulachon bycatch in shrimp trawl fisheries

Due to sampling conditions and time constraints, not all smelt were identified to the species level in the Oregon and California ocean shrimp trawl fishery observer database in 2004, 2005, and 2007 (NWFSC 2008), and thus, a portion of the bycatch in these fisheries was recorded as "unidentified smelt." Observed biomass of unidentified smelt occurring as bycatch in the Oregon and California ocean shrimp trawl fisheries was reported as 5.6 and 0.02 mt, respectively, across the 3 years with observer data—2004, 2005, and 2007 (NWFSC 2008, its Table 3). Based on WCGOP data in NWFSC (2008, its Table 3), unidentified smelt bycatch in the Oregon and California ocean shrimp trawl fishery in the combined years of 2004, 2005, and 2007 was calculated to be 0.0032 and 0.0002, respectively. These bycatch ratios were calculated by dividing the observed total catch weight in mt of unidentified smelt by the observed retained weight of ocean shrimp. Based on the above calculated bycatch ratios from data in NWFSC (2008, its Table 3), the estimated biomass of unidentified smelt taken as bycatch in the Oregon and California ocean shrimp fisheries for the combined years 2004, 2005, and 2007 was calculated at about 69.8 and 0.4 mt, respectively—based on applying these ratios to the total ocean shrimp catches in those three combined years of 21,809 mt (48,080,482 lbs) in the Oregon trawl fishery and 2,136 mt (4,709,460 lbs) in the California trawl fishery. Based on the portion of the observed smelt bycatch biomass that was identified to species in the Oregon ocean shrimp fishery by the WCGOP (NWFSC 2008), the unidentified smelt biomass was likely about 60% eulachon. Thus, across the years 2004, 2005, and 2007, a sum total of the unidentified biomass of smelt that may have been eulachon was about 41.9 mt in the Oregon trawl fishery and 0.026 mt in the California trawl fishery.

Table 17: Bycatch of eulachon observed by the WCGOP from 2002–2009 in the Oregon and California pink shrimp trawl fisheries (modified from Bellman et al. [2011, their Table 8]). Ocean shrimp fisheries were not observed in 2006. Number of eulachon observed, observed pink shrimp landings, ratio of eulachon bycatch as reported in Bellman et al. (2011, their Table 8), ratio of eulachon bycatch as calculated from data in Bellman et al. (2011, their Table 8), and total pink shrimp landings (mt).

State Year	Number of eulachon observed	Observed pink shrimp landings (mt)	Calculated eulachon bycatch ratio (eulachon/shrimp)	Eulachon bycatch ratio reported in Bellman et al. (2011, Table 8)	Total pink shrimp landings (mt)	Calculated number of eulachon as bycatch	Number of eulachon as bycatch reported in Bellman et al. (2011, Table 10)
Oregon							
2004	11,290	427	26.4403	26.4692	5,537	146,400	146,560
2005	11,668	403	28.9529	28.9635	7,159	207,273	207,362
2006	--	--	--	--	5,532	--	--
2007	14,084	650	21.6677	21.6689	9,129	197,804	197,807
2008	22,633	672	33.6801	33.6566	11,576	389,880	389,604
2009	63,174	737	85.7178	85.7712	10,049	861,378	861,888
California							
2004	350	91	3.8462	3.8677	997	3,835	3,845
2005	0	22	0.0000	0.0000	861	0	0
2006	--	--	--	--	64	--	--
2007	977	23	42.4783	43.0944	289	12,276	12,456
2008	5,907	133	44.4135	44.3267	945	41,971	41,910
2009	0	130	0.0000	0.0000	1,184	0	0

Table 18: Estimated bycatch of eulachon (metric tons) in ocean shrimp trawl fisheries north of 40°10´N latitude observed by the West Coast Groundfish Observer Program (WCGOP) from 2004–2009. Ocean shrimp fisheries were not observed in 2006.

Year	Percent of total ocean shrimp landings observed	Eulachon observed (mt)	Ocean shrimp observed (mt)	Eulachon bycatch ratio (mt eulachon/mt shrimp)	SE of bycatch ratio	Total trawl fishery ocean shrimp landings (mt)	Calculated total eulachon bycatch (mt)	Reported total eulachon bycatch (mt)
2004 [a]	6%	N/A	533	N/A	N/A	8,706	N/A	N/A
2005 [a]	4%	N/A	448	N/A	N/A	10,687	N/A	N/A
2006	--	--	--	--	--	--	--	--
2007 [a]	7%	0.297	749	0.0004	0.0030	10,935	4.4	4.7 [d]
2004, 2005, 2007 [a]	--	0.842	1,766	0.0005	--	30,328	15.2	--
2008 [b]	6%	0.683	901	0.0008	0.0008	15,364	12.3	12.1 [e]
2009 [c]	7%	0.651	985	0.0008	0.0010	14,412	11.5	10.8 [f]

a – NWFSC (2008, its Tables 2, 3), b – NWFSC (2009a, its Table 2), c – NWFSC (2010b, its Table 2), d – Bellman et al. (2008, their Table 7), e – Bellman et al. (2009, their Table 15), f – Bellman et al. (2010, their Table 16).

Estimated future mortality based on projected changes from baseline (in effort and gear composition, as estimated above)

Beginning in 2003, in Washington, Oregon, and California, mandated use of BRDs in offshore shrimp trawl fisheries has substantially reduced bycatch of fin fish in these fisheries (Hannah and Jones 2007, Frimodig 2008). In December 2010, the Oregon Fish and Wildlife Commission mandated smaller spacing between the bars of bycatch reduction device (BRD) grates to reduce bycatch of eulachon in the Oregon ocean shrimp trawl fishery. The maximum bar spacing will be one-inch during the 2011 season (April 1 –October 31) and ¾-inches in the 2012 season (Hannah and Jones 2011; see Oregon Administrative Rules for Commercial Shellfish Fishery online at: [http://www.dfw.state.or.us/OARs/05.pdf]). Hannah and Jones (2011, p. 9) stated that their "data analysis showed that eulachon catch was about 16% less using the ¾" rigid-grate than with the 1.0 [inch] version, both by number and weight."

Collateral BRD mortality

Although data on survivability of BRDs by small pelagic fishes, such as eulachon, are scarce, many studies on other fishes indicate that "among some species groups, such as small-sized pelagic fish, mortality may be high" and "the smallest escapees often appear the most vulnerable" (Suuronen 2005, p. 13–14). Results of several studies have shown a direct relationship between length and survival of fish escaping trawl nets, either with or without deflecting grids (Sangster et al. 1996, Suuronen et al. 1996, Ingólfsson et al. 2007), indicating that smaller fish with their poorer swimming ability and endurance may be more likely to suffer greater injury and stress during their escape from trawl gear than larger fish (Broadhurst et al. 2006, Ingólfsson et al. 2007). It is difficult to evaluate the true effectiveness of BRDs or impact of the ocean shrimp trawl fisheries on eulachon mortality without knowing the survival rate of fish that are deflected by BRDs and escape the trawl net (Broadhurst 2000, Suuronen 2005, Broadhurst et al. 2006).

Commercial, recreational, and indigenous fisheries

Eulachon have been commercially harvested in the Columbia River since the late 1860s, and commercial landing records began in 1888 (see Gustafson et al. 2010). A large recreational dipnet fishery that occurs almost exclusively in Columbia River tributaries, and for which catch records are unavailable, has existed in concert with commercial fisheries (Gustafson et al. 2010). The eulachon commercial fishery in the Columbia River continued to operate in the 2009–2010 season. According to JCRMS (2011, p. 28):

> For the 2009–2010 season, the mainstem Columbia River was open (seven days a week) in December 2009, then scheduled to be open under Level One protocol during January 1 through March 31, 2010. … The 2010

> season consisted of two weekly fishing periods in Zones 1–5. The periods were seven hours each from 7 AM to 2 PM on Mondays and Thursdays. By late February, catch had been estimated at 3,600 pounds with peak landings occurring on January 21, and no catch had been reported since February 11. On March 8 the Compact met and closed the mainstem commercial fishery effective March 11, prior to the scheduled closure date of March 31. Cumulative landings and commercial CPUE indicated the eulachon return was smaller than previously expected. … No landings were made from commercial tributary fisheries in 2010.

According to JCRMS (2011, p. 29), "no catch or effort … [was] observed or reported" in mainstem Columbia River recreational eulachon fisheries during the 2010 season. JCRMS (2011, p. 29) also stated that:

> Under Level One fishery guidelines, the only Washington tributary open was the Cowlitz River. The season was restricted to Saturdays during the month of February from 7 AM−3 PM with a bag limit of ten pounds per person. … A pilot Cowlitz River angler survey was implemented during 2010; patterned after a study design last conducted in 1978. Recreational effort was poor due to low abundance. Harvest estimates based on the pilot creel program (from 239 smelt anglers interviewed) include a minimum of 140 pounds of smelt harvested from 714 hours fished.

No commercial or recreational fisheries opened in the Columbia River or its tributaries in the 2010–2011 season (JCRMS 2011).

Habitat and trophic effects

Smith and Saalfeld (1955, p. 12) stated that the only recognizable prey found in stomachs of adult eulachon captured off Washington in 1948 were abundant "remains of the cumacean, *Cumacea dawsoni*." Other authorities report that juvenile and adult eulachon eat primarily "euphausiids and copepods" (Hart 1973, p. 149) or "euphausiids, crustaceans, and cumaceans" (Scott and Crossman 1973, p. 323). Hay (2002, p. 100) stated that "eulachon stomachs from offshore waters indicate that [they] mainly consume the euphausiid *Thysanoessa spinifera*." Euphausiids (principally *Thysanoessa spiniferia* and *Euphausia pacifica*) appear to be a primary prey item of eulachon in the open ocean and are also eaten by many other competing species. Euphausiids are also known as krill. Since WCGF fisheries target relatively large, commercially valuable fish species, (see Chapter 2 Description of the Fisheries), prey items of eulachon, such as euphausiids, are not likely to be directly impacted by WCGF fisheries to any significant extent. Indirect trophic effects of WCGF fisheries are also expected to be minor and in fact may positively affect the abundance of euphausiids as prey for eulachon through removal of other predators on euphausiids (Appendix A).

Impact of WCGF fisheries on eulachon population growth rate/abundance

Due to a lack of data on population abundance and reproductive rates of eulachon, combined with the rarity of observing eulachon in the WCGF fisheries, it is not possible to quantify an estimated impact of WCGF fisheries on population growth rate of eulachon. However, the level of mortality in the WCGF (less than 1000 individuals annually) is very low compared to the probable total numerical abundance of the species (likely in the millions -- see discussion in Gustafson et al. 2010), and is therefore likely to be having at most a negligible effect on the southern DPS of eulachon. The impact of the WCGF is also very low compared to other fishery impacts, particularly the ocean shrimp trawl fisheries.

*Green sturgeon (*Acipenser medirostris*)*

General biology[12]

The green sturgeon is an anadromous, long-lived, and bottom-oriented (demersal) fish species in the family Acipenseridae. Green sturgeon do not mature until they are at least 15–17 years of age at a size of 1.4–2.2 m in length (Beamesderfer et al. 2007). The maximum age of adult green sturgeon is likely to range from 60–70 years, and adults may exceed 2 m in length and 90 kg in weight. This species is found along the west coast of Mexico, the United States, and Canada.

Sturgeon have skeletons composed mostly of cartilage and lack scales, instead possessing five rows of characteristic bony plates on their body called "scutes." On the underside of their flattened snouts are sensory barbels and a siphon-shaped, protrusible, toothless mouth. Recent genetic information suggests that green sturgeon in North America are taxonomically distinct from morphologically similar forms in Asia (Adams et al. 2007).

One of the most marine-oriented and widely distributed of the sturgeons, the green sturgeon spends most of its life in Pacific coastal marine and estuarine waters from Mexico to Alaska. Mature adults return to the mainstem of large rivers to spawn during the spring (peaking in May–June) every 2–4 years (Beamesderfer et al. 2007). Spawning areas have been documented in the Rogue, Klamath, Trinity, Sacramento, and Eel rivers (Adams et al. 2007). Green sturgeon fecundity (50,000–80,000 eggs; Van Eenennaam et al. 2001) is reportedly lower than other sturgeons, but the egg size is larger. Eggs are laid in turbulent areas of high velocity on the river bottom during the spring, which settle into the interstitial spaces between cobble and gravel (Adams et al. 2007). Eggs hatch after 6–8 days, and larval feeding begins 10–15 days post-hatch; larval development is completed within 45 days at 60–80 mm TL (Beamesderfer et al. 2007). After rearing in freshwater or the estuary of their natal river for one to four years, young green sturgeon move into coastal waters. While in the ocean and estuaries, green sturgeon feed on a variety of benthic invertebrates (including crangonid and callianasid shrimp, Dungeness crab, molluscs, and amphipods) and small fish, such as sand lances (*Ammodytes* spp.) and anchovies (Engraulidae) (Moyle 2002, Dumbauld et al. 2008).

Range, migratory behavior, and stock structure

Green sturgeon occur as two apparent stocks based on spawning locations—a northern distinct population segment (DPS) comprised of the Klamath and Rogue River population, and a southern DPS consisting of the Sacramento River population (Israel et

[12] Much of this section is taken directly from http://www.nmfs.noaa.gov/pr/species/fish/greensturgeon.htm

al. 2004, Adams et al. 2007). Genetic and acoustic tagging data indicate little migration between spawning areas of these DPSs, although they co-occur in non-natal marine and estuarine habitats to varying degrees (Israel et al. 2009, Lindley et al. 2011).

After migrating out of their natal rivers, subadult green sturgeon move between coastal waters and various estuaries along the West Coast between San Francisco Bay, CA and Grays Harbor, WA (Lindley et al. 2008, Lindley et al. 2011). Multiple rivers and estuaries are visited by dense aggregations of green sturgeon in summer months (Moser and Lindley 2007), and migration patterns differ among individuals within and among populations (Lindley et al. 2011). Mature adults enter their natal river in the spring and typically leave the river during the subsequent autumn when water temperatures drop below 10°C and flows increase (Erickson and Webb 2007); thereafter, they migrate among the coastal ocean and non-natal estuarine habitats before returning again to spawn 2–4 years later. Winter months are generally spent in the coastal ocean, with many green sturgeon migrating to northern waters in the fall; areas north of Vancouver Island are favored overwintering areas, with Queen Charlotte Sound and Hecate Strait likely destinations based on observed depth and temperature preferences and detections of acoustically-tagged green sturgeon at the northern end of Vancouver Island (Lindley et al. 2008, Nelson et al. 2010). Peak migration rates exceeded 50 km per day during the spring southward migration (Lindley et al. 2008).

Habitat use

Relatively little is known about how green sturgeon utilize habitats in the coastal ocean and in estuaries, or the purpose of their episodic aggregations there at certain times (Lindley et al. 2008, Lindley et al. 2011). While in the ocean, archival tagging indicates that green sturgeon occur between 0 and 200 m depths, but spend most of their time between 20–80 m in waters temperatures of 9.5–16.0°C (Nelson et al. 2010, Huff et al. in review). They are generally demersal but make occasional forays to surface waters, perhaps to assist their migration (Kelly et al. 2007). Recent telemetry data in coastal ocean habitats suggests that green sturgeon spent a longer duration in areas with high seafloor complexity, especially where a greater proportion of the substrate consists of boulders (Huff et al. in review). However, while in estuaries where green sturgeon feed over the bottom on benthic invertebrates (Dumbauld et al. 2008), they do not appear to use hard substrates. Preliminary data from feeding pit mapping surveys conducted in Willapa Bay, WA showed densities were highest over shallow intertidal mud flats, while harder substrates (e.g., gravel) had no pits (M. Moser, unpublished data). In rivers, sturgeon prefer deep pools and may hold there for up to nine-months, presumably for the purposes of spawning, feeding, and conserving/restoring energy (Israel et. al 2010).

Critical habitat

Critical habitat has been designated for the southern green sturgeon DPS (Federal Register: 74 FR 52300). In the coastal ocean, this designation covers waters shallower than 110 m from Monterey Bay, CA to the Canadian border, including the Strait of Juan de Fuca. Natal rivers and numerous estuaries along the West Coast (e.g., San Francisco

Bay, lower Columbia River estuary, Willapa Bay, and Grays Harbor) were also designated as critical habitat for the species.

Status[13]

NMFS received a petition in 2001 for the green sturgeon to be listed under the Endangered Species Act. In 2002, NMFS determined that the green sturgeon is comprised of two DPSs that qualify as species under the ESA, but that neither warranted listing as threatened or endangered. Uncertainties in the structure and status of both DPSs led NMFS to add them to the Species of Concern List.

The "not warranted" determination was challenged in 2003. NMFS produced an updated status review in 2005 and reaffirmed that the northern green sturgeon DPS only warranted listing on the Species of Concern List; however, it was proposed that the Southern DPS (defined as coastal and Central Valley populations, south of the Eel River in California) should be listed as threatened under the ESA (Adams et al. 2007). NMFS published a final rule in 2006 listing the Southern DPS as threatened (Federal Register: 71 FR 17757). In 2009, critical habitat was established for the Southern DPS (Federal Register: 74 FR 52300), with ESA take prohibitions to be applied under a 4(d) rule by 2010 (Federal Register: 75 FR 30714).

In Canada, the green sturgeon is designated as being a species of Special Concern (COSEWIC 2004).

Abundance and trend

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either the Northern or Southern green sturgeon DPS in any of the natal rivers based on survey data (Israel et al. in prep). As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases, including monitoring designed for white sturgeon (*Acipenser transmontanus*) populations, harvest time series, or entrainment from water diversion and export facilities (Adams et al. 2007). Of these sources, only the water diversion data indicate a possible trend, suggesting green sturgeon abundance or recruitment has declined since 1986 in the Sacramento River (Adams et al. 2007). Long term population trends from fishery data (note: effort data is absent) indicate that the adult population in the Klamath River is fairly constant, with a few hundred spawning adults typically being harvested annually by tribal fisheries (Adams et al. 2007). Based on detections of tagged sturgeon in the marine environment during 2004, Lindley et al. (2008) estimated annual survival of tagged subadults and adults to be 0.83.

More recent genetic techniques and monitoring surveys are beginning to clarify questions about green sturgeon population size. Genetic data collected from outmigrating juvenile green sturgeon suggest that the number of adult green sturgeon in the upper Sacramento River (southern DPS) remains roughly constant, with between 10 and 28

[13] This section adapted from http://www.nmfs.noaa.gov/pr/species/fish/greensturgeon.htm

pairs breeding annually between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). In rivers of the northern DPS, recently developed surveys using dual-frequency identification sonar have estimated spawning run sizes of a few hundred fish per year (E. Mora, unpublished data; Israel et al. in prep). Erickson et al. (unpublished) estimated run sizes ranging from 426 to 734 adult green sturgeon (point estimates) using mark-recapture methods in the same systems during the same year, (Israel et al. in prep). These studies suggest each population may be represented by less than 1,000 adults, considering spawning periodicity is 2–4 years (Beamesderfer et al. 2007). Furthermore, it is apparent that the abundance of mature green sturgeon in the southern DPS is much smaller than in the northern one (Adams et al. 2007). Nonetheless, carefully designed studies remain needed to provide absolute estimates of abundance for the species.

Threats (from Recovery Plan or listing documents)

Green sturgeon face a variety of threats in the freshwater, estuarine, and marine environments within which they move throughout their life history. Threats to this species include: reduction/loss of spawning areas, insufficient freshwater flow rates in spawning areas, contaminants (e.g., pesticides), harvest bycatch, potential poaching (e.g., for caviar), entrainment by water projects, influence of exotic species, small population size, impassable barriers, and elevated water temperatures (Adams et al. 2007). A principal factor in the decline of the Southern DPS has been the reduction of potential spawning habitat to a single area in the Sacramento River due to migration barriers (dams).

Fishery impacts

Historically, large numbers of green sturgeon were harvested by white sturgeon commercial and sport fisheries, which often considered them as bycatch due to their inferior meat quality and lower relative market value (Emmett et al. 1991, Adams et al. 2007). A relatively smaller part of the harvest occurred as bycatch from tribal gillnet salmon fisheries in the Columbia and Klamath Rivers. From 1985–2003, harvest came predominately from the Columbia River (51%), coastal trawl fisheries (28%), the Oregon fishery (8%), and the California Tribal fishery (8%) (Adams et al. 2007). The total average annual harvest of green sturgeon declined substantially from 6,494 fish in 1985–1989 to 1,072 fish in 2000–2003.

Recently enacted fishing regulations and conservation measures have reduced current fishery impacts to green sturgeon throughout its range (http://www.nmfs.noaa.gov/pr/species/fish/greensturgeon.htm). Various commercial and sport fisheries in California, Oregon, Washington (United States), and British Columbia (Canada) now ban retention of green sturgeon. Implementation of sturgeon fishing restrictions in Oregon and Washington and protective efforts put in place on the Klamath, Trinity, and Eel Rivers may offer protection to the Southern DPS.

Impacts, all fisheries

California, Oregon, Washington –The largest existing fisheries impact to green sturgeon is bycatch-related mortality from three coastal and estuarine fisheries: the coastal groundfish trawl fishery, white sturgeon commercial and sport fisheries, and Klamath Tribal salmon gillnet fisheries (Adams et al. 2007). The only fishery where green sturgeon are still legally retained in the U.S. is in Tribal gillnet fisheries in the Klamath River. Historical annual catches in the fishery appear to be of the same order of magnitude as spawning escapement, suggesting possibly unsustainable harvest rates. On the Klamath, Tribal harvest has accounted for 200–450 fish annually between 1985 and 2003, with no evidence of declining catches (Adams et al. 2007). However, the Yurok Tribe have recently adopted new regulations for their subsistence harvest that reduce impacts to green sturgeon (Israel et al. in prep).

Mexico, British Columbia –Green sturgeon are rarely encountered in coastal waters of Baja California, Mexico, and fishery impacts in Mexican waters are likely negligible.

Canada currently bars retention of green sturgeon in all fisheries, although they are frequently encountered in coastal bottom trawl fisheries off the west coast of Vancouver Island and may have been specifically targeted in past decades (COSEWIC 2004).

Alaska –Observers have only rarely encountered green sturgeon as bycatch in trawl fisheries in the Bering Sea (Colway and Stevenson 2007).

Impacts, WCGF fisheries

Recently published summaries of bycatch estimates from U.S. West Coast groundfish fisheries provide guidance on the scale of impacts from 2002–2009 (Adams et al. 2007, Bellman et al. 2011). On average, 331 green sturgeon are estimated to have been caught per year from 2002–2009. The largest green sturgeon bycatch estimates occurred in 2006, when 793 individuals were estimated from the fishery; in comparison, an estimated 89 fish were caught in 2009 (Table 19).

The most important impact of WCGF fisheries appears to be benthic trawl fisheries occurring on the inner shelf. Most of the green sturgeon bycatch (annual average of 77%, 2002–2009) occurred in the limited entry sector of the California halibut (*Paralichthys californicus*) commercial trawl fishery, which primarily takes place at depths of <60 m in fishing grounds adjacent to San Francisco Bay, California (Bellman et al. 2011) (Table 19). By comparison, green sturgeon bycatch in the at-sea hake fishery is very low, with only three green sturgeon recorded by the observer program from 2002–2009. The depth distribution of tows encountering green sturgeon bycatch (2002–2009, all fisheries combined) indicates most sturgeon were caught in depths ≤10 m, but may be encountered in tows ranging from 0 to 130 m depth (Bellman et al. 2011).

The length frequency distribution of green sturgeon caught in the California halibut fishery from 2007 through April 2010 showed most individuals range in size from 80–110 cm total length (Bellman et al. 2011), which corresponds to ages of less than 15 years based on published age-length relationships (Beamesderfer et al. 2007). Because trawl bycatch is composed of smaller individuals, the data suggests larger adults are either not present in these areas or not vulnerable to capture by these fishing gear. It is likely that many of the green sturgeon collected as bycatch in the California halibut trawl fishery are from the Southern DPS, based on the estuarine distribution of green sturgeon populations (Lindley et al. 2011) and the fishery's primary trawl grounds (Bellman et al. 2011).

Green sturgeon bycatch estimates do not include any correction for discard survivorship, which is not currently available. However, preliminary research indicates green sturgeon may be susceptible to some level of discard mortality, particularly when encounters with fishing gear occur in higher temperature environments and last for longer periods of time (Bellman et al. 2011). It is in principle possible to estimate these rates from a tagging program, using a combination of traditional reward tags and pop-off archival tags (applied to discards), but such studies have not yet been conducted.

Given the poorly known size of green sturgeon populations and bycatch survival rates, it is not possible to assess the WCGF fishery impact on the species.

Table 19: Estimated bycatch of green sturgeon (number of individual fish) in all U.S. West Coast fisheries observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) from 2002–2009. Open access CA halibut fisheries were not observed in 2002 or 2006 (derived from Table 5 in Bellman et al. 2011).

	WCGOP					A-SHOP	
	Limited Entry Trawl			CA Halibut		At-Sea Hake	Green Sturgeon Total
Year	WA	OR	CA	Limited Entry	Open Access		
2002	19	13	0	19	--	0	51
2003	0	0	0	345	15	0	360
2004	0	10	4	194	65	0	273
2005	4	4	0	504	270	1	783
2006	0	5	0	786	--	2	793
2007	0	5	0	102	0	0	107
2008	0	0	0	188	0	0	188
2009	0	37	5	47	0	0	89

* A value is (--) when the fishery/strata was not observed as a whole. Note: Bycatch refers to number of sturgeon caught and released (discarded) at sea; total mortality is not estimated because discard survivorship rates remain unmeasured.

Habitat and trophic effects

WCGF bottom trawl fisheries are likely to have some impact on both the habitat and prey of green sturgeon. The diet of green sturgeon in the ocean is poorly known, but it is likely that they prey upon demersal fish (sand lance are a known diet item) captured in these fisheries. While green sturgeon seem to prefer high-relief, complex, benthic habitats at certain times and places, it is not clear what features of these habitats they are responding to and how dependant they are upon them (i.e., is it the boulders themselves or biota associated with the boulders?) (Huff et al. in review). Recent gear restrictions (i.e., footrope limits) and landing limits have been effective in protecting rocky habitats along the Pacific Coast from trawl fishing impacts by shifting fishing effort away from these areas (Bellman et al. 2005). Therefore, management efforts directed at protecting the rocky habitat of depleted rockfish (*Sebastes* spp.) may have accrued some additional benefits to green sturgeon in the ocean. These habitat and trophic effects are difficult to quantify more accurately, however, until more definitive information is known about the marine habitat preferences and diets of green sturgeon.

Impact of WCGF fisheries on population growth rate

It is currently not possible to assess the impact of WCGF fisheries on the population growth rate of green sturgeon from available data. The most likely impacts would occur through discard-related mortality of green sturgeon captured in bottom trawl fisheries, yet survival rate of discarded green sturgeon is unknown (although possibly high given their armor, relatively shallow distribution, and open swim bladder). These uncertainties, combined with unknown green sturgeon population size, make it difficult to assess the current impact of the WCGF fishery on the population growth rate.

Chapter 6: Marine turtles

*Leatherback turtle (*Dermochelys coriacea*)*

General biology[14]

The leatherback is the largest, deepest diving, and most migratory and wide ranging of all sea turtles. Reaching 4 to 6 feet in length and 500 to 1,500 pounds in weight, its shell consists of small bones covered by firm, rubbery skin with seven longitudinal keels. Leatherbacks are black with varying degrees of pale spotting, including a pink spot on the adult head. A tooth-like cusp sits on each side of the upper jaw, while the lower jaw is hooked. The paddle-like, clawless limbs are black with white margins and pale spots.

Female leatherbacks lay clutches of approximately 80 eggs in the sand on tropical beaches, several times during a nesting season. Leatherback hatchlings emerge from the nest after about two-months

Unlike other sea turtles that feed on hard-bodied prey, leatherbacks do not possess crushing chewing plates (Pritchard 1971). Instead, their pointed tooth-like cusps and sharp edged jaws work well for their diet of soft-bodied pelagic prey. Backward-pointing spines located in their mouth also masticate the soft prey.

Range, migration and foraging

Adult leatherback sea turtles enjoy the most extensive range of any living reptile (71EN to 47ES; Pritchard and Trebbau 1984). The seasonal presence of adult females at major eastern and western Pacific rookeries reveals migration between nesting and non-nesting areas, characteristic of Pacific stocks (Benson et al. 2007; Benson et al. 2011). Although the exact location and timing of migration is still being documented, their eastern Pacific migratory corridors exist along the western seaboards of the United States

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[14] This information is summarized from:

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery plan for leatherback turtles (*Dermochelys coriacea*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery plan for U.S. Pacific populations of the leatherback turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, MD. 65pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007. Leatherback sea turtle (*Dermochelys coriacea*). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf and Mexico, as well as transpacific migrations from Western Pacific nesting beaches (Benson et al. 2007, Benson et al. 2011).

The leatherback inhabits the continental shelf and pelagic environments. While foraging in the insular Pacific, individuals also occur in deep water near prominent archipelagoes. Leatherback distribution correlates with the presence of macroplanktonic prey. Stomach content analyses have indicated that leatherbacks feed on medusa, siphonophores, and salpae in temperate and boreal latitudes. Eisenberg and Frazier (1983) observed an adult feeding on the jellyfish Aurelia off the coast of Washington State.

It is now understood that leatherbacks undertake trans-Pacific migration (Figure 15; Benson et al. 2011). Morreale et al. (1994), using satellite telemetry, likewise reported that nesting cohorts appear to share identical post-nesting migrational pathways. However, Benson et al. (2011) also demonstrated that leatherbacks do not just drift in instinctive obedience to migratory impulse, but navigate seasonally and with temperature and current, visiting eddies, boundaries, and blooms in order to forage.

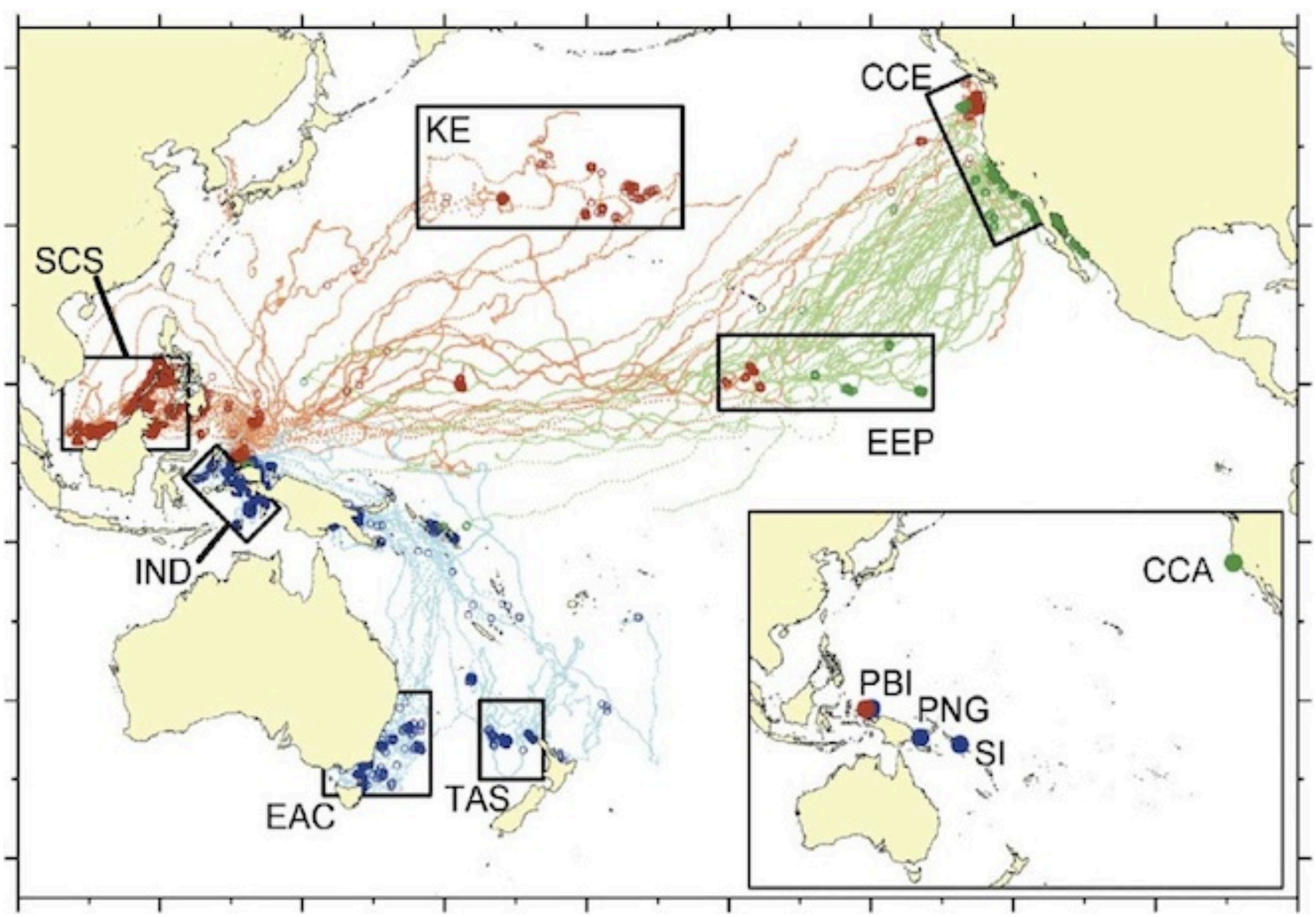

Figure 15: Between 2000 and 2007, Benson et al. (2011) attached GPS transmitters to 126 leatherbacks nesting in Indonesia, the Solomon Islands and Papua New Guinea. The colored lines indicate transpacific migration from their nesting grounds to the waters adjacent to the West Coast of North America. Reproduced from Benson et al. (2011).

Nesting Grounds

Historically, some of the largest nesting populations of leatherback turtles in the world bordered the Pacific Ocean, but no nesting occurs on Pacific beaches under U.S. jurisdiction. Nesting is widely reported from the western Pacific, including China, Southeast Asia, Indonesia, and Australia (Benson et al. 2007; Benson et al. 2011). Virtually all of the leatherbacks encountered on the West Coast of the U.S. originated in the western Pacific (Figure 15; Benson et al. 2007; Benson et al. 2011).

NMFS & USFWS (2007) recently summarized the abundance leatherback turtles nesting in the eastern and western Pacific. In the western Pacific (the apparent source of virtually all of the turtles off the U.S. West Coast), there do not appear to be sufficient data to estimate long-term trends. In the eastern Pacific (Costa Rica, Mexico), there appear to have been substantial declines in nesting abundance since the 1980s (see discussion in NMFS & USFWS 2007).

Habitat use

Leatherbacks are often described as a pelagic species; however, it is becoming increasingly evident that they aggregate in productive coastal areas to forage on preferred jellyfish prey (*scyphomedusae)* (Houghton et al., 2006; Benson et al., 2007; Witt et al., 2007). While their range spans the entire Pacific, occupation of the California Current is highly seasonal. Most of our current knowledge of leatherback turtle use of the California Current comes from recent and ongoing telemetry studies, aerial surveys, and ship-based research conducted primarily in the near-shore areas off central California. The telemetry work from Benson et al. (2011) has documented transpacific migrations between the western tropical Pacific and the California Current, which helps to identify migratory corridors (Figure 15).

Likewise, recent satellite-tracking studies at nesting beaches in Costa Rica and Mexico indicate that female turtles journey into pelagic waters after the nesting season ends. Leatherbacks were regularly captured in mid-Pacific waters by pelagic driftnet fisheries (Wetherall et al. 1993). Mortality and survival statistics are unavailable, and age-at-maturity and longevity have not been determined. Comprehensive discussions of the early pelagic stage of sea turtle development (the "lost year"), which include sightings of post-hatchling stage loggerhead, green, and hawksbill turtles associated with Sargassum weed and convergence debris, do not mention sightings of young *Dermochely*s.

Critical habitat

The USFWS initially designated critical habitat for leatherbacks on 26 September 1978 (43 FR 43688). The critical habitat area consisted of a strip of land 0.2 miles (0.32 kilometers) wide (from mean high tide inland) at Sandy Point Beach on the western end of the island of St. Croix in the U.S. Virgin Islands. On 23 March 1979, NMFS designated the marine waters adjacent to Sandy Point Beach as critical habitat from the hundred fathom (182.9 meters) curve shoreward to the level of mean high tide (44 FR 17710). In 2010, NMFS proposed revising the current critical habitat for the leatherback sea turtle by designating additional areas within the Pacific Ocean (Figure 16). Specific areas proposed for designation included two adjacent marine areas totaling approximately 46,100 square miles (119,400 square km) stretching along the California coast from Point Arena to Point Vincente, and one 24,500 square mile (63,455 square km) marine area stretching from Cape Flattery, Washington to the Umpqua River (Winchester Bay), Oregon east of a line approximating the 2,000 meter depth contour. The areas proposed for designation comprised approximately 70,600 square miles (182,854 square km) of marine habitat (Figure 16). Other Pacific waters within the U.S. Exclusive Economic Zone (EEZ) were evaluated based on the geographical area occupied by the species, but it was decided to exclude those areas from the critical habitat designation.

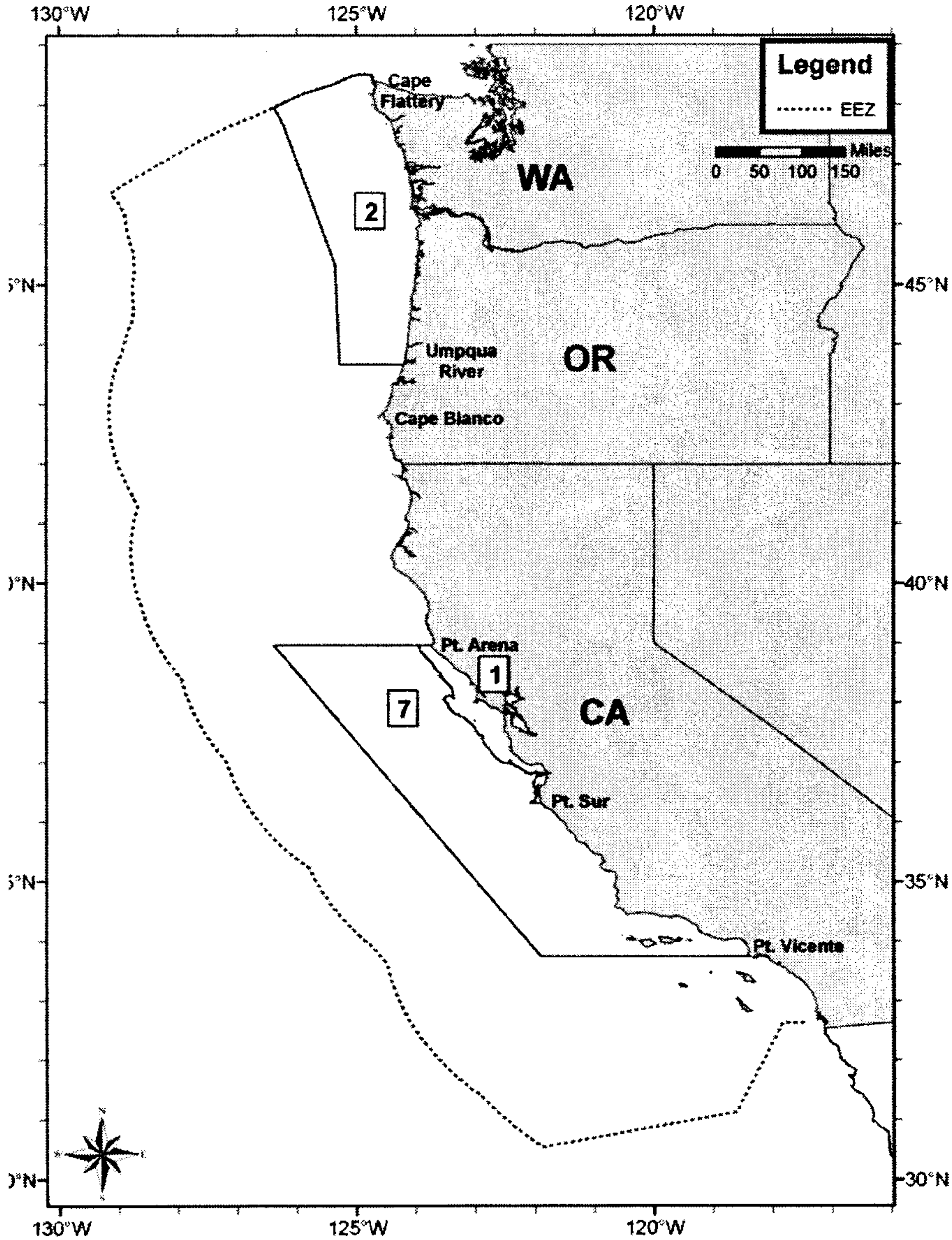

Figure 16: Map of proposed critical habitat for leatherback sea turtles (Source FR Doc. E9–31310 Filed 12–31–09)

Status

The leatherback sea turtle was listed as endangered throughout its range on 2 June 1970 under the U.S. Endangered Species Act (ESA). Similarly, the species is classified as Endangered in the International Union for Conservation of Nature and Natural Resources (IUCN) Red Data Book, where taxa so classified are considered to be "in danger of extinction and whose survival is unlikely if the causal factors continue operating". Leatherbacks are included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a designation that effectively bans trade in specimens or products except by special permit. Such a permit must show that the trade is not detrimental to the survival of the species and is not primarily for commercial purposes. There is no commercial trade in leatherback sea turtles or their parts or products at the present time.

Abundance and trend

Leatherbacks are seriously declining at all major Pacific basin rookeries (Bhaskar 1985; Betz and Welch 1992; Chua 1988; Limpus, 1995), largely as a result of intensive egg collection and fishery bycatch. Population declines have also been reported in India, Sri Lanka, and Thailand (Ross and Barwani 1982).

In the case of Mexiquillo, Michoacán, an estimated 4,796 nests were laid on 4.5 km of beach in 1986–1987, and approximately 1,074 nests were laid in 1989–1990 (L. Sarti M., UNAM, unpubl. data). The aerial survey data of Sarti et al. (1996) indicate that a geographic shift in nesting is unlikely. Leatherbacks are occasionally sighted at sea, with a growing database documenting their incidental catch in coastal and pelagic fisheries.

Threats

Leatherback turtles face a variety of threats, depending on the region in which they occur. On the U.S. West Coast, the primary turtle threat consists of incidental take in fisheries. Incidental catch poses a threat in pelagic foraging and transit areas, and the coastal feeding grounds and migratory corridors that probably exist along the West Coast of the United States and south into Mexico, and between the western Pacific and the California current. Entanglement and ingestion of marine debris, including old abandoned nets, continues to pose a threat to leatherbacks.

Fishery impacts

In designating critical habitat, NMFS identified two primary constituent elements (PCEs) essential for the conservation of leatherbacks in marine waters off the U.S. West Coast: (1) occurrence of prey species, primarily *scyphomedusae* of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cyanea), of sufficient condition, distribution, diversity, and abundance; (2) Migratory pathway conditions to allow for safe and timely passage and access to/from/within high use foraging areas. When evaluating the second identified PCE—migratory pathway conditions or passage—

NMFS considered the type of activities that could affect or impede the passage of a leatherback turtle. After reviewing several potential types of impediments, NMFS determined that only permanent or long-term structures that alter the habitat would be considered as having potential effects on passage. Given this determination, NMFS did not consider fishing gear or vessel traffic as potential threats to passage.

California, Oregon, Washington

From 2002 to 2009, the Observer Program documented one incident of leatherback turtle being taken in fishing gear in the North Pacific (Jannot et al., 2011). This resulted in a single leatherback turtle mortality during the reporting period. However, the very low observer coverage of this fishery did not allow for accurate estimation of the fleetwide mortality rate on the basis of this single take (Jannot et al. 2011). The WCGF fisheries clearly overlap with the foraging distribution of leatherback turtles (Figure 17, Figure **18**, and Figure **19**), so there is clearly some potential for impacts due to ship strikes or entanglement (Figure 17, Figure **18**, and Figure **19**).

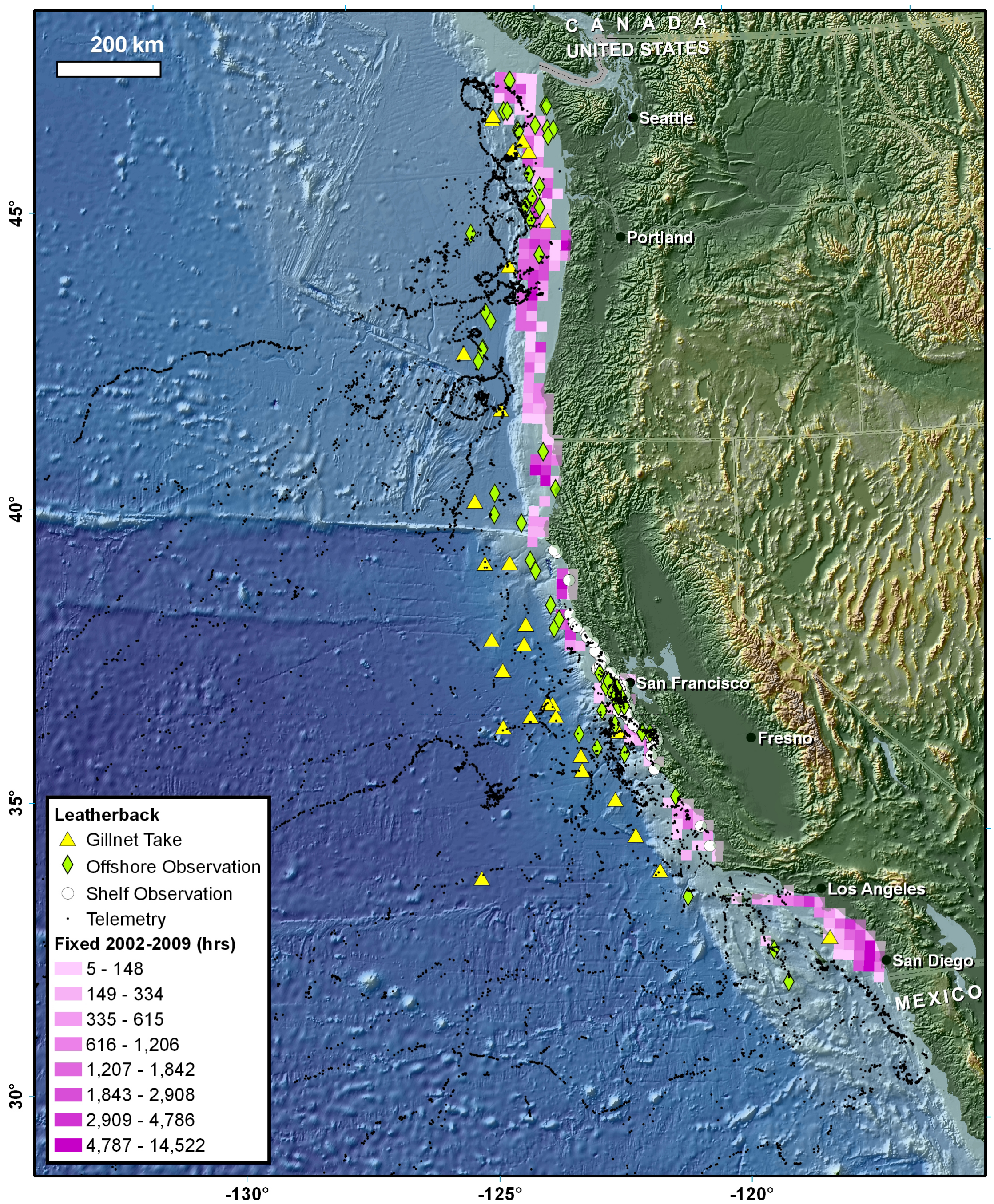

Figure 17: Leatherback vs Fixed Gear. Pink grid (Fixed 2002–2009 [hours]): Cumulative number of hours the fixed gear fishing fleet (see Feist et al. 2010 in Appendix B for details) had gear deployed in the water, expressed per gridcell (20 km on a side) from the years 2002–2009. Fixed gear types represented include historic longline, vertical hook and line, other hook and line, pot, and longline (fixed hook), longline (snap gear). Yellow triangles (Gillnet Take) from leatherback sea turtle bycatch locations for the DGN (gillnet) fishery. Green diamonds (Offshore Observation) and white circles (Shelf Observation) from NOAA sighting data and sighting data from platforms of opportunity for leatherback sea turtles. Black dots (Telemetry) from satellite telemetry point locations from 18 leatherback sea turtles. Turtle location information reproduced from NMFS et al. (2009).

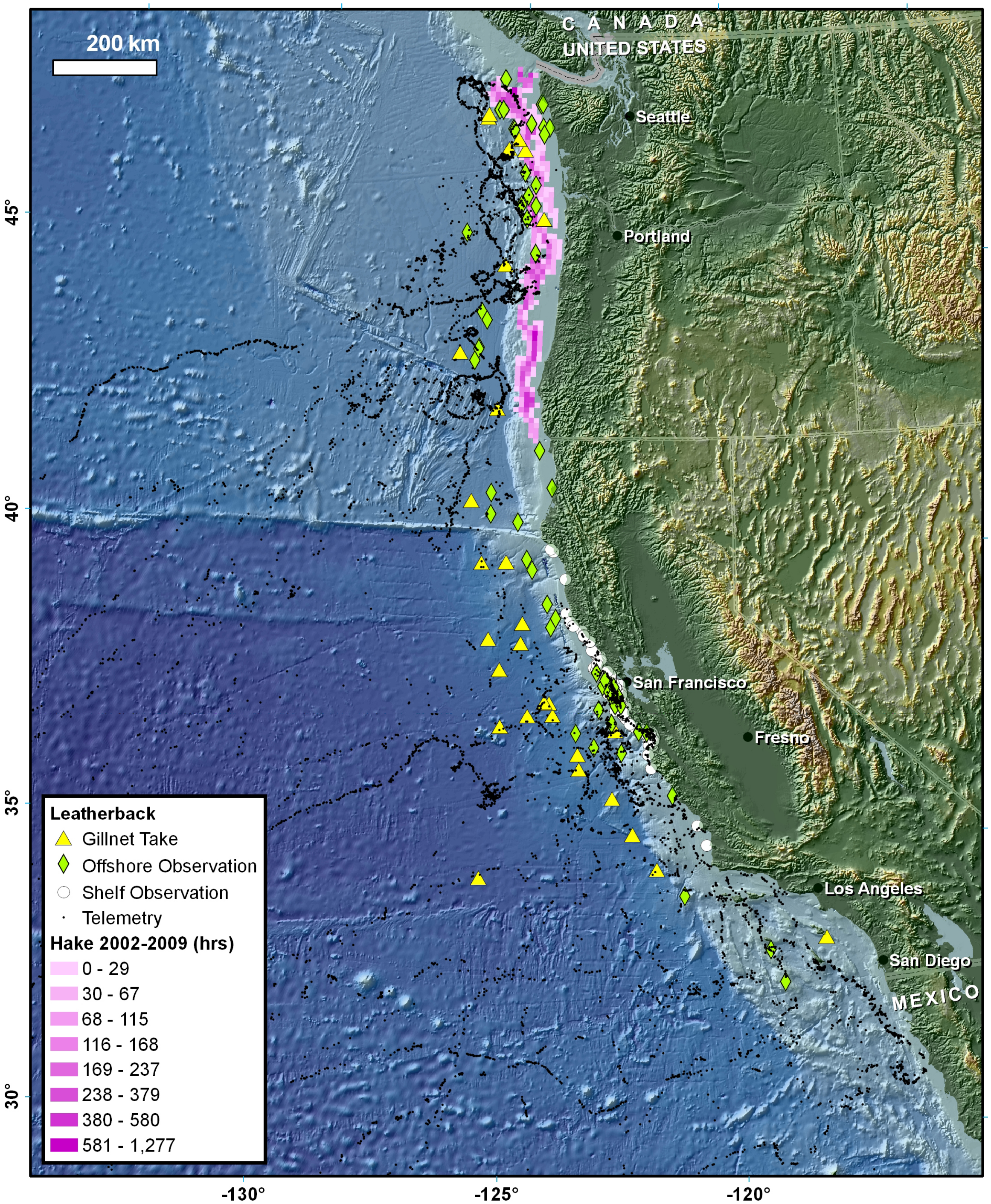

Figure 18: Leatherback vs Hake Fishery. Pink grid (Fixed 2002–2009 [hours]): Cumulative number of hours the at-sea hake fleet (see Feist et al. (2010) in Appendix B for details) had gear deployed in the water, expressed per gridcell (10 km on a side) from the years 2002–2009. Yellow triangles (Gillnet Take) from leatherback sea turtle bycatch locations for the DGN (gillnet) fishery. Green diamonds (Offshore Observation) and white circles (Shelf Observation) from NOAA sighting data and sighting data from platforms of opportunity for leatherback sea turtles. Black dots (Telemetry) from satellite telemetry

point locations from 18 leatherback sea turtles. Turtle location information reproduced from NMFS et al. (2009).

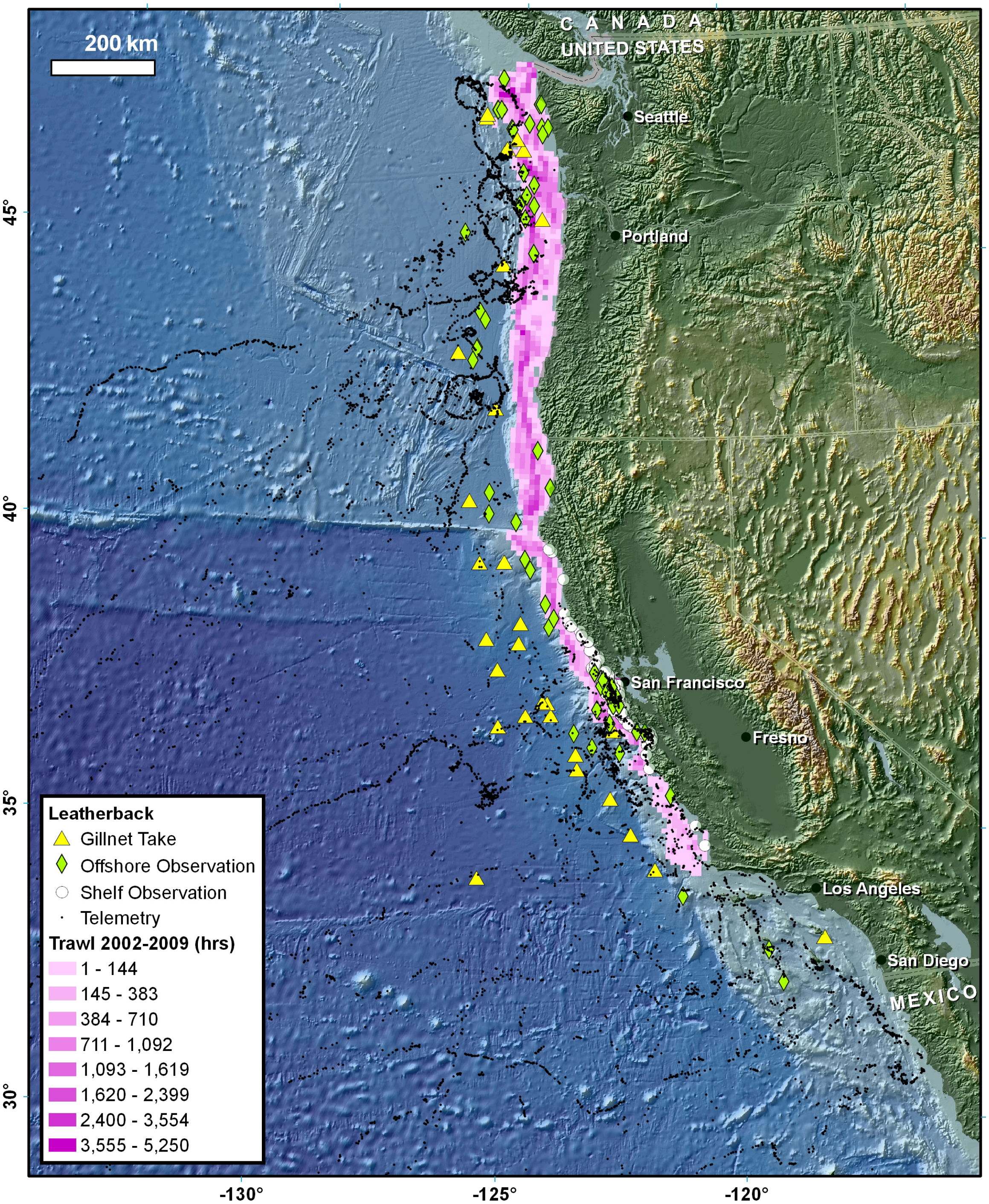

Figure 19: Leatherback vs Trawl Fishery. Pink grid (Fixed 2002–2009 [hours]): Cumulative number of hours the bottom trawl fleet (see Feist et al. (2010) in Appendix B for details) had gear deployed in the water, expressed per gridcell (10 km on a side) from the years 2002–2009. Yellow triangles (Gillnet Take) from leatherback sea turtle bycatch locations for the DGN (gillnet) fishery. Green diamonds (Offshore Observation) and white circles (Shelf Observation) from NOAA sighting data and sighting data from platforms of

opportunity for leatherback sea turtles. Black dots (Telemetry) from satellite telemetry point locations from 18 leatherback sea turtles. Turtle location information reproduced from NMFS et al. (2009).

Habitat and trophic effects

WCGF fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Leatherback turtles feed primarily on jellyfishes, which are not impacted by the WCGF fisheries to any significant extent. Indirect trophic effects of the WCGF fisheries are also expected to be minor.

Impact of WCGF fisheries on population growth rate

Because there is some overlap between the WCGF fisheries and leatherback turtle foraging distribution, the fishery may have some potential to impact leatherback turtles through bycatch or possibly ship strikes. However, despite the spatial and temporal overlap between the turtle distribution and the fishery, there has been only a single observed mortality due to fishing gear off the West Coast since 2000. For those sectors of the fishery with relatively high observer coverage (see Chapter 2 Description of the Fisheries) and no observed bycatch, we can be confident that the impacts on leatherback turtles of those sectors is low. However, the single reported take occurred in a sector (non-nearshore open acesss fixed gear) with very low observer coverage (1–9% from 2002 to 2009; Appendix H in Jannot et al. 2011). The abundance trend of the western Pacific population that forages off the U.S. West Coast does not appear to be known accurately. The lack of both accurate data on population trend and accurate estimates of take in some components of the fishery makes accurate estimation of effects impossible at this time.

*Green turtle (*Chelonia mydas*), Olive ridley turtle (*Lepidochelys olivacea*), Loggerhead turtle (*Carretta carretta*)*

Green turtles nest in numerous tropical beaches worldwide (see Figure 1 of NMFS & USFWS 2007b) and forage in coastal areas, but they are also found in the open ocean. The endangered Pacific Mexico breeding population forages primarily from the U.S.-Mexico border south along the west coast of Mexico. Green turtles are observed off the California coast during the summer, and a small population exists year-round in San Diego Bay.[15] However, their foraging areas are primarily south of the U.S.-Mexico border (NMFS & USFWS 2007b), and they have not been observed as bycatch in WCGF fisheries (Jannot et al. 2011). The generally low spatial overlap of the species with these fisheries, combined with the lack of any observed bycatch, suggests that these fisheries are unlikely to impact the species.

The olive ridley is another primarily tropical species that is rarely observed off the U.S. West Coast and has not been observed as bycatch in WCGF Fisheries (NMFS & USFWS 2007; Jannot et al. 2011). The generally low spatial overlap of the species with these fisheries, combined with the lack of any observed bycatch, suggests that these fisheries are unlikely to impact the species.

On 22 September 2011, NMFS adopted a Final Rule designating nine loggerhead DPSs worldwide (76 CFR 58868). A separate DPS was designated for the North Pacific Ocean, which is the subject of this assessment. The nesting habitat for this DPS occurs primarily in Japan, where trends in nesting females have generally been declining (Conant et al. 2009). Fisheries in Baja California, Mexico, and Japan take large numbers of loggerhead turtles annually, and they are considered a significant threat to the species (NMFS 2009). However, the species is rarely observed along the U.S. West Coast and has not been observed as bycatch in WCGF fisheries (Jannot et al. 2011). Some bycatch has occurred in California gill net fisheries near the U.S.-Mexico border (Julian and Beeson 1998; Jeffrey Seminoff personal communication), and it is possible that the fixed gear portion of the WCGF fisheries could encounter loggerhead turtles in that area (Figure **2**). However, considering the generally low spatial overlap between the species and the WCGF and the lack of observed take in these fisheries, it appears that any impacts are likely to be minor.

[15] http://swfsc.noaa.gov/textblock.aspx?Division=PRD&ParentMenuId=212&id=4378

Chapter 7: Seabirds

*Short-tailed albatross (*Phoebastria albatrus*)*

General biology[16]

Short-tailed albatrosses are large, pelagic seabirds with long, narrow wings adapted for soaring just above the water surface. Fledged juveniles are dark brown-black, but they soon develop pale bills and legs. Their white heads develop a yellow-gold crown and nape over several years. Their bills are large and pink with a bluish hooked tip, a conspicuous thin black line around the base, and, as in other Procellariiformes (tube-nosed marine birds), conspicuous external nostrils. They are the largest of the three species of North Pacific albatross, with a body length of 33–37 in (84–94 cm) and a wingspan of 84–90 in (213–229 cm) (Harrison 1985). Short-tailed albatross adults weigh 3.7–6.6 kg (USFWS 2008).

Birds breed at 5–6 years of age; a colonial, annually breeding species, individuals arrive on Torishima Island (main breeding colony) in Japan in October, but 25% of breeding-age adults may forego breeding in a given year. A single egg is laid in late October to late November (Austin 1949), and both parents incubate over a 64–65 day period. Hatching occurs from late December through January (Hasegawa and DeGange 1982). Chicks begin to fledge in late May–early June (Austin 1949), when adults begin abandoning the colony site (Hasegawa and DeGange 1982, Suryan et al. 2008). There is no detailed information on timing of breeding on the other colonies.

Short-tailed albatross are central place foragers and bring food back to nestlings after surface feeding on primarily squid (especially the Japanese common squid [*Todarodes pacificus*]), shrimp, fish (including bonitos [*Sarda* sp.], flying fishes [Exocoetidae] and sardines [Clupeidae]), flying fish eggs, and other crustaceans (Hasegawa and DeGange 1982, Tickell 1975, Tickell 2000). There is little information on non-breeding diet, but it is thought that squids, crustaceans, and fishes are important prey (Hasegawa and DeGange 1982).

Range, migratory behavior, and stock structure

Breeding Range

The short-tailed albatross once ranged throughout most of the North Pacific Ocean and Bering Sea (Figure **20**). A recent discovery of a fossil breeding site on Bermuda confirms that the species also formerly nested in the North Atlantic during the

[16] Most of the material in this section is summarized directly from: U.S. Fish and Wildlife Service. 2008. Short-tailed Albatross Recovery Plan. Anchorage, AK, 105 pp.

mid-Pleistocene (420–362 thousand years ago; Olson and Hearty, 2003). In the North Pacific, short-tailed albatross historically bred on few colonies from the Izu, Bonin, Daito, and Senkaku, western volcanic groups in Japan, and Agincourt Island and the Pescadore Islands in Taiwan (Hasegawa 1984). Of the known historical breeding colonies, only two are now active. The vast majority (80–85%) of the known breeding short-tailed albatross nest on colonies on Torishima Island (Izu group), which is an active volcano. The remaining known breeding birds nest on Minami-kojima (Senkaku Islands), whose ownership is under dispute among Japan, China, and Taiwan.

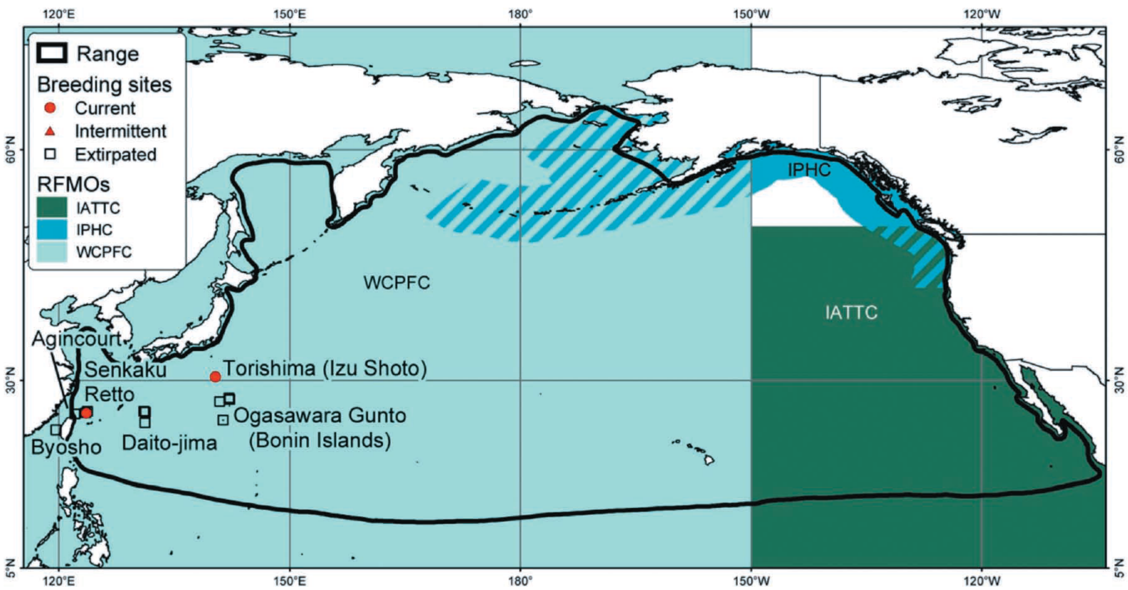

Figure 20: Former and current breeding sites and at-sea range of short-tailed albatross. The species' at-sea range overlaps with three Regional Fishery Management Organizations (RFMOs), but the majority of the time spent at sea is within the Western and Central Pacific Fisheries Commission area. Map by Wieslawa Misiak (from USFWS 2008).

In 2011, the USFWS reported that a short-tailed albatross chick was hatched on Midway Atoll, at the northwestern end of the Hawaiian Archipelago, marking the first confirmed hatching of a short-tailed albatross outside of the islands surrounding Japan in recorded history (USFWS News Release PINWR-11-01; RO-11-03). Prior to that, observations of infertile short-tailed albatross eggs and reports from the 1930s suggested that short-tailed albatross may have nested there in the past. Nesting attempts had been observed, but there had never been more than two short-tailed albatross individuals reported on the Atoll during the same year, and no successful nesting had been confirmed until 2011.

Marine Range

At-sea sightings since the 1940s indicate that short-tailed albatross are distributed widely throughout their historic foraging range in the temperate and subarctic North Pacific Ocean (Sanger 1972). While observations are concentrated along the edge of the continental shelf, in the northern Gulf of Alaska, Aleutian Islands, and Bering Sea (McDermond and Morgan 1993, Sherburne 1993), individual short-tailed albatross have been recorded along the West Coast of North America and as far south as the Baja Peninsula, Mexico (Palmer 1962).

From December through April, short-tailed albatross foraging is primarily concentrated near the breeding colonies, although individual trips may extend hundreds of miles or more from the colony sites. During the non-breeding season, short-tailed albatross range along the Pacific Rim from southern Japan to northern California, primarily along continental shelf margins (Figure **21**). Post-breeding birds either disperse rapidly north to the western Aleutian Islands or stay within the coastal waters of northern Japan and the Kuril Islands throughout the summer, moving in early September into the western Aleutian Islands; once in the Aleutians, most birds travel east toward the Gulf of Alaska (Suryan et al. 2006).

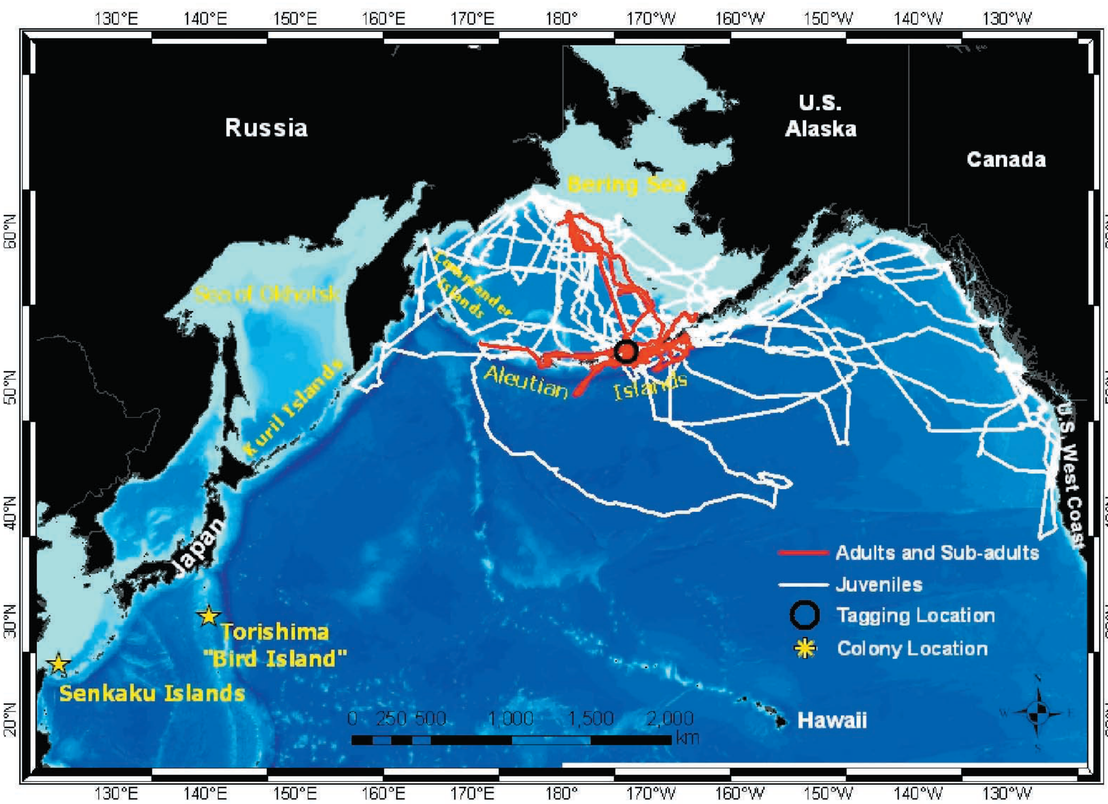

Figure 21: Satellite track lines for adults, sub-adults and juveniles captured at sea near Seguam Pass, Alaska (from USFWS 2008).

Juveniles and sub-adults are prevalent off the west coasts of Canada and the U.S. (Environment Canada 2008). In late September, large flocks of short-tailed albatross have been observed over the Bering Sea canyons (Piatt et al. 2006); these are the only known concentrations of this species away from their breeding islands. Short-tailed albatross forage extensively along continental shelf margins, spending the majority of time within national EEZs, particularly the U.S. (off Alaska), Russia, and Japan, rather than over international waters (Suryan et al. 2007a, Suryan et al. 2007b).

In general, short-tailed albatross show philopatry, returning to their natal colony as breeding adults. However, social attraction techniques (use of decoys and recorded playback of breeding colony sounds) have been used successfully to expand breeding colonies to other parts of Torishima Island; starting in 2008, efforts expanded to another Japanese island, 250 miles to the south of Torishima on Mukojima Island (www.fakr.noaa.gov/protectedresources/seabirds/usfws_stal_translocation_%20factsheet.pdf). Little information is available on the genetic structure of this species, but preliminary analyses of mtDNA sequences suggest extremely high genetic diversity as well as genetic separation of Torishima and Minami-kojima populations (Kuro-o et al. 2010). Additional genetic analyses, especially of newly created breeding populations, are necessary to explore potential bottleneck and founder effects.

Habitat use

At sea, short-tailed albatross individuals spend much of their time feeding in continental shelf-break areas (200–1,000 m depth) east of Honshu, Japan during breeding, and in shelf (0–200 m depth) and shelf-break areas of the Bering Sea, Aleutian chain, and in other Alaskan, Japanese, and Russian waters.

During the brood-rearing period, most foraging bouts are along the eastern coastal waters of Honshu Island, Japan (Suryan et al. 2008). Parents forage primarily off the east coast of Honshu Island, Japan, almost entirely north of Torishima and south of Ishinomaki (Figure **20**) (Suryan et al. 2008), where the warm Kuroshio current from the south collides with the cold Oyashio current from the north. During the non-breeding season, short-tailed albatross range along the Pacific Rim from southern Japan to northern California, primarily along continental shelf margins. During their post-breeding migration, females may have a prolonged exposure to fisheries in Japanese and Russian waters compared to males, which spent more time within the Aleutian Islands and Bering Sea. Juvenile birds have greater exposure to fisheries on the Bering Sea shelf and off the west coasts of Canada and the U.S. (Suryan et al. 2007a).

Short-tailed albatrosses are considered “continental shelf-edge specialists;” they can be relatively common nearshore, but only where upwelling hotspots occur (Piatt et al. 2006). Telemetry studies have also reinforced ship-based observations of individuals in central gyres rather than dispersed widely throughout the subarctic North Pacific and Bering Sea (Suryan et al. 2006, McDermond and Morgan 1993). This association with shelf-break and slope regions may result from the distribution of squids (Suryan et al. 2006).

Because short-tailed albatross forage extensively along continental shelf margins, they spend the majority of their time within EEZs, particularly the U.S. (off Alaska), Russia, and Japan, rather than over international waters (Suryan et al. 2007a, Suryan et al. 2007b). Overall, short-tailed albatross spent the greatest proportion of time off Alaska, and secondarily Russia, during the post-breeding season, regardless of whether the birds were tagged in Japan or Alaska. During the non-breeding season, short-tailed albatross range along the Pacific Rim from southern Japan to northern California, primarily along continental shelf margins.

Critical habitat

Critical habitat has not been designated for this species. In the 2000 final rule, the USFWS determined that designation of Critical Habitat was not prudent, due to the lack of habitat-related threats to the species, the lack of specific areas in U.S. jurisdiction that could be identified as meeting the definition of Critical Habitat, and the lack of recognition or educational benefits accruing to the American people as a result of such designation (65 FR 147:46651-46653).

Status

The short-tailed albatross was originally listed as endangered in 1970, under the Endangered Species Conservation Act of 1969, prior to the passage of today's Endangered Species Act (35 FR 8495). Due to an administrative error, the species was listed as endangered throughout its range <u>except</u> within the United States (50 CFR 17.11). The error was corrected on 31 July 2000, when the U.S. Fish and Wildlife Service published a final rule listing the short-tailed albatross as endangered under the ESA throughout its range, including the United States (65 FR 147:46643-46654). The short-tailed Albatross Recovery Plan was finalized for this species in 2008 (USFWS 2008).

Abundance and trend

As of spring 2011, the global population estimate of short-tailed albatross was 3,463 individuals (P. Sievert and H. Hasegawa, unpubl. data). Pre-exploitation global population estimates of short-tailed albatross are not known, but Dr. Hiroshi Hasegawa estimated there were at least 300,000 breeding pairs on Torishima alone (cited in USFWS 2008). From 1881 to 1903, an estimated five million short-tailed albatross were harvested from the breeding colony on Torishima, and they were harvested into the 1930s (except for a few years following a 1903 volcanic eruption); by 1949, there were no short-tailed albatross breeding at any of the historically-known breeding sites, including Torishima, and the species was thought to be extinct (Austin 1949).

The Torishima Island population growth rate, determined by annual increases in adults observed, eggs laid, and chicks fledged, has been estimated at an annual rate of 6.5–8.0% (H. Hasegawa, unpubl. data, cited in in USFWS 2008).

Threats (from Recovery Plan (USFWS 2008) or listing documents)

Short-tailed albatross face significant threats on breeding colonies and at sea. The major threat of over-exploitation that led to the species' original endangered status no longer occurs. Current threats listed in the Recovery Plan include catastrophic events, such as a volcanic eruption on the main breeding site on Torishima Island. Other catastrophic events, particularly monsoons, can also threaten habitat and nesting success. Past volcanic activity has restricted breeding to sparsely vegetated and steep slopes of loose volcanic soil, and monsoon rains result in frequent mudslides and severe erosion, which can reduce habitat, destroy nests, and reduce breeding success. Global threats may also include indirect adverse effects related to climate change and oceanic regime shifts. While known and potential threats from commercial fishing include U.S. and international demersal longline, pelagic longline, gillnet, jig/troll, and trawl fisheries, short-tailed albatross populations are not declining due to seabird bycatch in commercial fisheries (USFWS 2008). Other threats include contamination from organochlorines, pesticides, metals, and oil, and consumption of plastics. There has been an observed increase in the occurrence of plastics in birds on Torishima Island over the last decade, but the effect on survival and population growth is not known (USFWS 2008).

Fishery impacts

Fisheries have the potential to impact short-tailed albatross populations primarily through bycatch of individuals (USFWS 2008). Albatross, like many seabirds, attack baited hooks of longlines after the hooks are deployed; if they get hooked or snagged, they can be pulled underwater with the rest of the gear and drown (USFWS 2008). Short-tailed albatross may also potentially interact with trawl fisheries. Seabirds, including other albatrosses, fly behind vessels or float in offal plumes that trail beyond vessels, where they can strike the trawl cables (warps) or the sonar cable (third wire) attached to the net (NOAA 2006) or become entangled on the outside of nets towed at or near the surface; those striking cables are very unlikely to show up on the vessels deck to be sampled (USFWS 2008). To date, no short-tailed albatross have been observed to be taken in trawl fisheries, but they have been observed near trawl vessels, and the more abundant black-footed albatross has been observed to be taken in West Coast groundfish trawl fisheries (see further discussion below).

Seabird bycatch in commercial fisheries is a known or potential threat for U.S. and international demersal and pelagic longline fisheries, gillnet fisheries, jig/troll fisheries, and trawl fisheries. Biological opinions issued by the U.S. Fish and Wildlife

Service currently limit incidental take of short-tailed albatross in Alaska fisheries to two birds in two years for the Pacific halibut longline fishery, four birds in two years for the groundfish longline fishery, and two birds over the time period in which the current biological opinion remains in effect for the trawl fishery (USFWS 2003).

Impacts, all fisheries

There have been 16 reported lethal takes of short-tailed albatross in commercial fisheries since 1983; most of these were in hook-and-line fisheries, although some were in net fisheries (Table 20). The most recent reports—two takes in the Alaskan cod longline fishery and one take in the West Coast sablefish longline fishery—were the first reported in U.S. fisheries since 1998.

California, Oregon, Washington One known lethal take of short-tailed albatross has been reported off the West Coast of the continental U.S. In April 2011, a single short-tailed albatross juvenile was reported caught by longline gear in the limited entry sablefish fishery approximately 65 kilometers off the Oregon coast (WCGOP, unpubl. data).

Japan, Russia There is virtually no seabird bycatch information reported from Japanese fisheries, although it is likely that take has occurred in pelagic fisheries in Japan's Exclusive Economic Zone (EEZ); during brood rearing, adults forage for food off the east coast of Honshu, and individuals on Torishima Island have been observed with fishhooks in their mouths of the same type used in Japanese commercial fisheries (USFWS 2008). There is also inadequate seabird bycatch information from Russian fisheries, although demersal longline fisheries in the Russian EEZ are a known threat to short-tailed albatross (USFWS 2008), and short-tailed albatross have been taken in driftnet fisheries that still operate in the Russian EEZ (see Table 20).

Alaska and Hawaii No known takes of short-tailed albatross have been reported in domestic pelagic longline fisheries in the North Pacific. Demersal longline fisheries in the U.S. EEZ off Alaska (Bering Sea/Aleutian Islands area and Gulf of Alaska) are a known threat to short-tailed albatross, with almost all known takes occurring in demersal longline groundfish fisheries; no takes have been reported in groundfish trawl or pot fisheries. Two separate analyses for the demersal groundfish longline fisheries have estimated that, on average, one short-tailed albatross is taken in the Bering Sea hook-and-line fishery each year (Stehn et al. 2001), and mitigation measures have likely reduced this rate since those estimates were developed. U.S.-based pelagic longline swordfish and tuna fisheries in the vicinity of the Hawaiian Islands have the potential to affect short-tailed albatross; overall seabird (and albatross) bycatch rates have declined in Hawaii's pelagic longline fishery since bycatch reduction regulations were promulgated (Gilman and Kobayashi 2005, NMFS 2011). A recent analysis of the continued operation of the Hawaii-based pelagic longline fisheries (NMFS 2011) calculated rates of incidental take of short-tailed albatross of one per year for both the shallow-set longline and deep-set longline fisheries. The rate of incidental takes of seabirds in general and albatross in particular has declined markedly in Alaskan demersal longline fisheries since bycatch reduction regulations were instituted (USFWS 2008).

Table 20: Known short-tailed albatross mortalities associated with North Pacific and West Coast fishing activities since 1983. Data from USFWS (2008), NOAA Fisheries Information Bulletin 10-93 (2010), Yamashina Institute of Ornithology (YIO), and the West Coast Groundfish Observer Program (WCGOP). "In sample" refers to whether a specimen was in a sample of catch analyzed by a fisheries observer. n/a = not applicable

Date	Fishery	Observer program?	In sample?	Bird age	Location	Source
7/15/1983	Net	No	n/a	4 months	Bering Sea	USFWS (2008)
10/1/1987	Halibut	No	n/a	6 months	Gulf of Alaska	USFWS (2008)
8/28/1995	IFQ sablefish	Yes	No	1 year	Aleutian Islands	USFWS (2008)
10/8/1995	IFQ sablefish	Yes	No	3 years	Bering Sea	USFWS (2008)
9/27/1996	Hook-and-line	Yes	Yes	5 years	Bering Sea	USFWS (2008)
1/8/1997	?	n/a	n/a	8 months	Pacific Ocean, Japan	YIO (unpubl. data)
4/23/1998	Russian salmon drift net	n/a	n/a	Hatch-year	Bering Sea, Russia	USFWS (2008)
7/8/1998	Russian salmon drift net	n/a	n/a	3 months	Bering Sea, Russia	YIO (unpubl. data)
9/21/1998	Pacific cod hook-and-line	Yes	Yes	8 years	Bering Sea	USFWS (2008)
9/28/1998	Pacific cod hook-and-line	Yes	Yes	Sub-adult	Bering Sea	USFWS (2008)
7/11/2002	Russian ?	n/a	n/a	3 months	Sea of Okhotsk, Russia	YIO (unpubl. data)
8/29/2003	Russian demersal longline	n/a	n/a	3 years	Bering Sea, Russia	YIO (unpubl. data)
8/31/2006	Russian ?	n/a	n/a	1 year	Kuril Islands, Russia	YIO (unpubl. data)
8/27/2010	Cod freezer longline	Yes	Yes	7-year old	Bering Sea/Aleutian Islands	NOAA Fisheries (2010)
9/14/2010	Cod freezer longline	Yes	Yes	3-year old	Bering Sea/Aleutian Islands	NOAA Fisheries (2010)
4/7/2011	Sablefish demersal longline	Yes	Yes	1-year old	Pacific Ocean/Oregon	WCGOP (unpubl. data)

Impacts, West Coast Groundfish Fisheries

Since 2002, there have been three interactions reported between short-tailed albatross and West Coast groundfish fisheries. From 2002–2009, there were two observed fishery interactions with short-tailed albatross reported by the West Coast Groundfish Observer Program (Figure 22). Both interactions in 2002 were recorded opportunistically as "feeding on catch only" and were not recorded as resulting in mortality (Table 1 in Jannot et al. 2011). In 2011, a single short-tailed albatross was reported caught and killed by longline in the limited entry sablefish fishery approximately 65 kilometers off the Oregon coast (WCGOP, unpubl. data).

Overlap does occur between the West Coast groundfish fisheries and areas and habitat that short-tailed albatross use, so there is potential for impacts from bycatch (Figure **23**). However, there is a paucity of information on short-tailed albatross distribution, which makes risk assessment and impact analysis particularly challenging. When certain endangered species are too rare for quantifying the effects of an activity, a surrogate species may be used (USFWS and NOAA Fisheries Endangered Species Consultation Handbook, p. 4–47). Patterns of North Pacific distribution and habitat use (Fischer et al. 2009) support using black-footed albatross as a proxy for short-tailed albatross. Albatrosses are vulnerable in the North Pacific to longline fishing wherever they co-occur, and takes of both species have occurred in similar habitats and areas to date; the majority of black-footed albatross takes in observed fisheries (limited entry sablefish primary fixed gear and at-sea hake sectors) have also occurred along the shelf-break and north of Cape Mendocino (see Figure 22). Black-footed albatross and short-tailed albatross occupy similar geographic ranges, are similar in size, and exhibit similar feeding behavior, and both have been documented as bycatch in West Coast fisheries (Jannot et al. 2011) and other U.S. fisheries. Black-footed albatross are thus appropriate surrogates to assess the effects of a proposed action and estimate take on endangered short-tailed albatross (USFWS 2004a, NMFS 2011).

Recent analyses by Washington Sea Grant scientists reinforce the use of information on black-footed albatross as a proxy or surrogate for short-tailed albatross (Guy et al. unpubl. data). The authors compiled satellite telemetry data, fisheries-independent surveys, and fisheries-dependent at-sea surveys to examine distribution of short-tailed, black-footed, and Laysan albatross off the West Coast of the U.S. Satellite telemetry data suggested that black-footed and short-tailed albatross spent similar proportions of time among NMFS management areas delineated in PFMC (2008) as well as among depth strata (shelf: <200 m; shelf-break: 200 m–1,000 m; slope-pelagic: >1,000 m). By contrast, a third species, Laysan albatross, spent proportionally more time in slope and less time in shelf-break habitats as well as proportionally greater time in the southernmost NMFS management areas (Guy et al., unpubl. data). Fisheries-independent surveys of black-footed albatross showed similar spatial patterns to the satellite telemetry data as well as considerable spatial overlap (both among depth strata and NMFS management zones) with West Coast groundfish fishery effort, particularly the fixed gear, Pacific hake mid-water trawl, and limited entry bottom trawl fishery sectors (Guy et al., unpubl. data).

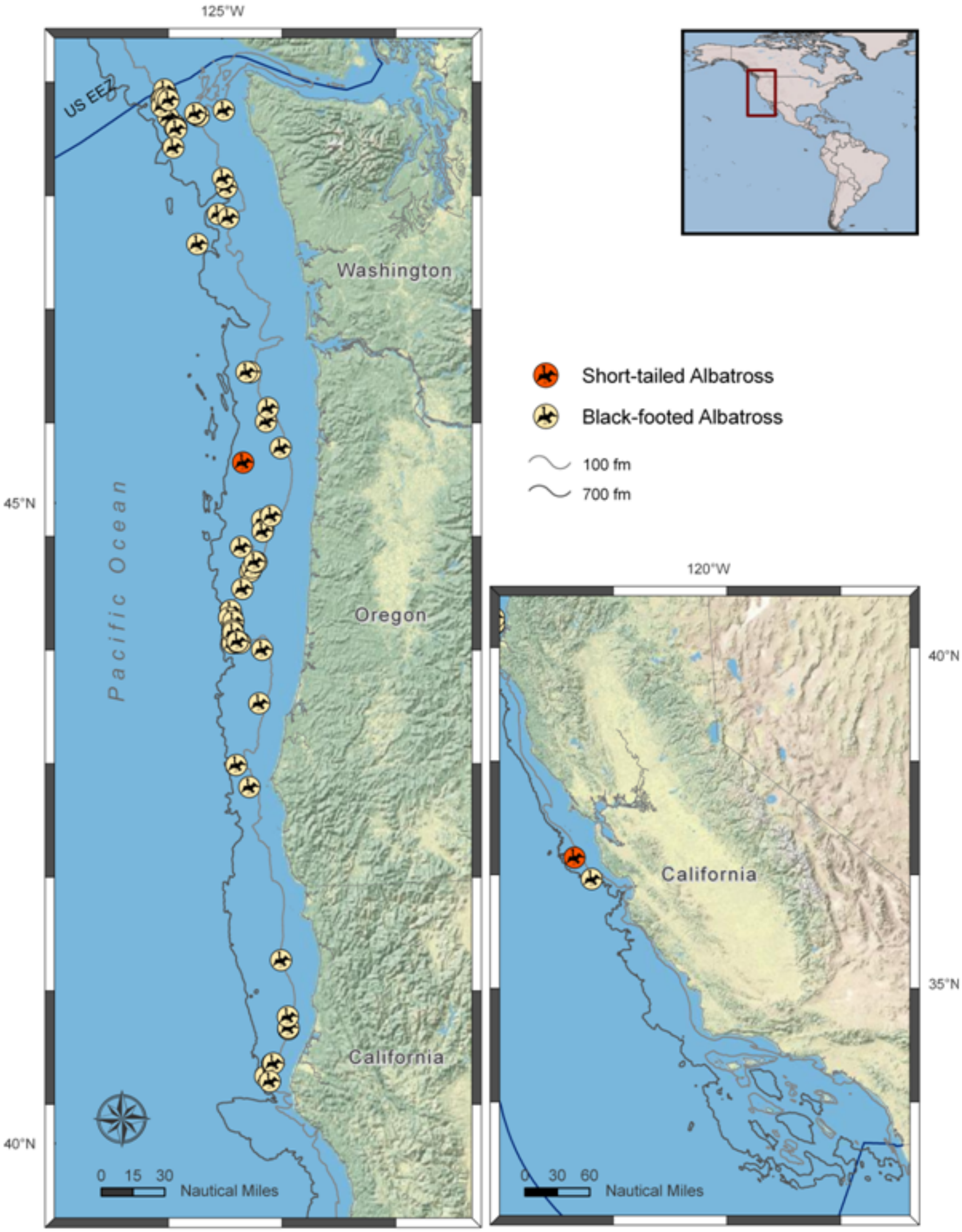

Figure 22: Geographic distribution of black-footed takes and short-tailed albatross interactions by the West Coast Groundfish Observer Program and the At-Sea Hake Observer Program from 2002–2009 (Adapted from Jannot et al. 2011). Takes are either randomly observed (i.e., contribute to bycatch estimates), recorded opportunistically (i.e., non-random, do not contribute to bycatch estimate), or both. Both of the short-tailed albatross interactions were recorded as "feeding on catch only" and did not result in mortality.

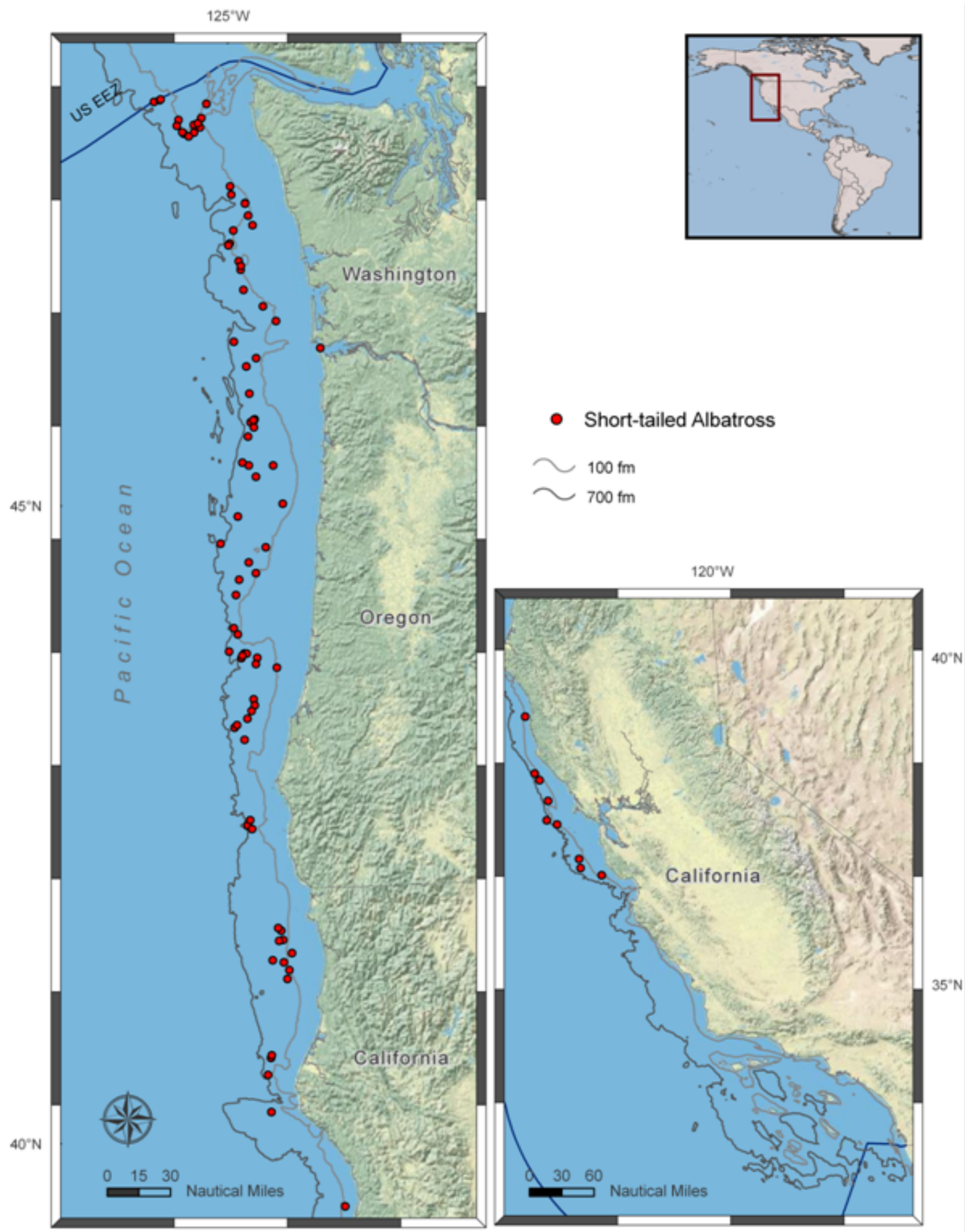

Figure 23: Geographic distribution of opportunistic sightings of short-tailed albatross by the West Coast Groundfish Observer Program from 2001–July 2011.

Opportunistic sightings by fisheries observers of short-tailed albatross also support use of black-footed albatross as a surrogate; data collected by West Coast groundfish fisheries observer programs (Figure 23) show a distribution of sightings largely along the shelf-break that is very similar to the observed takes of black-footed albatross (Figure 22).

Finally, the proportion of opportunistic sightings of short-tailed albatross among NMFS management zones (Figure **24**) and depth strata (Figure **25**) were similar to that found for black-footed and short-tailed albatross satellite telemetry data and fisheries-independent survey data for black-footed albatross (Troy Guy, pers. comm.).

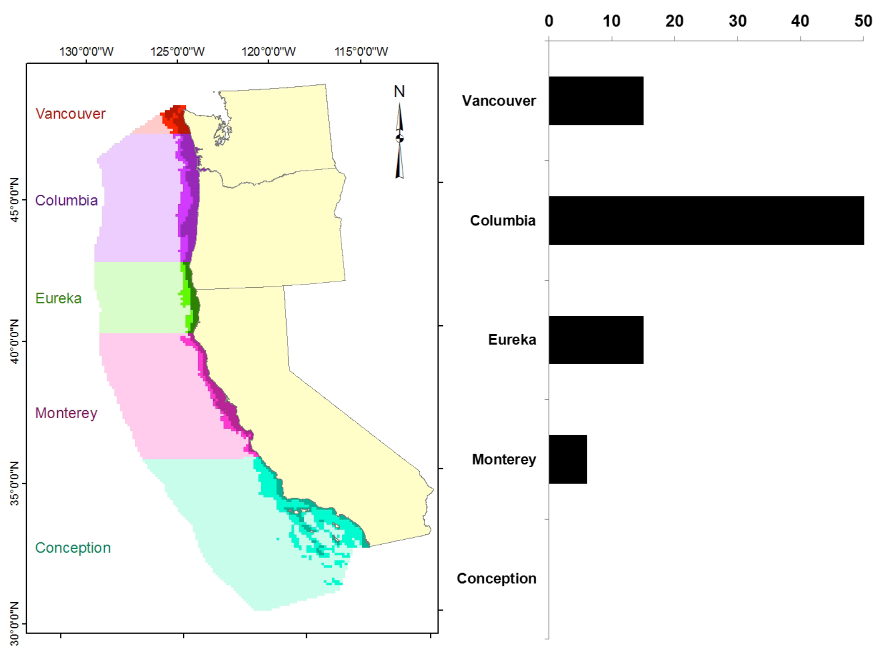

Figure 24: Short-tailed albatross opportunistic sightings in five NMFS management areas. Data from WCGOP fisheries from 2001 to May 2011. Colors delineate management area boundaries; shading delineates bathymetric zones. Figure prepared by Troy Guy, Washington Sea Grant.

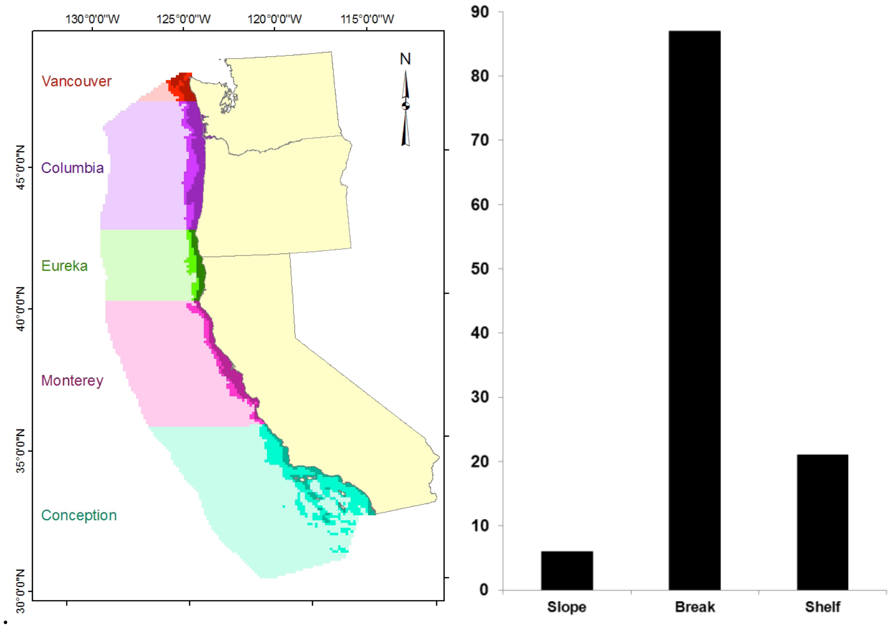

Figure 25: Short-tailed albatross opportunistic sightings in three bathymetric zones. Data from WCGOP fisheries from 2001 to May 2011. Colors delineate management area boundaries; of management areas; shading delineates bathymetric zones. Figure prepared by Troy Guy, Washington Sea Grant.

Short-tailed albatross incidental take estimate based on black-footed albatross mortality rates

West Coast Groundfish Observer Program observers have been deployed aboard vessels since 2001 to document protected species interactions, collect fishery-related information, and perform other biological sampling. The probability of a hooked seabird being observed is a function of observer coverage, the prioritization of the observers' duties onboard the vessels, and the observation skills and reporting accuracy of these individuals (USFWS 2004a, NMFS 2011).

Some groundfish fishery sectors (i.e., non-nearshore fixed gear/limited entry sablefish endorsed) had less than 100% observer coverage from 2002–2009, so observed interactions must be expanded beyond the observer coverage (~9–37% of landings) to estimate fleet-wide interactions (Jannot et al. 2011). This makes estimation of mortality of rare species, such as short-tailed albatross, very difficult because estimates based on a combination of low observer coverage and small numbers of observed takes are typically very uncertain (Jannot et al. 2011). Obtaining a reliable estimate of take when the observed number of takes is 0 or 1 is obviously particularly problematic, and the West Coast Observer Program does not attempt to estimate a fishery-wide take level in such situations.

Because short-tailed albatross take has been too rare for accurately quantifying levels of take in the WCGF, we used black-footed albatross as a surrogate species to estimate the annual mortality rate of short-tailed albatross by the WCGF (see also USFWS 2004a, NMFS 2011). Black-footed albatross are much more common than short-tailed albatross, and annual observed levels of take of this species in WCGF (both fixed gear and trawl) have ranged from 0–48 from 2002–2009, with estimated take from 0–91 (Jannot et al. 2011). Black-footed albatross are similar to short-tailed albatross in size, feeding behaviors, and patterns of distribution documented in surveys and via telemetry studies (see discussion in previous section), making them a reasonable proxy for the much less common short-tailed albatross.

Even with 100% observer coverage, all interactions might not be recorded because animals that become hooked on gear may fall off while the gear is in the water, and thus not be observed (Ward et al. 2004, Gilman et al. 2005). These "drop-offs," along with post-hooking mortality, are often referred to as "unseen mortality." Previous modeling efforts (USFWS 2004a, NMFS 2011) included a correction factor of 31% for drop-offs citing studies of pelagic longline fisheries (Ward et al. 2004, Gilman et al. 2005). Ward et al. (2004) demonstrated that drop-off rates in pelagic longline fisheries may underestimate seabird mortality by as much as 45% on the portions of a set that have soaked the longest. At present, drop-off rates for demersal longline fisheries have not been estimated for West Coast Groundfish Fisheries or for demersal longline fisheries in general (S. Fitzgerald, pers. comm.). In addition, the ratio of observed to unobserved take in trawl fisheries is also unknown, but there is likely to be unobserved take (S. Fitzgerald, pers. Comm.; Ed Melvin pers. Comm.). To take into account uncertainty in this factor, a range of correction factors from 0 to 45%, including the 31% used previously (USFWS 2004a, NMFS 2011), was used here to bracket estimates of short-tailed albatross incidental take.

The short-tailed albatross take (**T**) estimate for the West Coast groundfish fisheries is calculated as follows (following the approach of NMFS 2011):

T = **M** x **A** x **N**

Where:
M = Fishing mortality of surrogate species (black-footed albatross) = (annual mean estimated number of black-footed albatross in West Coast groundfish fisheries) + (annual mean estimated number of black-footed albatross in West Coast groundfish fisheries * drop-off adjustment) / black-footed albatross global population estimate
A = correction factor to account for differences in distribution between the species
N = Short-tailed albatross population estimate

The annual population level fishing mortality rate in the WCGF (**M**) for black-footed albatross is based on the 8-year (2002–2009) average of the estimated annual mortality of black-footed albatross by the West Coast groundfish fisheries reported in Jannot et al. (2011) (43.75 birds/year), adjusted by a drop-off or removal rate of 31%

(USFWS 2004a, NMFS 2011), and divided by the estimated black-footed albatross population size (245,234 in 2009; Flint 2009).

M = (43.75 + 43.75*0.31)/245,234 = **0.00023/year**.

When previously applied in Hawaiian fisheries, the at-risk area fraction (**A**) was a multiplier that accounted for the fraction of the short-tailed albatross range that overlaps with the fisheries of interest. In the case of the Hawaiian longline fisheries, the black-footed albatross range completely overlapped with the fishery in question, so the at-risk fraction (0.245) was simply derived by dividing the longline fisheries area by the short-tailed albatross range. In our case, black-footed and short-tailed albatross ranges both overlap with the West Coast groundfish fisheries to a similar extent and both species are traveling distances to enter the area; thus, no multiplier is needed to account for differences between the species.

A = **1**

N is the most recent population estimate for short-tailed albatross, which is 3,463 (P. Sievert and H. Hasegawa, unpubl. data).

Therefore,
T = M x **A** x **N**
T = **0.00023 x 1 x 3,463**
T = 0.8

The estimated short-tailed albatross take in the West Coast groundfish fisheries is **0.8** individuals per year.

Sensitivity analyses

This estimate can be influenced by uncertainty in the bycatch estimates of black-footed albatross, the assumed drop-off rate, and the population sizes of the two species. Here, we evaluate the sensitivity of the estimate to the first two sources of uncertainty. Using the lower 90% (21.13/year) and upper 90% (93.5/year) confidence limits for mean annual bycatch estimates of black-footed albatross and a range of drop-off rate scenarios results in a range of values of short-tailed albatross take (T) between 0.30 and 1.91 (Table **21**).

Table 21: Sensitivity analyses of the influence of varying bycatch drop-off rates and black-footed bycatch estimates on estimates of T for short-tailed albatross. Drop-off rates from discussion in NMFS (2011) and mean annual black-footed albatross bycatch rates for 2002–2009 from Jannot et al. (2011) were incorporated into calculations of M for black-footed albatross and then T for short-tailed albatross.

Drop-off rate	**T (short-tailed albatross/year)**		
	Estimate	**Lower 90% BFAL C.L.**	**Upper 90% BFAL C.L.**
0%	0.62	0.30	1.32
27%	0.78	0.38	1.68
31%	0.81	0.39	1.73
45%	0.90	0.43	1.91

Several additional factors could also potentially bias this estimate. With an increasing global short-tailed albatross population (H. Hasegawa, unpubl. data), interactions with fisheries are likely to increase, all else being equal. Opportunistic sightings have been increasing since the observer program began in 2001 (see paragraph below). Exposure to risk could be affected by time spent over the year in the West Coast fisheries areas as opposed to open ocean areas where transiting largely occurs. Exposure could be influenced by temporal overlap of the fisheries and short-tailed albatross presence off the West Coast. Most importantly, the estimates presented here are predicated on black-footed albatross being used as a surrogate for short-tailed albatross. This assumes that the two albatross species have the same mortality rates in the fisheries in question, the same distribution throughout the area (i.e., of the total populations of each species, the same proportion of each species occurs within the West Coast groundfish fisheries area), the same behavior with respect to interacting with vessels (taking bait, etc.), and the same mortality rate once hooked or otherwise impacted.

As additional data are collected or compiled and analyzed (e.g., black-footed albatross bycatch estimates for 2010 and 2011), it may be possible to explore additional methods of estimated short-tailed albatross take. For example, it may be possible to use ratios of STAL/BFAL abundance in the WGCF action area or the take ratio of the two species in other fisheries to obtain another semi-independent estimate of short-tailed albatross take. Higher levels of observer coverage would also be valuable for improving take estimates of this and other rare species.

The level of take estimated using this proxy method, 0.8 per year, is generally consistent with both the observed take (considering the level of observer coverage) and the co-occurrence of short-tailed albatross near the WCGF (Figure 23). Sightings of short-tailed albatross by WCGF observers are relatively common compared to some other fisheries. For example, in Hawaiian longline fisheries, 100% observer coverage has yielded 16 sightings over the last 11 years—one in 2000, two in 2004, three in 2007, three in 2008, three in 2009, and four in 2010 (NMFS unpubl. data); considerably lower observer coverage in the West Coast groundfish fisheries has yielded 95 short-tailed albatross sightings over the last 11 years—four in 2001, 14 in 2002, five in 2003, five in 2004, five in 2005, four in 2006, three in 2007, two in 2008, 16 in 2009, 18 in 2010, and 19 through July 2011 (Figure **23**; WCGOP, unpubl. data).

The short-tailed albatross take estimates presented here are based on black-footed albatross bycatch data collected largely in the absence of seabird bycatch mitigation measures. While some longline vessels in the groundfish fishery use streamer lines and other seabird avoidance gear voluntarily, organized efforts promoting the use of streamer lines have only begun in the last two years. Washington Sea Grant initiated a NMFS-supported streamer line distribution pilot program with tribal fisheries in 2009 and the major longline ports in the Oregon and Washington West Coast Groundfish Observer Program in 2010 (WA Sea Grant 2011). West Coast Groundfish Observer Program observers began documenting the use and characteristics of seabird avoidance gear on fixed gear vessels in 2009, and this information should be available for future analyses of bycatch of short-tailed and black footed albatross in future years (Jannot et al. 2011).

Habitat and trophic effects

West Coast groundfish fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Short-tailed albatross feed on squid, small fish (including bonitos [Sarda sp.], flying fishes [Exocoetidae] and sardines [Clupeidae]), flying fish eggs, and crustaceans, which are generally not targeted by demersal and trawl fisheries (USFWS 2003)). Indirect trophic effects of the West Coast groundfish fisheries are also expected to be minor and in fact may positively affect the abundance of squid and small fishes through removal of their predators (Appendix A).

Impact of WCGF fisheries on population growth rate

Based on the information summarized above, West Coast groundfish fisheries are imposing some additional (non-natural) mortality on short-tailed albatross. The number of takes per year is very likely to be higher than the number of takes observed (one lethal take over the period of 2002–2011), and based on the black-footed albatross mortality rate, is probably ~1/year and unlikely to be >2/year (Table **21**). On its own, this level of mortality is very small compared to the annual growth rate of the population (~6.5%; currently >200 birds/year). Even when combined with known mortality from other fisheries (Table 20), we see no reason to change the conclusion from the Recovery Plan that mortality from fishing is not a significant impediment to the growth and recovery of the species (USFWS 2008). Analyses of the impacts of Alaskan trawl mortality on the Torishima short-tailed albatross population suggest that trawl-related bycatch exceeding the current expected incidental take in that fishery (two takes in any 5-year period) by even a factor of 10 would have little impact on when the species' proposed recovery goals are achieved (Zador et al. 2008). Our analysis quantifies the level of mortality in another set of fisheries, but does not change the basic conclusion that, at present, the level of estimated fishing mortality is small compared to the annual growth rate of the population. Use of mitigation measures, such as streamer lines or integrated weighted lines like those employed in Alaskan fisheries, would be expected to reduce take even further (USFWS 2008, WA Sea Grant 2011).

*California least tern (*Sterna antillarum browni*)*

General biology[17]

The California least tern is the smallest of the North American terns and is found along the Pacific Coast of California, from San Francisco southward to Baja California. California least terns nest in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal action. The typical colony size is 25 pairs. Most individuals begin breeding in their third year. Their nest is a simple scrape in the sand or shell fragments. A typical clutch is 2 eggs, and both parents incubate and care for the young. They can re-nest up to two times if eggs or chicks are lost early in the breeding season. They are very gregarious and forage, roost, nest, and migrate in colonies. Fall migration commences the last week of July and first week of August. Several weeks before fall migration, adults and young wander along marine coastlines, congregating at prime fishing sites.

Birds breed at 2-3 years, and clutches are usually 2–3 eggs, mostly May–June (July–August nests are likely re-nesting attempts). Incubation usually lasts 20–25 days and is primarily done by the female. Young are tended by both parents, brooded for several days, fly at about 3–4 weeks, and are dependent for a few weeks more. The expected breeding life of an adult (once it has first bred) may be up to 9 years.

The species eats mainly small fishes (generally less than 9 cm long, such as anchovy, topsmelt, surf-perch, killifish, and mosquitofish), obtained by diving from air into shallow water. When breeding, California least terns forage within a few hundred meters of the colony.

Range, migratory behavior, and stock structure

Breeding Range

The California least tern breeding range today is the Pacific Coast of Baja and Alta California, south of the San Francisco Bay Area. Nesting has also occurred sporadically but increasingly at inland sites in the Bay-Delta and Central Valley (USFWS 2009a).

Marine Range

There is scant information, but the non-breeding range is presumed to be the Pacific Coast of North America from central Mexico south to Panama (USFWS 2009a).

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[17] Most of the material in this section is from: U.S. Fish and Wildlife Service (USFWS). 2006. California least tern (*Sternula antillarum browni*) 5-Year Review Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad, CA. 35 p.

Habitat use

California least terns forage primarily in near shore ocean waters and in shallow estuaries and lagoons. Some adults also feed close to shore in ocean waters. At colonies where feeding activities have been studied, the birds foraged mostly within 3.2 km of the breeding colony and primarily in near shore ocean waters less than 18.3 m deep.

Critical habitat

Critical habitat has not been designated for this species.

Status

The California least tern was originally listed as endangered in 1970 (FR notice: 35 FR 8491). The California least tern Recovery Plan was issued 27 September 1985, which was a revised version of a 1980 revision. A recent status review recommended that the species be down listed to "threatened" status (USFWS 2006).

Abundance and trend

Historically abundant, California least tern numbers had declined to about 600 pairs in the United States at the time of listing. Since then, mostly through active management, the numbers have increased about ten-fold. Breeding numbers of California least terns increased in California from about 600 pairs in the mid-1970s to about 1,200 pairs in 1983, declined by about 25% to around 1,000 pairs from 1984 to 1987 (possibly due to El Nino effects), increased to about 2,800 pairs through about 1994, and increased to approximately 7,100 pairs by 2005 (USFWS 2006).

The California least tern has been concentrated in Los Angeles, Orange, and San Diego counties. The Santa Margarita River mouth in San Diego County generally has supported the largest numbers of terns in recent years. Between Ventura County and the San Francisco Bay area, only Purisma Point and Mussel Rock Dunes (formerly called Guadalupe Dunes), and Vandenberg have been used regularly. Although the annual rate of population change has been variable and sometimes negative, the net result has been a population increase.

Threats (from action plan (USFWS 2009a) or 5-year review (USFWS 2006)

California least tern face significant threats, although these are primarily confined to factors affecting breeding colonies on land. These threats include:

- Destruction of nest sites and curtailment of foraging areas by coastal and marine development
- Modification of nest site habitat by invasive plant species;
- Predation of eggs and chicks; and
- Disturbance at nest sites; reduction in food availability due to climate cycles (e.g., El Nino) and global climate change; flooding of nest sites due to sea level rise; oil spills; increased predators (types and density) due to urbanization.

Major problems include: human use and development of nesting habitat; predation on adults, eggs, and young by birds (e.g., kestrels, night-herons) and mammals (foxes, skunks, and domestic cats and dogs); reduced number of suitable nesting areas, which limits or eliminates tern's anti-predator strategy of shifting among different nesting areas in different years; contaminant levels in eggs; and El Nino conditions may adversely affect population dynamics (NatureServe 2011).

Fishery impacts

Fisheries are unlikely to impact California least tern populations directly through bycatch of individuals. California least terns forage primarily in estuaries, lagoons, and in nearshore environments—inshore of most commercial fisheries. They are also surface feeding birds, preying on a variety of small fishes in shallow waters. When breeding, they forage within a few hundred meters of the colony in waters < 18 m deep. Interactions with fisheries are not mentioned as a threat to the species in the most recent status review (USFWS 2006).

Impacts, all fisheries

There have been no reported lethal takes of California least tern in commercial fisheries.

Impacts, West Coast Groundfish Fisheries

There have been no reported lethal takes of California least tern in West Coast groundfish fisheries. There have been no reports of entangled individuals of this species in California beach monitoring surveys (Moore et al. 2009).

Some overlap does occur between West Coast groundfish fisheries and areas and habitat California least tern use, so there is potential for interaction. However, any potential interactions would be confined to fisheries prosecuted in nearshore areas in southern California and no interactions have been recorded from 2002–2009 in any of the groundfish sectors observed by the West Coast Groundfish Observer Program (Jannot et al. 2011).

Recent compilation of fisheries-independent surveys by Washington Sea Grant scientists (Guy et al., unpubl. data) found that sightings of California least terns were rare and largely confined to the California Bight.

Habitat and trophic effects

West Coast groundfish fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). California least tern feed on mainly small fishes (generally less than 9 cm long, such as anchovy, topsmelt, surf-perch, killifish, and mosquitofish), which are obtained by diving from air into shallow water and are generally not targeted by demersal and trawl fisheries. Indirect trophic effects of the West Coast groundfish fisheries are also expected to be minor and in fact may positively affect the abundance of squid and small fishes through removal of their predators (Appendix A).

Impact of WCGF fisheries on population growth rate

Based on the information summarized above, West Coast groundfish fisheries are not imposing additional (non-natural) mortality on California least tern.

*Marbled murrelet (*Brachyramphus marmoratus*)*

General biology[18]

The marbled murrelet is a small seabird that inhabits the coastal forests and nearshore marine environment along the Pacific Coast of North America from southern California to southern Alaska and the Aleutian Islands.

Marbled murrelets lay a single egg clutch, with incubation and rearing occurring from late March (in California) or late April (Pacific Northwest) through the summer. Fledging ranges from late May (California) or late June (Pacific Northwest) through late summer and early fall (McShane et al. 2004 and references therein).

Marbled murrelets feed on a large variety of small fishes and invertebrates. From McShane et al. (2004):

> In general, small schooling fish and large pelagic crustaceans (euphausiids, mysids, amphipods) represent main prey items for marbled murrelets, with Pacific sand lance (*Ammodytes hexapterus*), northern anchovy (*Engraulis mordax*), immature Pacific herring (*Clupea harengus*), capelin (*Mallotus villosus*), and smelt (Osmeridae) documented as the most common prey species taken.

Foraging occurs primarily in shallow water (< 98 feet), and feeding has been observed at depths from 9.8 to 89 feet (McShane et al. 2004 and references therein).

Range, migratory behavior, and stock structure and habitat use

The marbled murrelet breeding range extends from the Aleutian Islands to central California. Throughout most of its breeding range the marbled murrelet uses old-growth forests for nesting and near shore marine environments for foraging. In the Pacific Northwest and California, murrelets tend forage within 2 km of the coast during the breeding season, with somewhat greater dispersal during the non-breeding season.

Critical habitat

Critical habitat was originally designated for the marbled murrelet in Washington, Oregon, and California on May 24, 1996 (61 FR 26256). Federal and non-federal lands totaling 3,887,800 acres were designated to protect nesting habitats. The U.S. Fish and

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[18] All of the material in this section is taken directly from: U.S. Fish and Wildlife Service (USFWS). 2009b. Marbled Murrelet (*Brachyramphus marmoratus*) 5-Year Review. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, Lacey, WA. 108 p. or from McShane et al. (2004).

Wildlife Service proposed to revise critical habitat for the marbled murrelet in June 2008 by removing ~250,000 acres in northern California and Oregon from the 1996 designation, based on new information indicating the areas did not meet the definition of critical habitat. This proposed rule has not been finalized, and critical habitat for the murrelet remains unchanged from the 1996 designation. Critical marine habitat has not been designated.

Status

The Washington, Oregon, and California Distinct Population Segment of the marbled murrelet was originally listed as threatened in 1992 (FR notice: 57 FR 45328). The marbled murrelet Recovery Plan "Recovery Plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California" was issued on 24 September 1997. A recent 5-year status review in 2009 recommended no changes to the threatened status, noting the listed portion of the species had declined in abundance since the prior (2004) status review and that the recovery criteria for the species had not been met (USFWS 2009b).

Abundance and trend

The total marbled murrelet abundance in North America is estimated to be >900,000, but most of these occur in Alaska (Table 3.2-1 of McShane et al. 2004). The most recent abundance estimate of the listed portion of the species (WA, OR, CA) is 17,700 (95% CI: 14,600–21,000) from northern California to Washington and 174 (91–256) in central California (USFWS 2009b and references therein). The listed portion of the population has been declining since the initiation of monitoring programs in 2000, with a decline of 2.4–4.3% annually in northern CA, OR, and WA, and 15% annually in central CA (USFWS 2009b).

Threats

Original reasons for decline and threats as of the listing included loss of nesting habitat, poor breeding success, predation, gill-net mortality, oil spills and other marine pollution, and possible changes in prey abundance and distribution (USFWS 1997). Changes in threats reported in the 2004 5-year review include: a declining rate of annual habitat loss, particularly on federal lands; improved regulatory mechanisms due to federal and state listings and other state and federal regulation (especially theNorthwest Forest Plan); and new gill-netting regulations in northern California and Washington, which reduced the threat to murrelets (USFWS 2004b). Some threats continued or were assumed to be unchanged, including the lack of development of new habitat to replace historic loss/modification of habitat, predation, and threats from oil spills (USFWS 2004b).

The most recent 5-year review (USFWS 2009b) listed continuing and emerging threats. Terrestrial threats to marbled murrelet populations include the historic and ongoing loss and modification of nesting habitat through commercial timber harvests, human-induced fires, and land conversions, and to a lesser degree, through natural causes, such as wild fires and wind storms. Marine threats to marbled murrelets include changes in the food web and prey quantity and quality,declining prey populations, commercial and recreational fisheries for some prey stocks, some continued (but not quantified) gill-net mortality in northern Washington, high body loads of PCBs in Pacific herring in Puget Sound, HABs, and marine dead zones. Climate change is likely to exacerbate many of these threats result in terrestrial and marine environments.

Fishery impacts

Impacts, all fisheries

Marbled murrelets have been observed to be killed by entanglement in gill-nets, primarily when set in shallow water areas favored by the murrelets (see extensive discussion in McShane et al. [2004]). McShane et al. (2004, and references cited therein) estimated that a minimum of 30 marbled murrelets per year were killed in gill net fisheries in Washington's inland marine waters from 1993–2003, which was estimated to be 0.05–0.11% of the northern Washington population. Gillnet mortality was reported to be substantial in central California prior to 1987, but low to zero after that due to changed fishery regulations (McShane et al. 2004). There are no marine gill net fisheries in Oregon. Some mortality likely continues to occur in inland Washington marine waters and the northern Washington coast, but has not been recently quantified (USFWS 2009b).

Impacts, West Coast Groundfish Fisheries

There has been no reported mortality of marbled murrelets in West Coast groundfish fisheries, and these fisheries are not mentioned or discussed as a threat in the recent status reviews (McShane et al. 2004, USFWS 2009b). The WCGOP reported single interactions with marbled murrelets in 2001 and 2002 in northern California. Both of these occurred in the limited entry trawl sector and were reported as "boarded vessel only" (Table 1 and Figure 1 from Jannot et al. 2011; J. Jannot pers. comm.). However, other alcids were reported as bycatch in WCGF fisheries, including the common murre (*Uria aalge*) and unidentified alcid species (Table 8 of Jannot et al. 2011). Bycatch occurred in the at-sea hake, the CA halibut, limited entry trawl, and nearshore fixed gear sectors. The total level of take was relatively low, however. For example, the estimated common murre take for the WCGF was only 3.4/year from 2002–2009 (with some years not reported), and take of unidentified alcids averaged <1/year (Jannot et al. 2011).

Habitat and trophic effects

West Coast groundfish fisheries target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2

Description of the Fisheries). Marbled murrelet are small, pursuit diving birds, preying mainly on small fishes and euphausiids—species not targeted by demersal fixed gear and trawl fisheries. Indirect trophic effects of the West Coast groundfish fisheries are also expected to be minor and in fact may positively affect the abundance of squid and small fishes through removal of their predators (Appendix A).

Impact of WCGF fisheries on population growth rate

Based on the information summarized above, West Coast groundfish fisheries do not appear to be imposing additional (non-natural) mortality on marbled murrelets. However, some components of the fishery occur in the nearshore areas frequented by murrelets, and a much more common species with similar foraging behavior and diet—the common murre—has been occasionally reported as bycatch in these fisheries. However, the West Coast population of the common murre is approximately 62 times as abundant as the marbled murrelet—population size was estimated at 1.1 million in 1988–89 (Carter et al. 2001)—and likely forages over a broader marine area (Manuwal et al. 2001). The relatively low rate of bycatch of common murres (average of 3.4 per year; Jannot et al. 2011) in WCGF suggests that bycatch of marbled murrelets in these fisheries, although not impossible, is expected to be very rare.

References

Adams, P. B., C. Grimes, J. E. Hightower, S. T. Lindley, M. L. Moser, and M. J. Parsley. 2007. Population status of North American green sturgeon *Acipenser medirostris*. Environmental Biology of Fishes **79**:339-356.

Aguilar, A. 2009. Fin whale. Pages 433-437, *in* W.F. Perrin, B. Wursig, and H.G.M. Thewissen (eds.), Encyclopedia of Marine Mammals, Academic Press, San Diego, CA. 1316 pages.

Allen, B.M, and R. P. Angliss. 2010. Alaska marine mammal stock assessments, 2009. U.S. Department Commerce, NOAA Technical Memorandum NMFS-AFSC-206. 276 pages.

Allen, B.M. and R.P. Angliss. 2010. North Pacific Right Whale (*Eubalaena japonica*): Eastern North Pacific Stock. In: Alaska marine mammal stock assessments, 2009. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-206, pages 195-200.

Allen, B.M, and R. P. Angliss. 2011. Steller sea lion (*Eumetopias jubatus*): Eastern U. S. Stock. In: Alaska marine mammal stock assessments, 2010. U.S. Department Commerce, NOAA Technical Memorandum NMFS-AFSC-223. 292 pages.

Andrews, R. C. 1916. The sei whale (*Balaenoptera borealis* Lesson). Memoirs of the American Museum of Natural History, New Series 1(6):291-388.

Andrews, R.D.1, Straley, J.M., Schorr, G.S.3 Thode, A.M., Calambokidis, J., Lunsford, C.R., O'Connell, V.2011 Satellite tracking Eastern Gulf of Alaska sperm whales: local movements around the shelf-edge contrast with rapid, long-distance migrations across stock boundaries

Arnould, John P. Y. (2009) Southern fur seals (Arctocephalus spp), in Perrin, W. F.; Wursig, Bernd G. and Thewissen, J.G.M. (eds), *Encyclopedia of marine mammals*, pp. 1079-1084, Academic, London, England.

Ashford, J. R., Rubilar, P. S. and Martin, A. R.. 1996. Interactions between cetaceans and longline fishery operations around South Georgia. Marine Mammal Science 12:452-457.

Aurioles-Gamboa, D. and Hernandez-Camacho, C.J. 2006. Notes on the southernmost records of the Guadalupe fur seal, *Arctocephalus townsendi*, in Mexico. Marine Mammal Science, 15: 581-583.

Aurioles-Gamboa, D., Elorriaga-Verplancken, F., and Hernandez-Camacho, C.J. 2010. The current population status of Guadalupe fur seal (*Arctocephalus townsendi*) on the San Benito Islands, Mexico. Marine Mammal Science, 26:402-408.

Austin, O.L. 1949. The Status of Steller's Albatross. Pacific Science 3: 283-295. Environment Canada, 2008. Recovery Strategy for the Short-tailed Albatross (*Phoebastria albatrus*) and the Pink-footed Shearwater (*Puffinus creatopus*) in Canada [Final]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 44 pp.

Baker CS, Medrano-Gonzalez L, Calambokidis J, Perry A, Pichler F, Rosenbaum H, Straley JM, Urban-Ramirez J, Yamaguchi M, Von Ziegesar O, 1998. Population

structure of nuclear and mitochondrial DNA variation among humpback whales in the North Pacific. Molecular Ecology 7:695-707.
Baker, C. S., T. R. Loughlin, V. Burkanov, C. W. Matson, R. G. Trujillo, D. G. Calkins, J. K. Wickliffe, J. W. Bickham. 2005. Variation of mitochondrial control region sequences of Steller sea lions: the three-stock hypothesis. Journal of Mammalogy 6: 1075-1084.
Baker CS, Steel D, 2010. geneSPLASH: genetic differentiation of 'ecostocks' and 'breeding stocks' in North Pacific humpback whales. In: Symposium on the results of SPLASH humpback whale study Final report and recommendations (Calambokidis J, ed). Quebec City, Canda; 58-59.
Barlow, J. 1994. Abundance of large whales in California coastal waters: a comparison Of ship surveys in 1979/80 and in 1991. Rep. Int. Whal. Comm. 44:399–406.
Barlow, J. 1995. The abundance of cetaceans in California waters. Part 1: Ship surveys in summer and fall of 1991. Fishery Bulletin 93(1):1-14.
Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon, and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rept. LJ-97-11. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA. 25 pp
Barlow, J. 2003. Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991–2001. Administrative Report LJ-03-03, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Dr., La Jolla CA 92037. 31pp.
Barlow, J. 2010. Cetacean abundance in the California Current estimated from a 2008 ship-based line-transect survey. NOAA-TM-NMFS-SWFSC-456
Barlow, J. and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. Fishery Bulletin 105:509-526.
Barlow, J. and Taylor, B. L. 2005. Estimates of sperm whale abundance in the northeastern temperate Pacific from a combined acoustic and visual survey. Marine Mammal Science 21(3):429-445.
Barlow J, Calambokidis J, Falcone EA, Baker CS, Burdin A, Clapham P, Ford JKB, Gabriele C, LeDuc R, Mattila D, Quinn TI, Rojas-Bracho L, Straley JM, Taylor B, Urbán R J, Wade P, Weller D, Witteveen B, Yamaguchi M, 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science Early online. Available http://onlinelibrary.wiley.com/doi/10.1111/j.1748-7692.2010.00444.x/pdf.
Barlow J, Ferguson M, Becker E, Redfern J, Forney KA, Vilchis I, Fiedler P, Gerrodette T, Ballance L, 2009. Predictive modeling of cetacean densities in the eastern Pacific Ocean. NOAA Technical Memorandum NMFS-SWFSC-TM-444:206 pp.
Barlow J, Swartz SL, Eagle T, Wade P, 1995. U.S. Marine Mammal Stock Assessments: Guidelines for Preparation, Background, and a Summary of the 1995 Assessments. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-6, 73 p.
Barraclough, W. E. 1964. Contribution to the marine life history of the eulachon *Thaleichthys pacificus*. Bull. Fish. Res. Board Can. 21:1333–1337.

Beamesderfer, R. C. P., M. L. Simpson, and G. J. Kopp. 2007. Use of life history information in a population model for Sacramento green sturgeon. Environmental Biology of Fishes 79:315-337.

Bellinger , M.R.; Banks, M.; Weitkamp, L., and Lawson, P. 2009. Preliminary Report of Mixed Stock Analysis of Chinook Salmon in Pacific Whiting (Hake) Bycatch Collected Shoreside in Newport, Oregon. Project CROOS, http://www.pacificfishtrax.org/media/Chinook_bycatch_in_whiting.pdf

Bellman, M. A., S. A. Heppell, and C. Goldfinger. 2005. Evaluation of US west coast groundfish habitat conservation regulation via analysis of spatial and temporal patterns of trawl fishing effort. Canadian Journal of Fisheries and Aquatic Science 62:2886-2900.

Bellman, M., E. Heery, and J. Hastie. 2008. Estimated discard and total catch of selected groundfish species in the 2007 U. S. West Coast fisheries. Pacific States Marine Fisheries Commission and Northwest Fisheries Science Center, Fishery Resource Analysis and Monitoring Division, Seattle, WA. 77 p. Online at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/TotalMortality_update2007.pdf [accessed June 2011].

Bellman, M.A. and J. Hastie. 2008. Observed and Estimated Total Bycatch of Salmon in the 2005-2006 West Coast Limited-Entry Bottom Trawl Groundfish Fishery. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Bellman, M.A., Heery, E., and J. Majewski. 2009. Estimated discard and total catch of selected groundfish species in the 2008 U.S. West Coast fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/total_mortality_2008_0310-revision.pdf [accessed June 2011].

Bellman, M.A., E. Heery, J. Jannot, and J. Majewski. 2010. Estimated discard and total catch of selected groundfish species in the 2009 U.S. west coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/total_mortality_2009.pdf [accessed June 2011].

Bellman, M.A., E. Heery, and J. Majewski. 2010. Observed and estimated total bycatch of salmon in the 2008 U.S. west coast groundfish fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Bellman, M.A., J. Jannot, and J. Majewski. 2011. Observed and estimated total bycatch of salmon in the 2009 U.S. west coast groundfish fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Bellman, M.A., J. Jannot, and J. Majewski. 2011. Observed and estimated total bycatch of green sturgeon and eulachon in the 2002-2009 U.S. West Coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/green_sturgeon_eulachon_tm0209rpt_final.pdf [accessed May 2011].

Benson SR, 2002. Ecosystem Studies of Marine Mammals and Seabirds in Monterey Bay, CA, 1996-1999. M.S. Thesis. : San Jose State University.

Benson SR, Croll DA, Marinovic B, Chavez FP, Harvey JT, 2002. Changes in the cetacean assemblage of a coastal upwelling ecosystem during El Niño 1997-98 and the La Niña 1999. Progress in Oceanography 54:279-291.

Benson, S.R., Forney, K.A., Harvey, J.T., Carretta, J.V., and Dutton, P.H. 2007. Abundance, distribution, and habitat of leatherback turtles (Dermochelys coriacea) off California 1990-2003. Fisheries Bulletin 105(3):337-347.

Benson, S.R., Eguchi, T., Foley, D.G., Forney, K.A., Bailey, H., Hitipeuw, C., Betuel P. Samber, B.P., Ricardo F. Tapilatu, R.F. Rei, V., Ramohia, P., Pita, J., and Dutton, P.H. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea." Ecosphere, Vol. 2 No. 7.

Berman-Kowalewski, M., F.M.D. Gulland, S. Wilkin, J. Calambokidis, B. Mate, J. Cordaro, D. Rotstein, J. St. Leger, P. Collins, K. Fahy, and S. Dover. 2010 Association between blue whale (*Balaenoptera musculus*) mortality and ship strikes along the California coast. Aquatic Mammals 36(1): 59-66.

Berzin, A. A. and A. A. Rovnin. 1966. The distribution and migrations of whales in the northeastern part of the Pacific, Chukchee and Bering seas. Izvestiya, Vladivostok. TINRO TOM 58:179–208.

Berzin, A.A. 1972. The sperm whale. Pacific Scientific Research Institute of Fisheries and Oceanography, Moscow. (Translation from Russian 1971 version by Israel Program for Scientific Translations, Jerusalem).

Best, P. B. 1993. Increase rates in severely depleted stocks of baleen whales. ICES J. Mar. Sci. 50:169-186.

Best, P.B. 1994. Seasonality of reproduction and the length of gestation in southern right whales, *Eubalaena australis*. Journal of Zoology 232:175-189.

Best, PB, and Kishino, H. 1998. Estimating natural mortality rate in reproductively active female southern right whales, *Eubalaena australis*. Marine Mammal Science. 14:738-749.

Betz, W., and M. Welch. 1992. Once thriving colony of leatherback sea turtles declining at Irian Jaya, Indonesia. Mar. Turtle Newsl. 56:8-9.

Bhaskar, S. 1985. Mass nesting by leatherbacks in Irian Jaya. WWF Monthly Report, January 1985:15-16.

Bickham, J. W., J. C. Patton, and T. R. Loughlin. 1996. High variability for control region sequences in a marine mammal: implications for conservation and biogeography of Steller sea lions (*Eumetopias jubatus*). Journal of Mammalogy 77: 95-108.

Biggs, D. C., Leben, R. R. and Ortega-Ortiz, J. G. 2000. Ship and satellite studies of mesoscale circulation and sperm whale habitats in the northeast Gulf of Mexico during GulfCet II. Gulf of Mexico Science 18:15-22.

Bleakney, J. S. 1965. Reports of marine turtles from New England and eastern Canada. Can. Field Nat. 79:120-128.

Bonner, W. N. 1986. Marine mammals of the Falkland Islands. British Antarctic Survey, Cambridge, UK.

Bost, C. A., and coauthors. 2009. The importance of oceanographic fronts to marine birds and mammals of the southern oceans. Journal of Marine Systems 78(3):363-376.

Broadhurst, M. K. 2000. Modifications to reduce bycatch in prawn trawls: A review and framework for development. Revs. Fish Biol. Fish. 10:27–60.

Broadhurst, M. K., P. Suuronen, and A. Hulme. 2006. Estimating collateral mortality from towed fishing gear. Fish Fish. 7:180–218.

Brown, R. F., S. D. Riemer, and B. E. Wright. 2002. Population status and food habits of Steller sea lions in Oregon. Rep. from Oregon Dept. of Fish and Wildlife to Oregon State Univ. Contract F0225A-01. 17 pp.

Brownell, R.L. Jr., P.J. Clapham, T. Miyashita and T. Kasuya. 2001. Conservation status of north Pacific right whales. J. Cetacean Res. Manage. (Special issue) 2:269-286.

Builder Ramsey, T., T. A. Turk, E. L. Fruh, J. R. Wallace, B. H. Horness, A. J. Cook, K. L. Bosley, D. J. Kamikawa, L. C. Hufnagle Jr., and K. Piner. 2002. The 1999 Northwest Fisheries Science Center Pacific West Coast upper continental slope trawl survey of groundfish resources off Washington, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-55. Online at http://www.nwfsc.noaa.gov/assets/25/4277_06162004_130254_tm55.pdf [accessed May 2011].

Burkanov, V. 2009. Russian Steller Sea Lion Research Update. AFSC Quarterly Research Reports, Jan-Feb-Mar 2009. pp 6-11.

Bustard, H.R. 1972. Australian Sea Turtles: Their Natural History and Conservation. Collins, London. 220 pp.

Calambokidis J, Steiger G, Ellifrit D, Troutman B, Bowlby C, 2004. Distribution and abundance of humpback whales and other marine mammals off the northern Washington coast. Fisheries Bulletin 102:563-580.

Calambokidis, J., A. Douglas, E. Falcone, and L. Schlender. 2007. Abundance of blue whales off the US West Coast using photo identification. Contract Report AB133F06SE3906 to Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 13p.

Calambokidis J, Falcone EA, Quinn T, Burdin A, Clapham P, Ford JKB, Gabriele C, LeDuc R, Matillia D, Rojas-Bracho L, Straley JM, Taylor B, Urban-Ramirez J, Weller D, Witteveen B, Yamaguchi M, Bendlin A, Camacho D, Flynn KR, Havron A, Huggins J, Maloney N, 2008. SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific. Final report for contract AB133F-03-RP-00078. Olympia, Washington: Cascadia Research.

Calambokidis, J., G.S. Schorr, G.H. Steiger, J. Francis, M. Bakhtiari, G. Marshall, E. Oleson, D. Gendron and K. Robertson. 2008. Insights into the underwater diving, feeding, and calling behavior of blue whales from a suction-cup attached video-imaging tag (CRITTERCAM). *Marine Technology Society Journal* 41(4):19-29.

Calambokidis, J., J. Barlow, J.K.B. Ford, T.E. Chandler, and A.B. Douglas. 2009. Insights into the population structure of blue whales in the Eastern North Pacific from recent sightings and photographic identification. Marine Mammal Science 25 (4): 816-832.

Calkins, D. G., and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Unpubl. Rep., Alaska Dep. Fish and Game, 333 Raspberry Road, Anchorage, AK 99518. 76 pp.

Calkins, D. G., and K. W. Pitcher. 1982. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 447-546, in: Environmental assessment of the Alaskan continental shelf. U.S. Dept. Comm. and U.S. Dept. Int., Final Rep. Principal Investigators, 19:1-565.

Carretta, J. V. and K. A. Forney. 1993. Report on two aerial surveys for marine mammals in California coastal waters utilizing a NOAA DeHavilland Twin Otter Aircraft: March 9-April 7, 1991 and February 8-April 6, 1992. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFSC-185. 77 pp.

Carretta, J.V., Lynn, M.S. and Leduc, C.A. 1994. Right whale (*Eubalaena glacialis*) sighting off San-Clemente Island, California. Mar. Mammal Sci. 10:101-5.

Carretta, J. V. and Chivers, S. J. 2004. Preliminary estimates of marine mammal mortality and biological sampling of cetaceans in California gillnet fisheries for 2003. Paper SC/56/SM1 presented to the IWC Scientific Committee, June 2004 (unpublished) [Available from the Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037].

Carretta, J.V., Price, T., Peterson, D., and Read, R. 2004. Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996-2002. Marine Fisheries Review, 66: 21-25.

Carretta, J.V., S.J. Chivers, and K. Danil. 2005. Preliminary estimates of marine mammal bycatch, mortality, and biological sampling of cetaceans in California gillnet fisheries for 2004. Administrative Report LJ-05-10, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 17 pp.

Carretta, J. V., Price, T., Petersen, D. and Read, R. 2005b. Estimates of marine mammal, sea turtles, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996-2002. Marine Fisheries Review 66(2):21-30.

Carretta, J. V. and Enriquez, L. 2006. Marine mammal bycatch and estimated mortality in California commercial fisheries during 2005. Administrative Report LJ-06-07, available from the Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 14p.

Carretta, J.V., Forney, K. A., Muto, M. M., Barlow, J., Baker, J., Hanson, B. and Lowry, M. S. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2005. U.S. Department of Commerce Technical Memorandum, NOAA-TM-NMFS-SWFSC-388, 317 p.

Carretta, J. V. and Enriquez, L. 2007. Marine mammal and sea turtle bycatch in the California/Oregon thresher shark and swordfish drift gillnet fishery in 2006. Administrative Report LJ-07-06, available from the Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 9p.

Carretta, J.V., Forney, K. A., Lowry, M. S., Barlow, J., Baker, J., Johnston, D., Hanson, B., Muto, M. M., Lynch, D. and Carswell, L. 2009. U.S. Pacific Marine Mammal Stock Assessments: 2008. U.S. Department of Commerce Technical Memorandum, NOAA-TM-NMFS-SWFSC- 434, 340 p.

Carretta, J.V. and L. Enriquez. 2009a. Marine mammal bycatch in the California/Oregon swordfish and thresher shark drift gillnet fishery in 2008. Administrative Report LJ-09-03. NOAA Fisheries, Southwest Fisheries Science Center, 3333 North Torrey Pines Court, La Jolla, CA 92037. 10p.

Carretta, J.V. and L. Enriquez. 2009b. Marine mammal and seabird bycatch observed in California commercial fisheries in 2007. Administrative Report LJ-09-01. NOAA Fisheries, Southwest Fisheries Science Center, 3333 North Torrey Pines Court, La Jolla, CA 92037. 12p.

Carretta, J. V., K. A. Forney, M. S. Lowry, J. Barlow, J. Baker, D. Johnston, B. Hanson, R.L. Brownell, Jr., J. Robbins, D.K. Mattila, K. Ralls, M. M. Muto, D. Lynch, and L. Carswell. 2010. U.S. Pacific Marine Mammal Stock Assessments: 2009. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-SWFSC-453. 336 pages.

Carretta J, Forney KA, Oleson E, Martien K, Muto M, Lowry M, Barlow J, Baker J, Hanson MB, Lynch D, Carswell L, Brownell RJ, Robbins J, Mattila D, Ralls K, Hill M, 2010. Draft U.S. Pacific marine mammal stock assessments: 2010. NOAA Technical Memorandum NMFS-SWFSC-TM-XXX.

Carretta, J.V. and L. Enriquez. 2010. Marine mammal and sea turtle bycatch in the California/Oregon swordfish and thresher shark drift gillnet fishery in 2009. Administrative Report LJ-10-03. NOAA Fisheries, Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA 92037. 11 p.

Carter, H. R., U. W. Wilson, R. W. Lowe, M. S. Rodway, D. A. Manuwal, J. E. Takekawa, and J. L. Yee. 2001. Population trends of the common murre (*Uria aalge californica*). Pages 33–132 *in* D. A. Manuwal, H. R. Carter, T. S. Zimmerman, and D. L. Orthmeyer, editors. Biology and conservation of the common murre in California, Oregon, Washington, and British Columbia. Volume 1: Natural history and population trends. U.S. Geological Survey, Information and Technology Report USGS/BRD/ITR– 2000-0012, Washington, D.C.

CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north-Atlantic areas of the U.S. Outer Continental Shelf. Cetacean and Turtle Assessment Program, Bureau of Land Management, BLM/YL/TR-82/03, Washington, D.C.

Chen, B.Y., and S.H. Mao. 1981. Hemoglobin fingerprint correspondence and relationships of turtles. Comp. Biochem. Physiol. 68B:497-503.

Chen, B.Y., S.H. Mao, and Y.H. Ling. 1980. Evolutionary relationships of turtles suggested by immunological cross-reactivity of albumins. Comp. Biochem. Physiol. 66B:421-425.

Chua, T.H. 1988. On the road to local extinction: the leatherback turtle (Dermochelys coriacea) in Terengganu, Malaysia. Pages 153-158 in A. Sasekumar, R. D'Cruz, and S. Lim Lee Hong (eds.), Proc. 11th Annual Seminar Malay. Soc. Mar. Sci. Univ. Malaya, Kuala Lumpur.

Clapham, P. J., S. Leatherwood, I. Szczepaniak, and R. L. Brownell. 1997. Catches of humpback and other whales from shore stations at Moss Landing and Trinidad, California, 1919-1926. Marine Mammal Science 13(3):368-394.

Clapham, P., C. Good, S. Quinn, R.R. Reeves, J.E. Scarff and R.L. Brownell, Jr. 2004.

Coleman, B. A. 1986. The 1980 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, length, and age composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS F/NWC-100. Online at: http://www.st.nmfs.noaa.gov/tm/nwc/nwc100.pdf [accessed May 2011].

Coleman, B. A. 1988. The 1986 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, length and age composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS F/NWC-152. Online at: http://www.st.nmfs.noaa.gov/tm/nwc/nwc152.pdf [accessed May 2011].

Colway, C. and D. E. Stevenson. 2007. Confirmed records of two green sturgeon from the Bering Sea and Gulf of Alaska. Northwestern Naturalist **88**:188-192.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle *(Carretta Carretta)* 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service, August 2009. 222 pages.

Cornelius, S.E. 1982. Status of sea turtles along the Pacific coast of Middle America. Pages 211-219 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, Washington, D.C. 583 pp.

Cornelius, S.E. 1986. The sea turtles of Santa Rosa National Park. Fundación de Parques Nacionales Costa Rica. 64 pp.

COSEWIC. 2003. COSEWIC assessment and status report on the sei whale *Balaenoptera borealis* (Pacific population, Atlantic population) in Canada. COSEWIC, Committee on the Status of Endangered Wildlife in Canada, Ottawa, Canada.

COSEWIC. 2004. COSEWIC assessment and update status report on the green sturgeon *Acipenser medirostris* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.

Cowlitz Indian Tribe. 2007. Petition to list the Southern Eulachon (*Thaleichthys pacificus*) Distinct Population Segment as threatened or endangered under the federal Endangered Species Act, November 9, 2007. Cowlitz Indian Tribe, Longview, WA.

Dalla Rosa L, 2010. Modeling the foraging habitat of humpback whales. PhD thesis, University of British Columbia, Vancouver. 185 pp.

Davis, R. W., Ortega-Ortiz, J. G., Ribic, C. A., Evans, W. E., Biggs, D. C., Ressler, P. H., Cadyc, R. B., Leben, R. R., Mullin, K. D. and Würsig, B. 2002. Cetacean habitat in the northern oceanic Gulf of Mexico. Deep-Sea Research I 49:121-142.

Department of the Navy (DON). 2008. Request for Letter of Authorization for the incidental harassment of marine mammals resulting from Navy training activities conducted within the northwest traing range complex. September 2008. 323 pp.

Di Natale, A. and Notarbartolo di Sciara, G. 1994. A review of the passive fishing nets and trap fisheries in the Mediterranean Sea and of the cetacean bycatch. Reports of the International Whaling Commission Special Issue 15:189-202.

Dohl, T. P., Guess, R. C., Duman, M. L. and Helm, R. C. 1983. Cetaceans of central and northern California, 1980-83: Status, abundance, and distribution. Report prepared for U. S. Minerals Management Service, contract #14-12-0001-29090. Available from National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115.

Distribution of north Pacific right whales (*Eubalaena japonica)* as shown by 19th and 20th century whaling catch and sighting records. Journal of Cetacean Research and Management 6:1-6.

Donovan, G. P. 1991. A review of IWC stock boundaries. Report of the International Whaling Commission (Special Issue 13).

Douglas, A.B., Calambokidis, J., Raverty, S., Jeffries, S.J., Lambourn, D.M., and S.A. Norman. 2008. Incidence of ship strikes of large whales in Washington State. Journal of the Marine Biological Association of the United Kingdom 88:1121–1132.

Drout V. 2003. Ecology of sperm whales (*Physeter macrocephalus*) in the Mediterranean Sea. PhD Thesis, University of Wales, Bangor.

Dumbauld, B. R., D. L. Holder, and O. P. Langness. 2008. Do sturgeon limit burrowing shrimp populations in Pacific Northwest estuaries. Environmental Biology of Fishes **83**:283-296.

Eckert, S.A. 2002. Distribution of juvenile leatherback sea turtle, *Dermochelys coriacea*, sightings. Marine Ecology Progress Series 230: 289-293.

Eckert, K.L. 1987. Environmental unpredictability and leatherback sea turtle (Dermochelys coriacea) nest loss. Herpetologica 43(3):315-323.

Eckert, K.L. 1993. The biology and population status of marine turtles in the north Pacific Ocean. NOAA Tech. Memo. NMFS. NOAA-TM-NMFS-SWFSC-186. 156 pp.

Eckert, K.L. and S.A. Eckert. 1988. Pre-reproductive movements of leatherback sea turtles (Dermochelys coriacea) nesting in the Caribbean. Copeia 1988:400-406.

Eckert, S.A., K.L. Eckert, P. Ponganis, and G.L. Kooyman. 1989. Diving and foraging behavior of leatherback sea turtles (Dermochelys coriacea). Can. J. Zool. 67:2834-2840.

Eisenberg, J.F. and J. Frazier. 1983. A leatherback turtle (Dermochelys coriacea) feeding in the wild. J. Herpetol. 17:81-82.

Emmett, R. L., S. A. Hinton, S. L. Stone, and M. E. Monaco. 1991. Distribution and abundance of fishes and inveretebrates in west coast estuaries, Volume II: Species life histories summaries. ELMR Rep. 8, NOAA/NOS Stategic Environemental Assessments Division, Rockville, MD.

Emmett, R. L., P. J. Bentley, and G. K. Krutzikowsky. 2001. Ecology of marine predatory and prey fishes off the Columbia River, 1998 and 1999. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-51.

Engelhaupt, D. T. 2004. Phylogeography, Kinship and Molecular Ecology of Sperm Whales (*Physeter macrocephalus*). University of Durham.

Erickson, D. L. and M. A. H. Webb. 2007. Spawning periodicity, spawning migration, and size at maturity of green sturgeon, *Acipenser medirostris*, in the Rogue River, Oregon. Environmental Biology of Fishes **79**:255-268.

Etnier, M.A. 2002. Occurrences of Guadalupe fur seals (*Arctocephalus townsendi*) on the Washington Coast over the past 500 years. Marine Mammal Science, 18:551-557.

Evans, P.G.H. 1997. Ecology of sperm whales (*Physeter macrocephalus*) in the eastern North Atlantic, with special reference to sightings & strandings records from the British Isles. Bulletin de 1'Institut Royal des Sciences Naturelles de Belgique, Biologic 67-Suppl.:37-46.

Falcone, E.A., B. Diehl, A. Douglas, and J. Calambokidis. 2011. Photo-identification of Fin Whales (*Balaeanoptera physalus*) along the US West Coast, Baja California, and Canada. Report to the Southwest Fisheries Science Center, National Marine

Fisheries Service La Jolla, CA, USA.
Felix, F., Haase, B. Davis, J.W., Chiluiza, D. and Amador, P. 1997. A note on recent strandings and bycatches of sperm whales (*Physeter macrocephalus*) and humpback whales (*Megaptera novaeangliae*) in Ecuador. Reports of the International Whaling Commission 47:917-919.
Fischer, K.N., R.M. Suryan, D.D. Roby, and G.R. Balogh. 2009. Post-breeding season distribution of black-footed and Laysan albatrosses satellite-tagged in Alaska: Inter-specific differences in spatial overlap with North Pacific fisheries. Biological Conservation 142: 751-760.
Fiscus, C. H. and G. A. Baines. 1966. Food and feeding behavior of Steller and California Sea Lions. *Journal of Mammalogy* 47: 195-200.
Fleischer, G. W., K. D. Cooke, P. H. Ressler, R. E. Thomas, S. K. de Blois, L. C. Hufnagle, A. R. Kronlund, J. A. Holmes, and C. D. Wilson. 2005. The 2003 integrated acoustic and trawl survey of Pacific hake, *Merluccius productus*, in U.S. and Canadian waters off the Pacific coast. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-65. Online at http://www.nwfsc.noaa.gov/assets/25/6233_06272005_114457_haketm65final.pdf [accessed May 2011].
Fleischer, G. W., K. D. Cooke, P. H. Ressler, R. E. Thomas, S. K. de Blois, and L. C. Hufnagle. 2008. The 2005 integrated acoustic and trawl survey of Pacific hake, *Merluccius productus*, in U.S. and Canadian waters off the Pacific coast. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-94. Online at http://www.nwfsc.noaa.gov/assets/25/6835_11062008_165201 _Hake2005SurveyTM94Final.pdf [accessed May 2011].
Fleming A, Jackson J, 2011. Global review of the humpback whale (Megaptera novaeangliae). NOAA-NMFS-SWFSC Tech Memo in press.
Flint, B. 2009. Hawaiian Islands National Wildlife Refuge and Midway Atoll National Wildlife Refuge – Annual Nest Counts through Hatch Year 2009. USFWS, Pacific Remote Islands National Wildlife Refuge Complex, 21 p.
Flinn, R. D., A. W. Trites, E. J. Gregr, and R. I. Perry. 2002. Diets of fin, sei, and sperm whales in British Columbia: An analysis of commercial whaling records, 1963-1967. Marine Mammal Science 18(3):663-679.
Ford, J. K. B., and G. M. Ellis. 2006. Selective foraging by fish-eating killer whales *Orcinus orca* in British Columbia. Marine Ecology-Progress Series 316:185-199.
Ford, J.K.B., G.M. Ellis, P.K. Olesiuk, and K.C. Balcomb. 2009. Linking killer whale survival and prey abundance: food limitation in the oceans' apex predator? Biology Letters, 6: 139-142.
Forney, K. A., J. Barlow, and J. V. Carretta. 1995. The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. Fish. Bull. 93:15–26.
Forney, K.A. 2004. Estimates of cetacean mortality and injury in two U.S. Pacific longline fisheries, 1994-2002. Admin. Rep. LJ-04-07. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 17 pp.
Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the U.S. west

coast and within four National Marine Sanctuaries during 2005. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-406. 27p.
Frimodig, A. 2008. Informational report: Bycatch reduction devices used in the pink shrimp trawl fishery. Rep. to California Fish and Game Commission. California Dept. Fish and Game, Marine Region, State Fisheries Evaluation Project. Online at http://www.dfg.ca.gov/marine/pdfs/ brd_report.pdf [accessed 23 February 2010].
Fritts, T.H., M.L. Stinson, and R. Márquez M. 1982. Status of sea turtle nesting in southern Baja California, México. Bull. South. Calif. Acad. Sci. 81(2):51-60.
Fritz, L. and Gelatt, T. 2010. Surveys of Steller Sea Lions in Alaska, June-July 2010. NOAA/NMML Memo. Alaska Fisheries Science Center, 7600 Sand Point Way NE Seattle WA 98115
Gabriel, W. L., and A. V. Tyler. 1980. Preliminary analysis of Pacific coast demersal fish assemblages. Mar. Fish. Rev. 42(3–4):83–88.
Gallo-Reynoso, J. P. 1994. Factors affecting the population status of Guadalupe fur seal, *Arctocephalus townsendi* (Merriam, 1897), at Isla de Guadalupe, Baja California, Mexico. Ph.D. Thesis, University of California, Santa Cruz, 199 p.
Gannier, A. and Praca, E. 2007. SST fronts and the summer sperm whale distribution in the north-west Mediterranean Sea. Journal of the Marine Biological Association of the United Kingdom 87:187-193.
Gendron, D., and S. C. Rosales. 1996. Recent sei whale (Balaenoptera borealis) sightings in the Gulf of California, Mexico. Aquatic Mammals 22(2):127-130.
Gendron, D., S. Lanham, and M. Carwardine. 1999. North Pacific right whale (*Eubalaena glacialis*) sighting South of Baja California. Aquatic Mammals 25:31-34.
Gilman, E., Brothers, N., and Kobayashi, D. 2005. Principles and approaches to abate seabird bycatch in longline fisheries. Fish and Fisheries 6(1): 35-49.
Goff, G.P. and J. Lien. 1988. Atlantic leatherback turtles (*Dermochelys coriacea*) in cold water off Newfoundland and Labrador. Canadian Field Naturalist 102 (1):1-5.
Gordon, J., Moscrop, A., Carlson, C., Ingram, S., Leaper, R., Matthews, J. and Young, K. 1998. Distribution, movements and residency of sperm whales off the Commonwealth of Dominica, eastern Caribbean: implications for the development and regulation of the local whalewatching industry. Reports of the International Whaling Commission 48:551-557.
Gosho, M. E., Rice, D. W. and Breiwick, J. M. 1984. The Sperm Whale, *Physeter macrocephalus*. Marine Fisheries Review 46:54-64.

Green, G. A., J. J. Brueggeman, R.A. Grotefendt, C.E. Bowlby, M. L. Bonnell and K. C. Balcomb. 1992. Cetacean distribution and abundance off Oregon and Washington, 1989-1990. In J. J. Brueggeman, ed. Oregon and Washington marine mammal and seabird surveys. Final report to Minerals Management Services, OCS Study MMS-91-0093, U.S. Department of the Interior by Ebasco Environmental and Ecological Consulting, Inc., 10900 NE 8th Street, Bellevue, WA. 100 pp.
Gregr, E. J., Nichol, L., Ford, J. K. B., Ellis, G. and Trites, A. W. 2000. Migration and population structure of northeastern Pacific whales off coastal British Columbia:

an analysis of commercial whaling records from 1908-1967. Marine Mammal Science 16(4):699-727.

Gregr, E. J., and A. W. Trites. 2001. Predictions of critical habitat for five whale species in the waters of coastal British Columbia. Canadian Journal of Fisheries and Aquatic Sciences 58(7):1265-1285.

Gustafson, R. G., M. J. Ford, D. Teel, and J. S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. US Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-105. Online at: http://www.nwfsc.noaa.gov/assets/25/7092_06162010_142619_EulachonTM105WebFinal.pdf [accessed May 2011].

Gustafson, R. G., M. J. Ford, P. B. Adams, J. S. Drake, R. L. Emmett, K. L. Fresh, M. Rowse, E. A. K. Spangler, R. E. Spangler, D. J. Teel, and M. T. Wilson. 2011. Conservation status of eulachon in the California Current. Fish and Fisheries Article first published online: 20 APR 2011 | DOI: 10.1111/j.1467-2979.2011.00418.x.

Haase, B. and Felix, F. 1994. A note on the incidental mortality of sperm whales (*Physeter macrocephalus*) in Ecuador. Reports of the International Whaling Commission Special Issue 15:481-483.

Hamazaki, T. 2002. Spatiotemporal prediction models of cetacean habitats in the mid-western North Atlantic Ocean (from Cape Hatteras, North Carolina, U.S.A. to Nova Scotia, Canada). Marine Mammal Science 18(4):920-939.

Hamilton, P.K., A.R. Knowlton, M.K. Marx and S.D. Kraus. 1998. Age structure and longevity in North Atlantic right whales, *Eubalaena glacialis,* and their relation to reproduction. Mar. Ecol. Prog. Ser. 171:285-292.

Hannah, R. W., and S. A. Jones. 2003. Measuring the height of the fishing line and its effect on shrimp catch and bycatch in an ocean shrimp (*Pandalus jordani*) trawl. Fish. Res. 60:427–438.

Hannah, R. W., and S. A. Jones. 2007. Effectiveness of bycatch reduction devices (BRDs) in the ocean shrimp (*Pandalus jordani*) trawl fishery. Fish. Res. 85:217–225.

Hannah, B., and S. Jones. 2011. 22nd annual pink shrimp review. Oregon Department of Fish & Wildlife, Marine Resources Program, Newport, OR. Online at http://www.dfw.state.or.us/MRP/publications/docs/shrimp_newsletter2011.pdf [accessed June 2011].

Hannah, R. W., S. A. Jones, and V. Hoover. 1996. Evaluation of fish excluder technology to reduce finfish bycatch in the ocean shrimp trawl fishery. ODFW Information Rep. 96-4. Oregon Dept. Fish and Wildlife, Marine Region, Newport.

Hannah, R. W., S. A. Jones, and K. M. Matteson. 2003. Observations of fish and shrimp behavior in ocean shrimp (*Pandalus jordani*) trawls. ODFW Information Rep. 2003-03. Oregon Dept. Fish and Wildlife, Marine Resources Program, Newport

Hannah, R.W., S. A. Jones, M. J. M. Lomeli, and W. W. Wakefield. 2011. Trawl net modifications to reduce the bycatch of eulachon (*Thaleichthys pacificus*) in the ocean shrimp (*Pandalus jordani*) fishery. Fisheries Research doi:10.1016/j.fishres.2011.04.016

Hanni, K.D., Long, D.J., Jones, R.E., Pyle, P., and Morgan, L.E. 1997. Sightings and strandings of Guadalupe fur seals in centeral and northern California, 1988-1995. Journal of Mammalogy, 78: 684-690.

Hanson, M.B., R.W. Baird, J.K.B. Ford, J. Hempelmann-Halos, D.M. Van Doornik, J.R. Candy, C.K. Emmons, G.S. Schorr, B. Gisborne, K.L. Ayres, S.K. Wasser, K.C. Balcomb, K. Balcomb-Bartok, J.G. Sneva, and M.J. Ford. 2010. Species and stock identification of prey consumed by endangered southern resident killer whales in their summer range. Endangered Species Research, 11:69-82.

Harrison, P. 1985. Seabirds, an Identification Guide. Boston: Houghton Mifflin Co., 448 pp.

Hart, J. L. 1973. Pacific fishes of Canada. Bull. Fish. Res. Board Can. 180.

Hasegawa, H. 1984. Status and conservation of seabirds in Japan, with special attention to the Short-tailed Albatross. Pp. 487-500 in Croxall, J.P., P.G.H. Evans and R.W. Schreiber, (eds.). Status and Conservation of the World's Seabirds.

Hasegawa, H. and A. DeGange. 1982. The short-tailed albatross Diomedea albatrus, its status, distribution and natural history. American Birds 6: 806-814.

Hastie, J. 2005. Observed and Estimated Total Bycatch of Salmon in the 2002-2004 West Coast Limited-Entry Trawl Fisheries for Groundfish. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Hay, D. 2002. The eulachon in Northern British Columbia. *In* T. Pitcher, M. Vasconcellos, S. Heymans, C. Brignall, and N. Haggan (eds.), Information supporting past and present ecosystem models of Northern British Columbia and the Newfoundland Shelf, p. 98–107. Fisheries Centre Research Reports, Vol. 10 No. 1. Univ. British Columbia, Fisheries Centre, Vancouver.

Hay, D. E., and McCarter, P. B. 2000. Status of the eulachon *Thaleichthys pacificus* in Canada. Department of Fisheries and Oceans Canada, Canadian Stock Assessment Secretariat, Research Document 2000-145. Ottawa, Ontario. Online at: http://www.dfo-mpo.gc.ca/csas/csas/DocREC/2000/PDF/2000_145e.pdf [accessed March 2011].

Hay, D.E., P. B. McCarter, R. Joy, M. Thompson, and K. West. 2002. Fraser River eulachon biomass assessments and spawning distribution: 1995-2002. Canadian Science Advisory Secretariat Research Document 2002/117, 57 p.

Heery, E., M.A. Bellman, and J. Hastie. 2009. Observed and estimated total bycatch of salmon in the 2007 U.S. west coast groundfish fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Hendrickson, J. R. and Alfred, E. R. 1961. Nesting populations of sea turtles on the east coast of Malaya Bull. Raffles Mus. Singapore. 26: 190-196.

Herman, L. M., C. S. Baker, P. H. Forestall, R. C. Antinoja. 1980. Right whale *Balaena glacialis* sightings near Hawaii: a clue to the wintering grounds? Marine Ecology Progress Series 2:27l-275.

Hill, P. S. and J. Barlow. 1992. Report of a marine mammal survey of the California coast aboard the research vessel McARTHUR July 28-November 5, 1991. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFSC-169. 103 pp.

Hill, P. S., Laake, J. L. and Mitchell, E. 1999. Results of a pilot program to document interactions between sperm whales and longline vessels in Alaska waters. NOAA Technical Memorandum. NMFS-AFSC-108. 42 p.

Hoffman, J. I., C. W. Matson, W. Amos, T. R. Loughlin, and J. W. Bickham. 2006. Deep genetic subdivision within a continuously distributed and highly vagile marine mammal, the Steller's sea lion (*Eumetopias jubatus*). Molecular Ecology 15: 2821-2832.

Horwood, J. 1987. The sei whale: Population biology, ecology and management. (Balaenoptera borealis). Croom Helm, London. 375pp. ISBN 0-7099-4786-0.

Hucke-Gaete, R., Moreno, C. A. and Arata, J. 2004. Operational interactions of sperm whales and killer whales with the Patagonian toothfish industrial fishery off southern Chile. CCAMLR Science 11: 127-140.

Huff, D. D., S. T. Lindley, P. S. Rankin, and E. A. Mora. in review. Green sturgeon physical habitat use in the coastal Pacific Ocean. PLoS One.

Ingólfsson, O. A., A. V. Soldal, I. Huse, and M. Breen. 2007. Escape mortality of cod, saithe, and haddock in a Barents Sea trawl fishery. ICES J. Mar. Sci. 64:1836–1844.

Iniguez, M., and coauthors. 2010. On the occurrence of sei whales, Balaenoptera borealis, in the south-western Atlantic. Marine Biodiversity Records 3: e68.

International Whaling Commission. 1980. Sperm whales: Special Issue. Reports of the International Whaling Commission Special Issue 2:1-275.

International Whaling Commission. (IWC) 1977. Report of the Scientific Committee on sei and Bryde's whales. Rep. Int. Whal. Comm., Spec. Iss. 1:1–9.

International Whaling Commission. (IWC) 1986. Report of the workshop on the status of right whales. Rep. Int. Whal. Comm. (Special issue) 10:1-33.

Israel, A. J., J. F. Cordes, M. A. Blumberg, and B. May. 2004. Geographic patterns of genetic differentiation among collections of green sturgeon. North American Journal of Fisheries Management **24**:922-931.

Israel, J. A., K. J. Bando, E. C. Anderson, and B. May. 2009. Polyploid microsatellite data reveal stock complexity among estuarine North American green sturgeon (*Acipenser medirostris*). Canadian Journal of Fisheries and Aquatic Sciences **66**:1491-1504.

Israel, J. A. and B. May. 2010. Indirect genetic estimates of breeding population size in the polyploid green sturgeon (*Acipenser medirostris*). Molecular Ecology **2010**:1058-1070.

Israel, J. A., M. Neuman, M. L. Moser, S. T. Lindley, B. W. M. Jr., D. L. Erickson, and P. Klimley. in prep. Recent advances in understanding the life history of green sturgeon (*Acipenser medirostris*) and potential anthropogenic threats to this imperiled fish.

Ivashin M. V. and Rovnin, A. A. 1967. Some results of the Soviet whale marking in the waters of the North Pacific. Norsk Hvalfangst-tidende 56:123-135.

James, M.C., C.A. Ottensmeyer and R.A. Myers. 2005. Identification of high-use habitat and threats to leatherback sea turtles in northern waters: new directions for conservation. Ecology Letters 2005(8):195-201.

Jameson, R. J., and K. W. Kenyon. 1977. Prey of sea lions in the Rogue River, Oregon. Journal of Mammalogy 58: 672.

Jannot, J., Heery, E., Bellman, M., Majewski, J. 2011. Estimated bycatch of marine mammals, seabirds, and sea turtles in the US west coast commerical groundfish

fishery, 2002-2009. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.
Jaquet, N. 1996. How spatial and temporal scales influence understanding of sperm whale distribution: a review. Mammal Review 26(1):51-65.
Jaquet, N. and Whitehead, H. 1996. Scale-dependent correlation of sperm whale distribution with environmental features and productivity in the South Pacific. Marine Ecology Progress Series 135:1-9.
Jaquet, N., Gendron D., and Coakes, A. 2003. Sperm whales in the Gulf of California: Residency, movements, behavior, and the possible influence of variation in food supply. Marine Mammal Science 19(3):545-562.
JCRMS (Joint Columbia River Management Staff). 2011. 2011 joint staff report concerning stock status and fisheries for sturgeon and smelt. Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife. Online at: http://wdfw.wa.gov/publications/01155/wdfw01155.pdf [accessed June 2011].
Jesse, L.K. 2008. Shoreside Hake Observation Program: 2007 Annual Report. Marine Resources Program, Oregon Department of Fish and Wildlife, Hatfield Marine Science Center. Newport, OR 97365.
Jones, R. E. 1981. Food habits of smaller marine mammals from northern California. Proc. Calif. Acad. Sci. 42:409-433.
Julian, F and Beeson M. 1998. Estimates of marine mammal, turtle, and seabird mortality for two California gillnet fisheries: 1990—1995. Fish. Bull. 96:271-284.
Kaplan I, 2009. Evaluating trophic impacts of California Current groundfish fisheries on protected species. Northwest Fisheries Science Center, Conservation Biology Division, Integrated Marine Ecology Program. 35 pp.
Kaplan, I. Fulton, E.A., Holland, D. Unpublished Manuscript. Linking ecology, economics, and fleet dynamics to evaluate alternative management strategies for US West Coast trawl fisheries.
Kaplan, I. C. and Levin, P. 2009. Ecosystem-based management of what? An emerging approach for balancing conflicting objectives in marine resource management. Fish and Fisheries Series 31:77-95.
Kaplan, I. C. 2011. Evaluating Trophic Impacts of California Current Groundfish Fisheries on Protected Species. Unpublished documnent, NWFSC.
Kasuya T. and Miyashita, T. 1988. Distribution of sperm whale stocks in the North Pacific. Scientific Reports of the Whales Research Institute 39:31-75.
Kawamura, A. 1980. A review of food of balaenopterid whales. Sci. Rep. Whales Res. Inst 32:155-197.
Kawamura, A. 1982. Food habits and prey distributions of three rorqual species in the North Pacific Ocean. Scientific Reports of the Whales Research Institute, Tokyo 34:59-91.

Keller, A. A., T. L. Wick, E. L. Fruh, K. L. Bosley, D. J. Kamikawa, J. R. Wallace, and B. H. Horness. 2005. The 2000 U.S. West Coast upper continental slope trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-70. Online at http://www.nwfsc.noaa.gov/assets/25/6459_03102006_131701_Slope2000FinalV2SA.pdf [accessed May 2011].

Keller, A. A., E. L. Fruh, K. L. Bosley, D. J. Kamikawa, J. R. Wallace, B. H. Horness, V. H. Simon, and V. J. Tuttle. 2006a. The 2001 U.S. West Coast upper continental slope trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-72. Online at http://www.nwfsc.noaa.gov/assets/25/6460_03202007_121309_ Slope2001TechMemo.pdf [accessed May 2011].

Keller, A. A., B. H. Horness, V. J. Tuttle, J. R. Wallace, V. H. Simon, E. L. Fruh, K. L. Bosley, and D. J. Kamikawa. 2006b. The 2002 U.S. West Coast upper continental slope trawl survey of groundfish resources off Washington, Oregon and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-75. Online at http://www.nwfsc.noaa.gov/assets/25/6493_04062006_150352_ Slope2002TM75Final.pdf [accessed May 2011].

Keller, A. A., V. H. Simon, B. H. Horness, J. R. Wallace, V. J. Tuttle, E. L. Fruh, K. L. Bosley, D. J. Kamikawa, and J. C. Buchanan. 2007a. The 2003 U.S. West Coast bottom trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-86. Online at http://www.nwfsc.noaa.gov/assets/25/6719_01082008_151554_ GroundfishSurvey2003TM86FinalSA.pdf [accessed May 2011].

Keller, A. A., B. H. Horness, V. H. Simon, V. J. Tuttle, J. R. Wallace, E. L. Fruh, K. L. Bosley, D. J. Kamikawa, and J. C. Buchanan. 2007b. The 2004 U.S. West Coast bottom trawl survey of groundfish resources off Washington, Oregon and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-87. Online at http://www.nwfsc.noaa.gov/assets/25/6656_01152008_153323_ GroundfishSurvey2004TM87FinalSA.pdf [accessed May 2011].

Keller, A. A., B. H. Horness, E. L. Fruh, V. H. Simon, V. J. Tuttle, K. L. Bosley, J. C. Buchanan, D. J. Kamikawa, and J. R. Wallace. 2008. The 2005 U.S. West Coast bottom trawl survey of groundfish resources off Washington, Oregon and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-93. Online at http://www.nwfsc.noaa.gov/assets/25/6802_08122008_165005_GroundfishSurveyTM93Final.pdf [accessed May 2011].

Kelly, J. T., A. P. Klimley, and C. E. Crocker. 2007. Movements of green sturgeon, *Acipenser medirostris*, in the San Francisco Bay estuary, California. Environmental Biology of Fishes **79**:281-295.

Kenney, R.D. 2002. North Atlantic, North Pacific, and Southern Right Whales. In: Encyclopedia of Marine Mammals. Perrin, W.F., B. Würsig, and J.G.M. Thewissen, eds. Academic Press, pages 806-813.

Kieckhefer T, 1992. Feeding ecology of humpack whales in continental shelf waters near Cordell Bank, California. Master's thesis. Moss Landing, CA: Moss Landing Marine Laboratories.

Krahn, M. M., M. J. Ford, W. F. Perrin, P. R. Wade, R. P. Angliss, M. B. Hanson, B. L. Taylor, G. M. Ylitalo, M. E. Dahlheim, J. E. Stein, and R. S. Waples. 2004. 2004 status review of southern resident killer whales (Orcinus orca) under the Endangered Species Act. NOAA Technical Memorandum NMFS-NWFSC-62, U.S. Department of Commerce, Seattle, Washington.

Kuro-o, M., Yonekawa, H., Saito, S., Eda, M., Higuchi, H., Koike, H., and Hasegawa, H. 2010. Unexpectedly high genetic diversity of mtDNA control region through severe bottleneck in vulnerable albatross Phoebastria albatrus. Conserv. Genet. 11, 127–137.

Lagerquist B, Mate B, Ortega-Ortiz J, Winsor M, Urbán-Ramirez J, 2008. Migratory movements and surfacing rates of humpback whales (Megaptera novaeangliae) satellite tagged at Socorro Island, Mexico. Marine Mammal Science 24:815-830.

Laist D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17:35–75.

Lauth, R. R., M. E. Wilkins, and P. A. Raymore Jr. 1997. Results of trawl surveys of groundfish resources of the West Coast upper continental slope from 1989 to 1993. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-79.

Lauth, R. R. 1997a. The 1995 Pacific West Coast upper continental slope trawl survey of groundfish resources off southern Oregon and northern California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-80. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-80.pdf [accessed May 2011].

Lauth, R. R. 1997b. The 1996 Pacific West Coast upper continental slope trawl survey of groundfish resources off Washington and Oregon: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-81. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-81.pdf [accessed May 2011].

Lauth, R. R. 1999. The 1997 Pacific West Coast upper continental slope trawl survey of groundfish resources off Washington, Oregon and California: Estimates of distribution, abundance, and composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-98. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-98/Text%20from%20NOAA-TM-AFSC-98.pdf [accessed May 2011].

Lauth , R. R. 2000. The 1999 Pacific West Coast upper continental slope trawl survey of groundfish resources off Washington , Oregon and California: Estimates of distribution , abundance, and length composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-115. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-115/Text%20from%20NOAA-TM-AFSC-115%20.pdf [accessed May 2011].

Lazell, J. 1980. New England waters: critical habitat for marine turtles. Copeia 1980:290-295.

Leatherwood, S., R. R. Reeves, W. F. Perrin, and W. E. Evans. 1982. Whales, dolphins and porpoises of the eastern North Pacific and adjacent Arctic waters: A guide to their identification. NOAA Technical Report NMFS CIRCULAR No. 444. 244p.

LeDuc, R. G., W. L. Perryman, J. W. Gilpatrick, Jr., J. Hyde, C. Stinchcomb, J. V. Carretta, and R. L. Brownell, Jr. 2001. A note on recent surveys for right whales in the southeastern Bering Sea. J. Cetacean Res. Manage. (Special Issue 2):287-289.

Leh, C. 1985. Marine turtles in Sarawak. Mar. Turtle Newsl. 35:1-3.

Lian, C., Singh, R., & Weninger, Q. (December 01, 2009). Fleet restructuring, rent generation, and the design of individual fishing quota programs: Empirical evidence from the Pacific Coast groundfish fishery. Marine Resource Economics, 24, 4, 329-359.

Lien, J. 1994. Entrapments of large cetaceans in passive inshore fishing gear in Newfoundland and Labrador (1979–1990). Rep. Int. Whal. Commn. (Special Issue 15):149–157.

Limpus, C.J. 1982. The status of Australian sea turtle populations. Pages 297-303 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, Washington, D.C. 583 pp.

Limpus, C.J. 1995. Global overview of the status of marine turtles: A 1995 viewpoint. Pages 605-609 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles (Revised Edition), Smithsonian Institution Press, Washington, D.C. 615 pp.

Limpus, C.J., and N.C. McLachlan. 1979. Observations on the leatherback turtle, Dermochelys coriacea (L.), in Australia. Aust. Wildl. Res. 6:105-116.

Limpus, C.J., N.C. McLachlan, and J.D. Miller. 1984. Further observations on breeding of Dermochelys coriacea in Australia. Aust. Wildl. Res. 11:567-571.

Lindley, S. T., M. L. Moser, D. L. Erickson, M. Belchik, D. W. Welch, E. L. Rechisky, J. T. Kelly, J. Heublein, and A. P. Klimley. 2008. Marine migration of North American green sturgeon. Transactions of the American Fisheries Society **137**:182-194.

Lindley, S. T., D. L. Erickson, M. L. Moser, G. Williams, O. P. Langness, B. W. McCovey, M. Belchik, D. Vogel, W. Pinnix, J. T. Kelly, J. C. Heublein, and A. P. Klimley. 2011. Electronic tagging of green sturgeon reveals population structure and movement among estuaries. Transactions of the American Fisheries Society **140**:108-122.

Lockyer, C. 1972. The age at sexual maturity of the southern fin whale (Balaenoptera physalus) using annual layer counts in the ear plug. J. Cons. Cons. Int. Explor. Mer 34(2):276–294.

Lockyer, C. 1977. Some estimates of growth in the sei whale, *Balaenoptera borealis*.

Rep. Int. Whal. Comm., Spec. Iss. 1:58–62.
Lockyer, C. H., and A. R. Martin. 1983. The sei whale off Western Iceland. II. Age, growth and reproduction. (Balaenoptera borealis). Report of the International Whaling Commission 33:465-476.-Sc/34/Ba13).
Loughlin, T. R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Pages 159-171, in: A. E. Dizon, S. J. Chivers, and W. F. Perrin (eds.), Molecular Genetics of Marine Mammals. Society for Marine Mammalogy Spec. Publ. 3.
Mangels, K. F. and T. Gerrodette. Report of cetacean sightings during a marine mammal survey in the eastern Pacific Ocean and the Gulf of California aboard the NOAA ships *McArthur* and *David Starr Jordan* July 28 - November 6, 1993. U.S. Dep. Commer. NOAA Tech. Memo. NMFSSWFSC-221. 88 pp.
Manuwal, D. A., H. R. Carter, T. S. Zimmerman, and D. L. Orthmeyer, Editors. 2001. Biology and conservation of the common murre in California, Oregon, Washington, and British Columbia. Volume 1: Natural history and population trends. U.S. Geological Survey, Biological Resources Division, Information and Technology Report USGS/BRD/ITR– 2000-0012, Washington, D.C. 132 pp.
Marchal, P., Lallemand, P., and Stokes, K. 2009. The relative weight of traditions, economics, and catch plans in New Zealand fleet dynamics. Canadian Journal of Fisheries and Aquatic Sciences, 66: 291–311.
Márquez M., R. 1976. Reservas naturales para la conservacion de las tortugas marinas en México. Inst. Nac. Pesca, México, Ser. Informacion 83:1-21.
Márquez, M., R., and M.A. Carrasco A. 1993. Resúmen de playas de anidación de Tortugas marinas, reservas naturales y actividades de conservación. Programa Nacional de Investigación y Manejo de Tortugas Marinas. INP. CRIP-Manzanillo. Manzanillo, Col. Reporte interno. 21 pp.
Márquez M., R., A. Villanueva, and C. Peñaflores. 1981. Anidación de la Tortuga Laúd Dermochelys coriacea schlegelli en el Pacífico mexicano. Ciencia Pesquera 1(1):45-52 INP, México.
Martin, A.R. 1983. The sei whale off western Iceland. I. Size, distribution and abundance. Rep. Int. Whal. Comm. 33:457–463.
Masaki, Y. 1970. Study on the stock units of sperm whales in the North Pacific. Document SM 70/SP/9 submitted to special IWC sperm whale meeting, Honolulu, March 1970.
Masaki, Y. 1977. The separation of the stock units of sei whales in the North Pacific. (Balaenoptera borealis). Report of the International Whaling Commission Special Issue 1:71-79.
Mate, B. R. 1973. Population kinetics and related ecology of the northern sea lion, *Eumetopias jubatus* and the California sea lion, *Zalophus californi*anus, along the Oregon coast. Ph.D. dissertation, University of Oregon. 94p.
Mate, B. R., B. A. Lagerquist, and J. Calambokidis. 1999. Movements of North Pacific blue whales during their feeding season off southern California and their southern fall migration. Mar. Mamm. Sci. 15(4):1246-1257.
McDermond, D.K., and K.H. Morgan. 1993. Status and conservation of North Pacific albatross. Pages 70-81 in Vermeer, K., Briggs, K.T., Moran, K.H., and D. Seigel-

Causey (eds.), The status, ecology, and conservation of marine birds of the North Pacific. Canadian Wildlife Service Special Publication, Ottawa.

McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished report. EDAW, Inc. Seattle, Washington. Prepared for the U.S. Fish and Wildlife Service, Region 1. Portland, Oregon.

Mead, J. G. 1977a. Records of sei and Bryde's whales from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. Reports of the International Whaling Commission 1:113-116.

Mead, J. G. 1977b. Records of sei and Bryde's whales from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. (Balaenoptera borealis, Balaenoptera edeni). Report of the International Whaling Commission Special Issue 1:113-116.-Sc/Sp74/Doc36).

Mellinger, D. K., Stafford, K. M., and Fox, C. G. 2004. Seasonal occurrence of sperm whales (*Physeter macrocephalus*) sounds in the Gulf of Alaska, 1999-2001. Marine Mammal Science 20:48-62.

Melvin, E.F. 2000. Streamer lines to reduce seabird bycatch in longline fisheries. Washington Sea Grant Program, University of Washington. WS-AS-03.

Mesnick, S. L., Taylor, B. L., Archer, F. I., Martien, K. K., Escorza Trevino, S., Hancock-Hanser, B. L., Moreno Medina, S., Pease, V. L., Robertson, K. M., Straley, J. M., Baird, R. W., Calombokidis, J., Schorr, G. S., Wade, P., Burkanov, V., Lunsford, C., Rendell, L., and Morin, P. A. 2011. Sperm whale population structure in the eastern and central North Pacific inferred by the use of single-nucleotide polymorphisms, microsatellites, and mitochondrial DNA. Molecular Ecology Resources 11:278-298.

Mitchell, E. 1975. Preliminary report on Nova Scotia fishery for sei whales (Balaenoptera borealis). Report of the International Whaling Commission 25:218-225.

Mizroch, S. A., D. W. Rice, and J. M. Breiwick. 1984. The blue whale, *Balaenoptera musculus.* Mar. Fish. Rev. 46(4):15–19.

Mizroch, S.A., D.W. Rice, and J.M. Breiwick. 1984. The fin whale, *Balaenoptera physalus*. Mar. Fish. Rev. 46(4):20–24.

Moody, M. F., and T. Pitcher. 2010. Eulachon (*Thaleichthys pacificus*) past and present. Fisheries Centre Research Reports 18: 1-197. Online at: http://www.fisheries.ubc.ca/publications/reports/report18_2.php [accessed March 2011].

Moore, S. E., K. M. Stafford, M. E. Dahlheim, C. G. Fox, H. W. Braham, J. J. Polovina, and D. E. Bain. 1998. Seasonal variation in reception of fin whale calls at five geographic areas in the North Pacific. Mar. Mamm. Sci. 14(3):617-627.

Moore, E., S. Lyday, J. Roletto, K. Litle, J.K. Parrish, H. Nevins, J. Harvey, J. Mortenon, D. Greig, M. Piazza, A. Hermance, D. Lee, D. Adams, S. Allen, and S. Kell. 2009. Entanglements of marine mammals and seabirds in central California and the north-west coast of the United States 2001–2005. Marine Pollution Bulletin 58: 1045–1051.

Morin, P.A., Archer, F.I., Foote, A.D., Vilstrup, J., Allen, E.E., Wade, P., Durban, J., Parsons, K., Pitman, R., Li, L., Bouffard, P., Nielsen, S.A., Rasmussen, M., Willerslev, E., Gilbert, M.T.P., and Harkins, T., Complete mitochondrial genome phylogeographic analysis of killer whales (Orcinus orca) indicates multiple species. Genome Research, 2010. 20(7): p. 908-916.

Morreale, S.J., E.A. Standora, F.V. Paladino, and J.R. Spotila. 1994. Leatherback migrations along deepwater bathymetric contours. Pages 109-110 in B.A. Schroeder and B.E. Witherington (compilers), Proc. Thirteenth Annual Symposium on Sea Turtle Biology and Conservation. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-341. 341 pp.

Moser, M. L. and S. T. Lindley. 2007. Use of Washington estuaries by subadult and adult green sturgeon. Environmental Biology of Fishes **79**:243--253.

Moyle, P. B. 2002. Inland fishes of California. University of California Press, Berkeley, CA.

Nasu, K. 1966. Fishery oceanographic study on the baleen whaling grounds. Scientific Reports of the Whales Research Institute Tokyo 20:157-210.

Nasu, K. 1974. Movements of baleen whales in relation to hydrographic conditions in the northern part of the North Pacific Ocean, Bering Sea. Oceanography of the Bering Sea. D. W. Hood and E. J. Kelley, eds. Int. Mar. Sci., University of Alaska, Fairbanks. pp. 345-361.

NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 12, 2011).

Nelson, M., M. Garron, R. L. Merrick, R. M. Pace III, and T. V. N. Cole. 2007. Mortality and serious injury determinations for baleen whale stocks along the United States eastern seaboard and adjacent Canadian Maritimes, 2001-2005. U.S. Department of Commerce, NOAA, Northeast Fisheries Science Center.

Nelson, T. C., P. Doukakis, S. T. Lindley, A. D. Schreier, J. E. Hightower, L. R. Hildebrand, R. E. Whitlock, and M. A. H. Webb. 2010. Modern technologies for an ancient fish: tools to inform management of migratory sturgeon stocks. A report for the Pacific Ocean Shelf Tracking (POST) Project.

Nemoto, T., and A. Kawamura. 1977. Characteristics of food habits and distribution of baleen whales with special reference to the abundance of North Pacific sei and Bryde's whales. Report of the International Whaling Commission (Special Issue 1):80-87.

NMFS (National Marine Fisheries Service). 1985. Threatened Fish and Wildlife; Guadalupe Fur Seal. Federal Register [Docket No. 41264-5160, 16 December 1985] 50(241): 51252-51258.

NMFS, 1991. Final Recovery Plan for the humpback whale (Megaptera novaeangliae). November 1991. U.S. Department of Commerice. National Oceanic and Atmospheric Administration. National Marine Fisheries Service. Office of Protected Resources.; 105 pp. .

National Marine Fisheries Service. 1991. Recovery Plan for the sperm whale (*Physetermacrocephalus*). National Marine Fisheries Service, Silver Spring, MD.

(NMFS) National Marine Fisheries Service. 2005. Recovery Plan for the North Atlantic Right Whale (*Eubalaena glacialis*). National Marine Fisheries Service, Silver Spring, MD.
NMFS, 2005. Revisions to Guidelines for Assessing Marine Mammal Stocks. 24 pp. Available at: http://www.nmfs.noaa.gov/pr/pdfs/sars/gamms2005.pdf.
National Marine Fisheries Service. 2006. Endangered and Threatened Species; Designation of Critical Habitat for the Southern Resident Killer Whale. Federal Register 71(229): 69054-69070.
National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007. Leatherback sea turtle (*Dermochelys coriacea*). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf
National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007b. Green sea turtle (*Chelonia mydas*). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf
National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007c. Olive Ridley sea turtle (*Lepidochelys olivacea*). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/oliveridley_5yearreview.pdf
National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007d. Loggerhead sea turtle (*Carretta Carretta*). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/loggerhead_5yearreview.pdf
National Marine Fisheries Service, Northwest Regional Office. 2007. 2007 Pacific Whiting Fishery Summary. Report, http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Whiting-Management/Index.cfm.
(NMFS) National Marine Fisheries Service. 2008. Stock Assessment of SEI WHALE (*Balaenoptera borealis*): Eastern North Pacific Stock
National Marine Fisheries Service. 2008. Recovery Plan for Southern Resident Killer Whales (Orcinus orca). National Marine Fisheries Service, Northwest Region, Seattle, Washington.
National Marine Fisheries Service. 2008. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Revision. National Marine Fisheries Service, Silver Spring, MD. 325 pages.
National Marine Fisheries Service. 2010. Recovery Plan for the sperm whale (*Physeter macrocephalus*). National Marine Fisheries Service, Silver Spring, MD. 165pp.
NMFS (National Marine Fisheries Service). 2010. Endangered and threatened wildlife and plants: Threatened status for southern distinct population segment of eulachon. Federal Register 75(52), 13012–13024. Online at: http://www.nwr.noaa.gov/Publications/FR-Notices/2010/upload/75FR13012.pdf [accessed May 2011].
(NMFS) National Marine Fisheries Service. 2011. Draft Recovery Plan for the Sei Whale (*Balaenoptera borealis*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD.

NMFS. 2011. Biological Assessment Continued Operation of the Hawaii-based Pelagic Longline Fisheries. Sustainable Fisheries Division, Pacific Islands Regional Office, National Marine Fisheries Service, Honolulu, Hawaii. July 12, 2011. 73 p.

NMFS (National Marine Fisheries Service). 2011. Endangered and threatened species, designation of critical habitat for southern distinct population segment of eulachon. Federal Register 76(3), 515–536. Online at: http://edocket.access.gpo.gov/2011/pdf/2010-33314.pdf [accessed May 2011].

National Marine Fisheries Service. 2011. Southern Resident Killer Whales (Orcinus orca) 5-year Status Review: Summary and Evaluation. National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NOAA Fisheries. 2010. Information Bulletin 10-93. Sustainable Fisheries Division, Alaska Fisheries Science Center. 17 September, 2010. (http://alaskafisheries. noaa.gov/index/infobulletins/bulletin.asp?BulletinID=7271).

NOAA. 2002. NOAA Fisheries, Northwest Region, Seattle, WA. 2002 West Coast Groundfish Limited Entry Permit Count (www.nwr.noaa.gov/1sustfish/permits/prmcount.htm)

NOAA. 2006. Summary of seabird bycatch in Alaskan Groundfish Fisheries, 1993 through 2004. Unpublished report. Alaska Fisheries Science Center, Seattle, WA.

(NOAA) National Oceanic and Atmospheric Administration. 2006. Endangered and Threatened Species; Revision of Critical Habitat for the Northern Right Whale in the Pacific Ocean. Federal Register, 6 July 2006, 71(129): 38277-38297.

(NOAA) National Oceanic and Atmospheric Administration. 2008a. Endangered and Threatened Species; Endangered Status for North Pacific and North Atlantic Right Whales. Federal Register, 6 March 2008, 73(45): 12024-12030.

(NOAA) National Oceanic and Atmospheric Administration. 2008b. Endangered and Threatened Species; Designation of Critical Habitat for North Pacific Right Whale. Federal Register, 8 April 2008, 73(68): 19000-19002.

(NOAA NMFS) NOAA National Marine Fisheries Service. 2006. Review of the Status of the Right Whales in the North Atlantic and North Pacific Oceans. 62 pp.

NWFSC (Northwest Fisheries Science Center). 2008. Data report and summary analyses of the California and Oregon pink shrimp fisheries, December 2008. NWFSC, Fishery Resource Analysis and Monitoring Division, West Coast Groundfish Observer Program, Seattle, WA. 38 pp. Online at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/pink_shrimp_report_final.pdf [accessed May 2011].

NWFSC (Northwest Fisheries Science Center). 2009a. Data report and summary analyses of the California and Oregon pink shrimp trawl fisheries. West Coast Groundfish Observer Program, National Marine Fisheries Service, NWFSC, Seattle, WA, 33 pp. Available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/shrimp_twl_report_2009_final.pdf [accessed May 2011].

NWFSC (Northwest Fisheries Science Center). 2009b. Data report and summary analyses of the U.S. West Coast limited entry groundfish bottom trawl fishery. 70 p. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Available at:

http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/trawl_report_2009_final.pdf [accessed May 2011].
NWFSC (Northwest Fisheries Science Center). 2010a. Data report and summary analyses of the U.S. west coast limited entry groundfish bottom trawl fishery. 67 pp. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/trawl_report_2010.pdf [accessed May 2011].
NWFSC (Northwest Fisheries Science Center). 2010b. Data report and summary analyses of the California and Oregon pink shrimp trawl fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, Northwest Fisheries Science Center, 2725 Montlake Blvd E., Seattle, WA 98112. 30 pp. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/shrimptwl_report_2010.pdf [accessed May 2011].
Northwest Fisheries Science Center (NWFSC). 2011. West Coast Groundfish Observer Manual April 2011 Catch Shares Training Manual. West Coast Groundfish Observer Program. NWFSC,2725 Montlake Blvd. East, Seattle, Washington, 98112.
ODFW (Oregon Department of Fish and Wildlife). 1999. Marine Recreational Fishing in Oregon (brochure). Marine Resources Program, Newport. Oregon.
Ohsumi, S. 1965. Reproduction of the sperm whale in the north-west Pacific. Scientific Reports of the Whales Research Institute 19:1-35.
Ohsumi, S. and S. Wada. 1974. Status of whale stocks in the North Pacific, 1972. Rept. Int. Whal. Commn. 25:114-126.
Ohsumi S. and Masaki, Y. 1975. Japanese whale marking in the North Pacific, 1963-1972. Bulletin Far Seas Fisheries Research Laboratory 12:171-219.
Ohsumi, S. and Masaki, Y. 1977. Stocks and trends of abundance of the sperm whale in the North Pacific. Reports of the International Whaling Commission. 27:167-175.
Olesiuk, P. F., M. A. Bigg, G. M. Ellis, S. J. Crockford, and R. J. Wigen. 1990. An assessment of the feeding habits of harbour seals (Phoca vitulina) in the Strait of Georgia, British Columbia, based on scat analysis. Can. Tech. Rep. Fish. and Aquat. Sci. No. 1730.
Olesiuk, P. F., M. A. Bigg, and G. M. Ellis. 1990a. Life history and population dynamics of resident killer whales (Orcinus orca) in the coastal waters of British Columbia and Washington State. Report of the International Whaling Commission, Special Issue 12:209-243
Olivarría, C. 2002. Interactions between odontocetes and the artisan fisheries of Patagonian toothfish Disossitchus eleginoides off Chile, Eastern South Pacific. Toothed Whale/Longline Fisheries Interactions in the South Pacific Workshop SREP.
Olsen, E., and coauthors. 2009. First satellite-tracked long-distance movement of a sei whale (Balaenoptera borealis) in the North Atlantic. Aquatic Mammals 35(3):313-318.
Olson, S.L. and P.J. Hearty. 2003. Probable extirpation of a breeding colony of Short-tailed Albatross (Phoebastria albatrus) on Bermuda by Pleistocene sea-level rise. Proc. Nat. Acad. Sci. 100: 12825-12829.

Omura, H. 1958. North Pacific right whale. Sci. Rep. Whales. Res. Inst. (Japan) 13.
Omura H. and Ohsumi, S. 1964. A review of Japanese whale marking in the North Pacific to the end of 1962, with some information on marking in the Antarctic. Norsk Hvalfangst-tidende 53:90-112.
Omura, H., S. Ohsumi, K.N. Nemoto and T. Kasuya. 1969. Black right whales in the north Pacific. Sci. Rep. Whales Res. Inst. (Japan) 21.
Omura, H. 1986. History of right whale catches in the waters around Japan. Rep. Int. Whal. Commn (special issue) 10:35-41.
Palmer, R.S. 1962. Short-tailed albatross (Diomedea albatrus). Handbook of North American Birds 1: 116-119.
Parks, N. B., F. R. Shaw, and R. L Henry. 1993. Results of a 1988 trawl survey of groundfish resources of the upper continental slope off Oregon. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-23. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-23.pdf [accessed May 2011].
Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973. A Special Issue of the Marine Fisheries Review. Marine Fisheries Review 61:1-74.
Peterson, R.S., Hubbs, C.L., Gentry, R.L., and Delong, R.L. 1968. The Guadalupe fur seal: Habitat, Behavior, Population Size, and Field Identification. Journal of Mammalogy, 49: 665-675
PFMC (Pacific Fishery Management Council. October 2002. Pacific Fishery Management Council. Draft Environmental Impact Statement for the Proposed Groundfish Acceptable Biological Catch and Optimum Yield Specifications and Management Measures 2003 Pacific Coast Groundfish Fishery.
PFMC. 2005. Final Environmental Impact Statement for Amendment 19 to Conserve and Protect Essential Fish Habitat for West Coast Groundfish.
PFMC. 2008. Status of the Pacific Coast Groundfish Fishery; Stock Assessment and Fishery Evaluation; Volume 1 – Description of the Fishery.
PFMC (Pacific Fishery Management Council). 2008. Status of the Pacific Coast coastal pelagic species fishery and recommended acceptable biological catches. Stock assessment and fishery evaluation—2008. Online at http://www.pcouncil.org/bb/2008/0608/G1a_ATT1_0608.pdf [accessed May 2011].
PFMC. 2008b. Pacific coast groundfish fishery management plan for the California, Oregon, and Washington groundfish fishery as amended through Amendment 19, including Amendment 15. Pacific Fishery Management Council, Portland, OR 97220, July 2008. 167 p.
PFMC. 2011. Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement.
Piatt, J.F., J. Wetzel, K. Bell, A.R. DeGange, G.R. Balogh, G.S. Drew, T. Geernaert, C. Ladd, and G.V. Byrd. 2006. Predictable hotspots and foraging habitat of the

endangered short-tailed albatross (Phoebastria albatrus) in the North Pacific: implications for conservation. Deep Sea Research II 53: 387-398.
Pike, G. C., and I. B. Macaskie. 1969. Marine mammals of British Columbia. Bulletin of the Fisheries Research Board of Canada 171:1-54.
Pitcher, K. W., P. F. Olesiuk, R. F. Brown, M. S. Lowry, S. J. Jeffries, J. L. Sease, W. L. Perryman, C. E. Stinchcomb, and L. F. Lowry. 2007. Status and trends in abundance and distribution of the eastern Steller sea lion (*Eumetopias jubatus*) population. Fish. Bull. 107: 102-115.
Pitman, R.L. and P. Ensor. 2003. Three forms of killer whales (Orcinus orca) in Antarctic waters. Journal of Cetacean Research and Management 5(2): 131–139.
Pritchard, P.C.H. 1971. The leatherback or leathery turtle, Dermochelys coriacea. IUCN Monograph 1:1-39.
Pritchard, P.C.H. 1973. International migrations of South American sea turtles (Cheloniidae and Dermochelyidae). Anim. Behav. 21:18-27.
Pritchard, P.C.H. 1977. Marine turtles of Micronesia. Chelonia Press, San Francisco. 83 pp.
Pritchard, P.C.H. 1980. Dermochelys coriacea: leatherback turtle. Catalog Amer. Amphib. Rept. 238:1-4.
Pritchard, P.C.H. 1982a. Nesting of the leatherback turtle, Dermochelys coriacea, in Pacific Mexico, with a new estimate of the world population status. Copeia 1982:741-747.
Pritchard, P.C.H. 1982b. Marine turtles of the South Pacific. Pages 253-262 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D. C. 583 pp.
Pritchard, P.C.H. 1982c. Sea turtles of Micronesia. Pages 263-274 in K.A. Bjorndal (ed.),Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, Washington, D. C. 583 pp.51
Pritchard, P.C.H., and P. Trebbau. 1984. The turtles of Venezuela. Society for the Study ofAmphibians and Reptiles, Contrib. Herpetol. 2.
Raum-Suryan, K. L., K. W. Pitcher, D. G. Calkins, J. L. Sease, and T. R. Loughlin. 2002. Dispersal, rookery fidelity and metapopulation structure of Steller sea lions (*Eumetopias jubatus*) in an increasing and a decreasing population in Alaska. Marine Mammal Science 18: 746-764.
Raum-Suryan, K.L., M.J. Rehberg, G.W. Pendleton, K.W. Pitcher, T.S. Gelatt. 2004. Development of dispersal, movement patterns, and haul-out use by pup and juvenile Steller sea lions (*Eumetopias jubatus*) in Alaska. Marine Mammal Science 20: 823-850.
Raum-Suryan, K. L., Jemison, L. A., Pitcher, K. W. 2009. Entanglement of Steller sea lions (*Eumetopias jubatus*) in marine debris: identifying causes and finding solutions. Marine Pollution Bulletin 58: 1487-1495.
Raymore Jr., P. A., and K. L. Weinberg. 1990. 1984 spring and autumn surveys of Pacific West Coast upper continental slope groundfish resources. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-F/NWC-179.
Read, A.J. 1994. Interactions between cetaceans and gillnet and trap fisheries in the northwest Atlantic. Rep. Int. Whal. Commn. (Special Issue 15):133–147.

Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr., R.L., Butterworth, D.S., Clapham, P.J., Cooke, J., Donovan, G.P., Urbán, J. & Zerbini, A.N. 2008. *Balaenoptera borealis*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4.

Reeves, R. R., Leatherwood S., Karl, S. A., and Yohe, E. R. 1985. Whaling results at Akutan (1912-39) and Port Hobron (1926–37), Alaska. Reports of the International Whaling Commission. 35:441-457.

Reeves, R. R., P. J. Clapham, R. L. Brownell, and G. K. Silber. 1998. Recovery Plan for blue whale (*Balaenoptera musculus*). Office of Protected Resources, NMFS, NOAA, Silver Springs, Maryland. 30 pp.

Reeves, R. R., B. S. Stewart, P. J. Clapham, and J. A. Powell. 2002. Guide to marine mammals of the world. Chanticleer Press, Inc., New York.

Rice, D. W. & Fiscus, C. H. 1968. Right whales in the southeastern North Pacific. *Norsk Hvalfangst-Tidende.* **57:**105–107.

Rice, D. W. 1974. Whales and whale research in the eastern North Pacific. Pages 170-195 *in* W. E. Schevill, editor. The Whale Problem: A Status Report. Harvard University Press, Cambridge, MA.

Rice, D. W. 1977. Synopsis of biological data on the sei whale and Bryde's whale in the eastern North Pacific. Report of the International Whaling Commission (Special Issue 1):92-97.

Rice, D.W., 1978. The humpback whale in the North Pacific: Distribution, exploitation, and numbers. Pages 29–44 in K. S. Norris and R. R. Reeves, eds. Report on a workshop on problems related to humpback whales (Megaptera novaeangliae) in Hawaii. Contract Report to the U.S. Marine Mammal Commission. NTIS PB-280–794. 90 pp.

Rice, D. W. 1989. Sperm Whale *Physeter macrocephalus*. Pp. 177-233 In S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals. Vol. 4. River Dolphins and the Larger Toothed Whales. Academic Press, New York.

Rice, D. W. 1998. Marine mammals of the world: Systematics and distribution. Special Publication Number 4. The Society for Marine Mammology, Lawrence, KS. 231p.

Riemer, S. D., Wright, B. E., Brown, R. F., 2010. Food habits of Steller sea lions (*Eumetopias jubatus*) off Oregon and northern California, 1986–2007. Fishery Bulletin 109:369-381.

Robbins J, 2010. Entanglement scarring on North Pacific humpback whales. In: Symposium on the results of SPLASH humpback whale study Final report and recommendations (Calambokidis J, ed). Quebec City, Canada; 18-19.

Robbins J, Landry S, Mattila D, 2009. Estimating entanglement mortality from scar-based studies. Scientific Committee Meeting of the International Whaling Commission, 2009. SC/61/BC3.

Robbins J, Mattila D, 2004. Estimating humpback whale (Megaptera novaeangliae) entanglement rates on the basis of scar evidence. Report to the Northeast Fisheries Science Center, National Marine Fisheries Service.

Rosenbaum, H.C, R.L. Brownell Jr., M.W. Brown, C. Schaeff, V. Portway, B.N. White, S. Malik, L.A. Pastene, N.J. Patenaude, C.S. Baker, M. Goto, P.B. Best, P.J. Clapham, P. Hamilton, M. Moore, R. Payne, V. Rowntree, C.T. Tynan, and R.

DeSalle. 2000. Worldwide genetic differentiation of *Eubalaena*: questioning the number of right whale species. Molecular Ecology 9:1793-1802.

Ross, J.P., and M.A. Barwani. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. Pages 189-195 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, Washington, D. C. 583 pp.

Rowlett, R.A., G.A. Green, C.E. Bowlby, and M.A. Smultea. 1994. The first photographic documentation of a northern right whale off Washington State. Northwestern Naturalist 75:102-104.

Rowntree, V., J. Darling, G. Silber, and M. Ferrari. 1980. Rare sighting of a right whale (*Eubalaena glacialis*) in Hawaii. Can. J. Zool. 58:308-312.

Salden, D.R. and J. Mickelsen. 1999. Rare sighting of a north Pacific right whale (*Eubalaena glacialis*) in Hawaii. Pacific Science 53(4):341-345.

Sanger, G. A. 1972. The recent pelagic status of the short-tailed albatross (Diomedea albatrus). Biological Conservation 4(3): 186-193.

Sangster, G. I., K. M. Lehmann, and M. Breen. 1996. Commercial fishing experiments to assess the survival of haddock and whiting after escape from four sizes of diamond mesh codends. Fish. Res. 25:323–345.

Sarti M., L., S.A. Eckert, N. García T., and A.R. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. Mar. Turtle Newsl. 74:2-5.

Sarti M., L., C. López, N. García, L. Gámez, C. Hernández, C. Ordoñez, A. Barragán, and F. Vargas. 1993. Protección e investigación de algunos aspectos biológicos y reproductivos de las tortugas marinos en la zona sur de la de la costa michoacána. Temporada 1992-93. Informe final. Facultad de Ciencias. UNAM. Mexico. 34 pp.

Scarff, J. E. 1986. Historic and present distribution of the right whale (*eubalaena glacialis*) in the eastern North Pacific south of 50"N and east of 18O"W. Reports of the International Whaling Commission (Special Issue 10):43-63.

Scarff, J. E. 1991. Historic distribution and abundance of the right whale (*Eubalaena glacialis*) in the North Pacific, Bering Sea, Sea of Okhotsk and Sea of Japan from the Maury Whale Charts. Report of the International Whaling Commission 41:467-487.

Schorr, G.S., E.A. Falcone, J. Calambokidis and R.A. Andrews. 2010. Satellite tagging of fin whales off California and Washington in 2010 to identify movement patterns, habitat use, and possible stock boundaries. Report to the Southwest Fisheries Science Center, National Marine Fisheries Service La Jolla, CA, USA.

Schweigert, J., B. McCarter, T. Therriault, L. Flostrand, C. Hrabok, P. Winchell, and D. Johannessen. 2007. Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), Appendix H: Pelagic fishes. Can. Tech. Rep. Fish. Aquat. Sci. 2667. Online at http://www.dfo-mpo.gc.ca/library/328842%20Appendix%20H.pdf [accessed May 2011].

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184.

Shaw, F. R., M. E. Wilkins, K. L. Weinberg, M. Zimmermann, and R. R. Lauth. 2000. The 1998 Pacific west coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-114. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-114/NOAA-TM-AFSC-114.pdf [accessed May 2011].

Sherburne, J. 1993. Status Report on the Short-tailed Albatross Diomedea albatrus. Unpublished Rep. for the U.S. Fish and Wildlife Service. Alaska Natural Heritage Program. 33pp.

Silber, G.K., M.W. Newcomer, P.C. Silber, H. Perez-Cortes M. and G.M. Ellis. 1994. Cetaceans of the Northern Gulf of California: Distribution, occurrence, and relative abundance. Mar. Mamm. Sci. 10(3): 283–298.

de Silva, G.S. 1982. The status of sea turtle populations in East Malaysia and the South China Sea. Pages 327-337 in K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, Washington, D. C. 583 pp.

Similä, T., J.C. Holst, and I. Christensen. 1996. Occurrence and diet of killer whales in northern Norway: seasonal patterns relative to the distribution and abundance of Norwegian spring-spawning herring. Canadian Journal of Fisheries and Aquatic Sciences, 53:769-779.

Skov, H., and coauthors. 2008. Small-scale spatial variability of sperm and sei whales in relation to oceanographic and topographic features along the Mid-Atlantic Ridge. Deep Sea Research Part Ii: Topical studies in Oceanography 55(1-2)254-268.

Smith, W. E., and R. W. Saalfeld. 1955. Studies on Columbia River smelt *Thaleichthys pacificus* (Richardson). Washington Dept. Fisheries, Olympia. Fish. Res. Pap. 1(3):3–26.

Smith, S.C., and H. Whitehead, H. 1993. Variations in the feeding success and behaviour of Galápagos sperm whales (Physeter macrocephalus) as they relate to oceanographie conditions. Canadian Journal of Zoology, 1993, 71:(10) 1991-1996, 10.1139/z93-283

Smultea, M. A., T. A. Jefferson, and A. M. Zoidis. 2010. Rare Sightings of a Bryde's Whale (Balaenoptera edeni) and Sei Whales (B. borealis) (Cetacea: Balaenopteridae) Northeast of O'ahu, Hawai'i. Pacific Science 64(3):449-457.

Spalding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion and harbour seal on the British Columbia coast. Bull. Fish. Res. Board Canada 146: 1-52.

Stafford, K. M., S. L. Nieukirk, and C. G. Fox. 2001. Geographic and seasonal variation of blue whale calls in the North Pacific. Journal of Cetacean Management. 3:65-76.

Starbird, C.H., and M.M. Suarez. 1994. Leatherback sea turtle nesting on the North Vogelkop coast of Irian Jaya and the discovery of a leatherback sea turtle fishery on Kei Kecil Island. Pages 143-146 in Bjorndal, K. A. , A.B. Bolten, D. A. Johnson, and Eliazar, P. J., (compilers) Proc. of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. U.S. Dep. Commer., NOAA Tech. Memo NMFS-SEFSC-351. 323 pp.

Starbird, C., A. Baldridge, and J.T. Harvey. 1993. Seasonal occurrence of leatherback sea turtles (Dermochelys coriacea) in the Monterey Bay Region, with notes on other sea turtles, 1986-1991. Calif. Fish and Game 79(2):54-62.

Stehn, R.A., K.S. Rivera, S. Fitzgerald, and K.D. Wohl. 2001. Incidental catch of seabirds by longline fisheries in Alaska. In: Seabird bycatch: trends, roadblocks, and solutions. (Ed) E.F. Melvin and J.K. Parrish. Proceedings of the Symposium, Seabird Bycatch: Trends, Roadblocks, and Solutions, February 26-27, 1999,

Blaine, Washington, Annual Meeting of the Pacific Seabird Group. University of Alaska Sea Grant, AK-SG-01-01.
Stevick P, Allen J, Clapham P, Friday N, Katona S, Larson F, Lien J, Mattila D, Palsboll P, Sigurjonsson J, Smith T, Oien N, Hammond PS, 2003. North Atlantic humpback whale abundance and rate of increase four decades after protection from whaling. Marine Ecology-Progress Series 258:263-273.
Straley, J., O'Connell, T., Mesnick, S., Behnken, L. and Liddle, J. 2005. North Pacific Research Board Project Final Report. Sperm Whale and Longline Fisheries Interactions in the Gulf of Alaska.
Suryan, R.M. 2008. Oregon State University. Unpublished data.
Suryan, R.M., F. Sato, G.R. Balogh, K.D. Hyrenbach, P.R. Sievert, and K. Ozaki. 2006. Foraging destinations and marine habitat use of short-tailed albatross: A multi-scale approach using first-passage time analysis. Deep-Sea Research II 53 (2006) 370–386.
Suryan, R.M., G.R. Balogh, and K.N. Fischer. 2007a. Marine Habitat Use of North Pacific Albatross During the Non-breeding Season and Their Spatial and Temporal Interactions with Commercial Fisheries in Alaska. North Pacific Research Board Project 532 Final Report. 69pp.
Suryan, R.M., K.S. Dietrich, E.F. Melvin, G.R. Balogh, F. Sato, and K. Ozaki. 2007b. Migratory routes of short-tailed albatross: use of exclusive economic zones of North Pacific Rim countries and spatial overlap with commercial fisheries in Alaska. Biological Conservation 137: 450-460.
Sutcliffe, W. H., and P. F. Brodie. 1977. Whale Distributions in Nova Scotia Waters. Bedford Institute of Oceanography, Technical Report No. 722, Dartmoth, Nova Scotia.
Suuronen, P. 2005. Mortality of fish escaping trawl gears. FAO Fish. Tech. Pap. 478. FAO Rome.
Suuronen, P., J. A. Perez-Comas, E. Lehtonen,, and V. Tschernij. 1996. Size-related mortality of herring (*Clupea harengus* L.) escaping through a rigid sorting grid and trawl codend meshes. ICES J. Mar. Sci. 53:691–700.
Sydeman, W. J. and Allen, S. G. (1999), Pinniped population dynamics in central California: correlations with sea surface temperature and upwelling indices. Marine Mammal Science, 15: 446–461
Tamura, T., and coauthors. 2009. Some examinations of uncertainties in the prey consumption estimates of common minke, sei and Bryde's whales in the western North Pacific. Unpublished paper to the IWC Scientific Committee, Madeira, Portugal.
Tershy, B. R., D. Breese, and C. S. Strong. 1990. Abundance, seasonal distribution and population composition of balaenopterid whales in the Canal de Ballenas, Gulf of California, Mexico. Report of the International Whaling Commission Special Issue 12:369-375.-Individual Recognition of Cetaceans Use of Photo-Identification and Other Techniques To Estimate Population Parameters.
Tickell, W.L.N. 1975. Observations on the status of Steller’s albatross (Diomedea albatrus) 1973. Bulletin of the International Council for Bird Preservation XII:125-131.
Tickell, W.L.N. 2000. Albatross. New Haven: Yale University Press.

Tillman, M. F. 1977. Estimates of population size for the North Pacific sei whale. (Balaenoptera borealis). Report of the International Whaling Commission Special Issue 1:98-106.-Sc/27/Doc 25).

Toft, J. E., Punt, A. E., & Little, L. R. (January 01, 2011). Modelling the economic and ecological impacts of the transition to individual transferable quotas in the multispecies US west coast groundfish trawl fleet. Ices Journal of Marine Science, 68, 7, 1566-1579

Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. Zoologica 19(1):1-50 plus maps.

Treacy, S. D. 1985. Feeding habits of marine mammals from Grays Harbor, Washington to Netarts Bay, Oregon. Pages 149-198 in: R. J. Beach, A. C. Geiger, S. J. Jeffries, and B. L. Troutman (eds.). Marine mammals and their interactions with fisheries of the Columbia River and adjacent waters. NWAFC Proc. Rep. 85-04.

Trites, A.W., D.G. Calkins and A.J. Winship. 2007. Diets of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, 1993 to 1999. Fishery Bulletin 105:234-248.

Tynan C, Ainley D, Barth J, Cowles T, Pierce S, Spear L, 2005. Cetacean distributions relative to ocean processes in the northern California Current system. Deep-Sea Res II 52:145-167.

U.S. Fish and Wildlife Service (USFWS).1997. Recovery Plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.

U.S. Fish and Wildlife Service (USFWS). 2003. Biological Opinion on the Effects of the Total Allowable Catch-Setting Process for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries to the Endangered Short-tailed Albatross (*Phoebastria albatrus*) and Threatened Steller's Eider (*Polysticta stelleri*), September 2003. Anchorage, AK. FWS-2003-205.

U.S. Fish and Wildlife Service (USFWS). 2004a. Biological Opinion on the Effects of the Reopened Shallow-Set Sector of the Hawaii Longline Fishery on the Short-tailed Albatross (*Phoebastria albatrus*), October 2004. Honolulu, HI. FWS 1-2-1999-F-02.2. 129 p.

U.S. Fish and Wildlife Service (USFWS). 2004b. Marbled murrelet (*Brachyramphus marmoratus*) 5-year review. U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office, Region 1, Portland, OR. 28 p.

U.S. Fish and Wildlife Service (USFWS). 2006. California least tern (*Sternula antillarum browni*) 5-Year Review Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad, CA. 35 p.

U.S. Fish and Wildlife Service (USFWS). 2008. Short-tailed albatross Recovery Plan. Anchorage, AK, 105 pp.

U.S. Fish and Wildlife Service (USFWS). 2009a. U.S. Fish and Wildlife Service-Spotlight Species Action Plan (2010-2014). California least tern (*Sternula* (= *Sterna*) *antillarum browni*). Carlsbad Fish and Wildlife Office. U.S. Fish and Wildlife Service, Carlsbad, CA. 4 p.

U.S. Fish and Wildlife Service (USFWS). 2009b. Marbled murrelet (*Brachyramphus marmoratus*) 5-year review. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, Lacey, WA. 108 p.

Van Eenennaam, J. P., M. A. H. Webb, X. Deng, S. I. Doroshov, R. B. Mayfield, J. J. Cech, D. C. Hillemeier, and T. E. Willson. 2001. Artificial spawning and larval rearing of Klamath River green sturgeon. Transactions of the American Fisheries Society **130**:159-165.

Visser, I. 1999. Benthic foraging on stingrays by killer whales (Orcinus orca) in New Zealand waters. Marine Mammal Science, 15:220-227.

Visser, I.N. 2000. Killer whale (Orcinus orca) interactions with longline fisheries in New Zealand waters. Aquatic Mammals 2000, 26.3, 241–252.

Von Saunder, A. and J. Barlow. 1999. A report of the Oregon, California and Washington Line-transect Experiment (ORCAWALE) conducted in west coast waters during summer/fall 1996. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFSC-264. 40 pp.

Wada, S. 1973. The ninth memorandum on the stock assessment of whales in the North Pacific. Rep. Int. Whal. Comm. 23:164-169.

Wada S. 1980. On the genetic uniformity of the North Pacific sperm whale. Reports of the International Whaling Commission Special Issue 2:205-211.

Wade, P. R. and Gerrodette, T. 1993. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. Reports of the International Whaling Commission. 43:477-493.

Wade, P.R. and R. Angliss. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. U.S. Department of Commerce, NOAA Technical Memo. NMFS-OPR-12. 93 pp.

Wade, P.R., M.P. Heide-Jorgensen, K. Shelden, J. Barlow, J. Carretta, J. Durban, R. LeDuc, L. Munger, S. Rankin, A. Sauter and C. Stinchcomb. 2006. Acoustic detection and satellite tracking leads to discovery of rare concentration of endangered North Pacific right whales. Biol. Lett. 2:417-419.

Wade, P.R., A. Kennedy, R. LeDuc, J. Barlow, J. Carretta, K. Sheldon, W. Perryman, R. Pitman, K. Robertson, B. Rone, J.C. Salinas, A. Zerbini, R.L. Brownell, Jr, and P.J. Clapham. 2011. The world's smallest whale population? Biol. Lett. 7:83-85.

Waite, J. M., K. Wynne, and D. K. Mellinger. 2003. Documented sighting of a North Pacific right whale in the Gulf of Alaska and post-sighting acoustic monitoring. Northwest. Nat. 84:38-43.

Wang, P. 1978. Studies on the baleen whales in the Yellow Sea. Acta Zool. Sin. 24:269-277 .

Ward, P., Myers, R.A., and Blanchard, W. 2004. Fish lost at sea: the effect of soak time on pelagic longline catches. Fish. Bull. 102: 179-195.

Ward, E.J., E.E. Holmes, and K.C. Balcomb. 2009. Quantifying the effects of prey abundance on killer whale reproduction. Journal of Applied Ecology 46:632-640.

Waring G.T., D.L. Palka, K.D. Mullin, J.H.W. Main, L.J. Hansen, and K.D. Bisack. 1997. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments — 1996. NOAA Tech. Memo. NMFS-NE-114: 250 pp.

Waring, G. T., Quintal, J. M. and Schwartz, S. L., editors. 2001. US Atlantic and Gulf of Mexico marine mammal stock assessments- 2001. NOAA Technical Memorandum NMFS NE 168; 307p.

Waring G, Josephson E, Maze-Foley K, Rosel PE, 2009. U.S. Atlantic and Gulf of Mexico marine mammal stock assessment -- 2009. NOAA Technical Memorandum NMFS-NE-213.

Washington Sea Grant. 2011. Bringing albatross conservation to West Coast groundfish fisheries: progress on outreach efforts in the longline fleet. 24 August 2011.

Watkins, W.A., Moore, K. E., and Tyack, P. 1985. Sperm whale acoustic behaviors in the southeast Caribbean. Cetology 49:1-15.

WDF (Washington Department of Fisheries). 1993. Commercial Salmon Fishing Gears for Washington Fisheries. Olympia, WA.

WDF (Washington Department of Fisheries). 1993. Marine Fish and Shellfish Gears for Washington Fisheries. Olympia, WA.

WDFW (Washington Department of Fish and Wildlife). 2002. Fishing in Washington Sportfishing Regulations. Olympia, WA.

Weinberg, K. L., M. E. Wilkins, and T. A. Dark. 1984. The 1983 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-F/NWC-70.

Weinberg, K. L., M. E. Wilkins, R. R. Lauth, and P. A. Raymore Jr. 1994a. The 1989 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-33. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-33.pdf [accessed May 2011].

Weinberg, K. L., M. Zimmermann and R. R. Lauth. 1994b. Appendices to the 1989 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-33.

Weinberg, K. L., M. E. Wilkins, F. R. Shaw, and M. Zimmermann. 2002. The 2001 Pacific west coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-128. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-128.pdf [accessed May 2011].

Wetherall, J.A., G.H. Balazs, R.A. Tokunaga, and M.Y.Y. Yong. 1993. Bycatch of marine turtles in the North Pacific high-seas driftnet fisheries and impacts on the stocks. In: Ito, J. et al. (editors), INPFC Symposium on biology, distribution, and stock assessment of species caught in the high seas driftnet fisheries in theNorth Pacific Ocean, Bulletin Number 53 (III): 519-538 Int. North. Pac. Fish Comm.

Whitehead, H. 2002. Estimates of the current global population size and historical trajectory for sperm whales. Marine Ecology Progress Series 242:295-304.

Whitehead, H. 2003. Sperm Whales: social evolution in the ocean. University of Chicago Press, 431 pg.

Wiles, G. J. 2004. Washington State status report for the killer whale. Washington Department Fish and Wildlife, Olympia, Washington.

Wilkins, M. E. 1998. Appendices to the 1995 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-89. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-89a.pdf [accessed May 2011].

Wilkins, M. E., M. Zimmermann, and K. L. Weinberg. 1998. The 1995 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-89. Online at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-89.pdf [accessed May 2011].

Wilkins, M. E., and F. R. Shaw. 2000. Appendices to the 1998 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-114. Online at http://www.afsc.noaa .gov/Publications/AFSC-TM/NOAA-TM-AFSC-114/Appendices%20to%20NOAA-TM-AFSC-114.pdf [accessed May 2011].

Wilkins, M. E., and K. L. Weinberg. 2002. Appendices to the 2001 Pacific West Coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-128. Online at http:// www.afsc.noaa.gov/race/media/publications/archives/pubs2002/techmemo128_append.pdf [accessed May 2011].

Willson, M. F., R. H. Armstrong, M. C. Hermans, and K Koski. 2006. Eulachon: a review of biology and an annotated bibliography. Alaska Fisheries Science Center Processed Report 2006-12. Auke Bay Laboratory, Alaska Fish. Sci. Cent., NOAA, Natl. Mar, Fish. Serv., Juneau, AK. Online at http://www.afsc.noaa.gov/publications/ProcRpt/PR%202006-12.pdf [accessed March 2011].

Wilson, M.T. 2009. Ecology of small neritic fishes in the western Gulf of Alaska. I. Geographic distribution in relation to prey density and the physical environment. Mar. Ecol. Progr. Ser. 392: 223–237.

Wilson, M. T., C. M. Jump, and A. Buchheister. 2009. Ecology of small neritic fishes in the western Gulf of Alaska. II. Consumption of krill in relation to krill standing stock and the physical environment. Mar. Ecol. Progr. Ser. 392: 239–251.

Witt, M.J., R. Penrose and B.J. Godley. 2007. Spatio-temporal patterns of juvenile marine turtle occurrence in waters of the European continental shelf. Marine Biology 151:873-885

Woodhouse, C. D., and J. Strickley. 1982. Sighting of northern right whale *(Eu*balaena *glacialis)* in the Santa Barbara Channel. Journal of Mammalogy 63:701-702.

Yablokov, A. V. 1994. Validity of whaling data. Nature 367:108.

Zador, S.G., Punt, A.E., Parrish, J.K., 2008. Population impacts of endangered short-tailed albatross bycatch in the Alaskan trawl fishery. Biological Conservation 141: 872–882.

Zerbini A, Clapham P, Wade P, 2010. Assessing plausible rates of population growth in humpback whales from life-history data. Marine Biology 157:1225-1236.

Zimmermann, M. 1994. Appendices to the 1992 Pacific west coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-42.
Zimmermann, M., M. E. Wilkins, R. R. Lauth, and K. L. Weinberg. 1994. The 1992 Pacific west coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length composition. U. S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-42.

Appendix A - Evaluating Trophic Impacts of California Current Groundfish Fisheries on Protected Species

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Introduction:

This document aims to provide strategic, qualitative advice regarding the impacts of West Coast groundfish fisheries on key forage species of the California Current. The document addresses the likely impacts of a range of fishing strategies, and the effects of these strategies on forage groups such as euphausiids (krill), cephalopods (squid), and small pelagic fish (sardines, *Sardinops sagax*, and anchovies, *Engraulis mordax*). These prey groups are primary diet items for protected species, including marine mammals and birds.

The importance of euphausids, squid, and small pelagic fish as forage in the California Current is supported by a comprehensive synthesis of diet information for major taxa within the California Current ecosystem, including fish, marine mammals, birds, and invertebrates (Dufault et al. 2009). This synthesis is a compilation of 75 published diet studies from this ecosystem, and calculations of representative diets for each species or aggregated functional group. Table 1 lists diets of marine mammals and birds, as reported in Dufault et al. (2009). In particular, cephalopods comprise more than 25% of the diets of pinnipeds, toothed whales, and small cetaceans. Euphausiids comprise more than 25% of the diets of baleen whales, and are also are a smaller percentage of the diets of surface seabirds and migratory seabirds (sooty shearwaters, *Puffinus griseus*). Small pelagic fish comprise more than 25% of the diets of migratory seabirds, diving birds, surface seabirds, and juvenile pinnipeds.

Below I describe simulation results from an Atlantis ecosystem model of the California Current. The model is a spatially explicit, dynamic projection of the biomass, abundance, and weights-at-age of over 60 species or functional groups on the US West Coast (Brand et al. 2007, Kaplan and Levin 2009). The simulations involve a range of fishing scenarios, from no fishing up to levels well above current harvests. In the model, abundance of any species or group is influenced by both direct fishing mortality, and by shifts in predation mortality that may stem from fishing. We therefore expect the ecosystem model to capture both the direct and indirect effects of fishing on these forage species.

I consider the impacts of fishing on forage fish for three separate cases studies, or sets of simulations. The first case study (Kaplan and Levin 2009) explores a range of hypothetical harvest levels. The second case study investigates realistic estimates of current harvest, and potential increases in harvest over the next 5 years that may arise under an individual transferable quota program (Kaplan et al. submitted). The third case study involves a revised version of the model (Horne et al. in press), and tests a series of alternate fisheries management options such as marine protected areas and gear switching.

These cases studies illustrate that current activities of the US West Coast groundfish fisheries are unlikely to have strong negative impacts on these forage species.

Methods

The Atlantis California Current Ecosystem Model

The California Current Atlantis ecosystem model (Brand et al. 2007, Kaplan and Levin 2009) is built to address the impacts of climate, oceanography, nutrient dynamics, and spatially explicit fishing effort on a dynamic food web. The generic Atlantis code is well developed at this time, and Fulton (2001, 2004) and Fulton et al. (2005, 2007) have parameterized it for several systems in Australia. Most recently, Fulton et al. have used the SE Australia model to rank alternative policy scenarios, quantitatively evaluating alternative management packages of quotas, protected areas, closed seasons, and other policy options (Fulton et al. 2007).

Our California Current Atlantis model extends from the US/Canada Border to Point Conception, California, and out to the 1200m isobath (Figure 1). The trophic dynamics are represented by 55 functional groups in the food web. Functional groups are typically comprised of pools of 1 to 10 species with similar ecological roles. General classes of functional groups include habitat-forming species like kelp, corals and sponges, as well as vertebrate consumers, benthic invertebrates, zooplankton, phytoplankton and detritus. Vertebrate populations have age structure, and Atlantis explicitly tracks weight-at-age. The model is divided into 62 spatial zones, each with up to seven depth layers. This allows us to explicitly test hypotheses regarding fish migrations and movement behavior, fleet dynamics, and spatial management. The model is forced with daily hydrodynamic

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flows, salinity, and temperature outputs from a high-resolution three-dimensional Regional Ocean Modeling System (www.myroms.org), implemented by E. Curchitser and K. Hedstrom (*pers. comm., Institute of Marine and Coastal Sciences, Rutgers University, 71 Dudley Road, New Brunswick, NJ 08901*), and recently applied by Hermann et al. (2009). A separate sub-module simulates simplified effort dynamics for fisheries. The full parameterization for the California Current is available in Brand et al. (2007).

Modifications since the publication of Brand et al. (2007) primarily involve addition of canary rockfish and English sole groups, minor updates to stock abundance as reported in the 2007 stock assessments (PFMC 2008), and inclusion of updated diet data (Dufault et al 2009). The new diet data are particularly important, since they dictate the links in the food web, and thus predator/prey interactions.

The revised version of the model used in the third set of simulations below (Horne et al. in press) is quite similar to the original implementation, but includes more recent estimates of biomass, a slightly different spatial geometry in Central California, and the addition of several extra functional groups (one invertebrate, one mammal, and five finfish functional groups).

Case Studies (Sets of Scenarios)

Case Study 1: Effects of hypothetical harvest levels (Kaplan and Levin 2009)

This set of simulations investigated the impact of a range of harvest levels on the California Current ecosystem, and then tested the utility of various ecosystem indicators to detect the resulting community-level effects of fishing.

The results presented here are from 25 year model runs subject to a range of fishing intensities. The initial conditions for the biological model include abundance and weight-at-age of each vertebrate group in each area, and biomass per area for all other groups. These initial conditions are based on data from approximately 1995-2005.

Fishing was parameterized based on initial abundance of each group. We identified all functional groups that are landed by US West Coast fisheries, using the PacFIN fish ticket landings database. Small pelagic fish and squid were reported in the landings, wile euphausiids were not. We then simulated the harvest of a constant amount (metric tons) of these groups per year, ranging from 0 x initial abundance to 1x initial abundance. The increments for harvest were [0 0.01 0.03 0.05 0.075 0.1 0.15 0.2 0.25 0.3 0.5 0.7 1.0] x initial abundance.

Case Study 2: Realistic estimates of current harvest and potential increases (Kaplan et al. submitted)

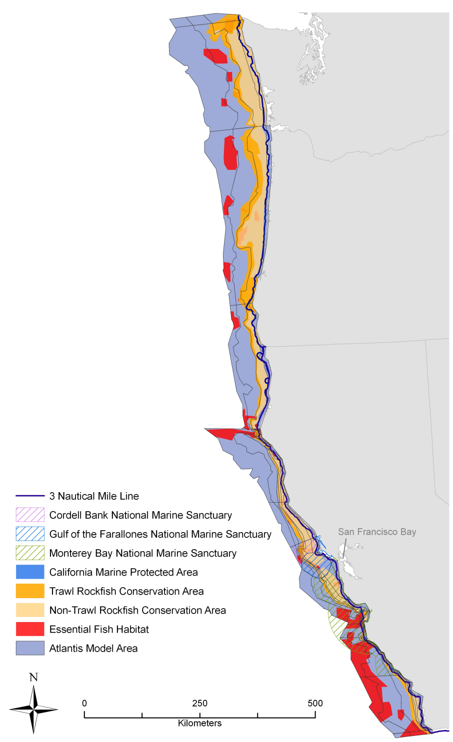
This set of simulations was motivated by a desire to evaluate the ecosystem impacts of increased catch of certain target species, as may occur under an individual transferable quota program for the West Coast groundfish fishery. The catch scenarios are:

- ***Status Quo***, in which catches per species and area occur based on the assumption that regulations in the future are the same as those set between 2003 and 2006. Catches of target and bycatch species under this scenario are roughly the same as those that occurred from 2003 to 2006.
- ***Scenario 1*** (Low Catch Scenario), in which fishermen minimally increase catches of target species compared to the Status Quo scenario.
- ***Scenario 2*** (Medium Catch Scenario), in which fishermen moderately increase catch of some target species.
- ***Scenario 3*** (High Catch Scenario): fishermen substantially increase catch of some target species.
- ***No Fishing***, in which there is no catch of any species or group by any fishery.

The annual catch projections (Table A1) were applied beginning in model year 2009, with these catches imposed for 20 years (through 2028).

We converted the catch scenarios (Table A1) to annual catch estimates per functional group, and applied these catches beginning in model year 2009. This required matching regions defined in the catch projections with Atlantis regions, as well as matching the species from the catch projection to functional groups within Atlantis. For functional groups not listed in the catch scenarios (i.e. not contained in Table A1), we applied the final year of data we had from the PacFIN landings database (2004) to all projection years. Annual catches were applied in each model year as long as they did not exceed the standing stock. We did not decrease harvests if biomass declined (i.e. we did not simulate a management response).

Case Study 3: Effects of alternate fishing strategies (Horne et al. in press).



The third case study uses a revised Atlantis ecosystem model (Horne et al. in press), with the aim of considering spatial management options and the effects of alternate fishery management policies on ecosystem services. We tested fishery management scenarios that capture a range of options for spatial management and shifts in prevalence of particular fishing gears. Using the Atlantis ecosystem model, we simulated the impact of each of these scenarios for 20 years. Fishing is simulated on a per fleet basis, where a fleet is generally a gear (e.g groundfish trawl, recreational hook and line).

For each fleet (gear), we specify

1) The proportion of each model spatial cell that is open or closed to that fleet
2) The fishing mortality (%/year) applied to each spatial cell that is open to fishing

The scenarios begin in 2010 and apply a particular combination of spatial management and fleet-specific fishing mortalities for 20 years.

Scenario 1: Status Quo

This scenario aims to evaluate the predicted performance of existing state MPAs, Rockfish Conservation Areas (RCAs), and Essential Fish Habitat (EFH) closures.

The scenario projects the Atlantis ecosystem model for 20 years, imposing fishing mortality from all existing fleets onto all relevant species or functional groups. Spatial fishing closures in the model are based on existing EFH and RCA restrictions that limit bottom contact or bottom trawl gear [1] (Figures 2 and 3). EFH and RCA closures are assumed to persist to the end of the simulation, since recovery of rockfish (*Sebastes*) stocks is expected to take several decades. Fishing mortality is apportioned between each of 20 gears.

[1] http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-EFH/upload/Map-Gfish-EFH-Close.pdf

For the groundfish gears, fishing mortality is derived from estimates of total mortality, including discards, from Bellman et al. (2008) [2]. For the non-groundfish gears, fishing mortality is based on landings reported in the PacFIN database[3]. For these simple simulations, we assume that fishing mortality (% mortality per year) remains constant over the course of the simulation. We do not vary fishing mortality or attempt to model time-varying quotas.

Scenario 2: Gear Shift

This scenario captures the desire to reduce bycatch by encouraging fishers to switch from trawl gear to "fixed gear" (pot or longline) that has lower bycatch rates. New individual quota regulations recently enacted by the Pacific Fishery Management Council allow for such gear switching [4]. Bellman et al. (2008) estimated total mortality per gear, and this can be used to parameterize a switch in gears. All details of the scenarios are the the same as Status Quo, except Scenario 2 cuts coast-wide limited entry trawl fishing mortality rates by 50%. Longline and pot fishing effort (mortality) is increased by a factor of 2.5 so that total value of landed target species remains equal to Status Quo. This results in a decrease in fishing mortality on non-target species, due to the higher selectivity of longline and pot gear.

[2] http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/TotalMortality_update2007.pdf

[3] http://www.psmfc.org/pacfin/data/r307.woc07

[4] http://www.pcouncil.org/groundfish/gffmp/gfa20/FinalAlternatives_080112.pdf

Scenario 3: Closed Area for Bottom Contact Gear

Status Quo spatial management involves an offshore RCA that prohibits trawl gear and a separate inshore RCA that prohibits non-trawl commercial gear. The offshore trawl RCA allows bottom contact gear (longline and pot) that may harm biogenic habitat. Scenario 3 converts all RCAs to prohibit all bottom contact gear (trawl, longline, and pot). As in other scenarios, RCAs will be permanent and will not vary seasonally.

No fishing scenario.

This is a 20 year run with no fishing mortality, meant to predict biomass levels for an unfished population.

Results and Discussion

Case Study 1: Effects of hypothetical harvest levels

This work from Kaplan and Levin (2009) illustrated that forage species such as small pelagic fish and squid are quite resilient to direct fishing mortality, as would be expected from their life history. Table 2 illustrates that small pelagic fish in the model did not decline under fishing mortality rates as high as 0.3 yr^{-1}, and cephalopods declined by only about half under the highest fishing mortality rates simulated here (0.7 yr^{-1}). While

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focused stock assessments are better tools than Atlantis for precisely estimating allowable mortality rates, the simulations illustrate the high productivity of these stocks. Bycatch of these two forage species by groundfish fisheries is most likely at least an order of magnitude less than those mentioned above.

In this case study, no direct fishing mortality was imposed on large zooplankton (euphausiids), and so only indirect effects of fishing impacted them, such as changes in predation mortality. Large zooplankton abundance varied less than 4% between scenarios, with the slight increase in simulations in which their predators were heavily depleted.

Case Study 2: Realistic estimates of current harvest and potential increases

These examples predicted that changing harvest levels from Status Quo to three possible alternatives (under an individual quota program) would not impact small pelagic fish, squid, or euphausiids (Table 3). In these scenarios, there was no fishing on euphausiids, and a constant amount of fishing on squid and small pelagic fish that did not vary between scenarios. Therefore the results suggest that the changes in groundfish harvest levels tested here would not impact forage species through indirect effects (predation or competition).   It should be noted that the fishing mortality rates tested here are both realistic and low, with fishing mortality rates of <5% for groundfish target species.

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Comparing the results under no fishing to the four fished scenarios suggests that without fishing one could expect slightly fewer (3%) euphausiids, due to high abundances of their predators. This is similar to the relationship identified in the results for Case Study 1. Reduced fishing mortality on small pelagic fish would cause a slight increase in their abundance (~25%). The model predicts a large increase in abundance of squid in the absence of direct fishing on them (~20x), though this may be unrealistic, and further model calibration and fitting may resolve this.

Case Study 3: Effects of alternate fishing strategies

In the Horne et al. (in press) model, the Status Quo scenario, Gear Shift, and Closed Area scenarios varied management strategies for groundfish fisheries. This subsequently changed predation on forage species as well as competition, but did not change fishing mortality on forage species. Relative to Status Quo, the Gear Shift and Closed Area led to less than a 1% impact on small pelagic fish and euphausiids (Table 4). In Table 4, squid appear more abundant in the Gear Shift scenario (1.65x) and the Closed Area scenario (51x) than Status Quo, which had very low squid abundance at the end of 20 year simulation.

The No Fishing scenario here suggests that high predator abundance in the unfished situation may lead to 20% lower abundances of small pelagic fish, and as much as a 60% reduction in euphausiid abudance, relative to what would be expected under Status Quo fishing. The very high abundance of squid when they were released from direct fishing mortality (Table 4) is relative to a Status Quo case where their abundance oscillated and then declined steeply. Relative to estimates of 2009 squid biomass, in the No Fishing Scenario squid increased 313x over the course of a 20 year simulation. In reality, ceasing fishing mortality on squid is likely to lead to an increase in their abundance, but ongoing calibration of the model is likely to suggest more moderate increases.

Summary

The simulations above demonstrate the resilience and productivity of forage species, such as euphausiids, squid, and small pelagic fish. The realistic fishing scenarios tested (Case Studies 2-3) suggest that moderate and realistic alterations in the groundfish fisheries are unlikely to have strong negative impacts on these groups. All three case studies demonstrate that forage group abundance may be slightly higher under current fishing levels than in unfished scenarios, which had higher predation rates on forage species. Protected species such as marine mammals and birds, which frequently prey heavily upon these forage groups, are unlikely to be strongly impacted by food web interactions caused by groundfish fisheries.

References:

Brand, E. J., Kaplan, I.C., Harvey, C.J., Levin, P.S., Fulton, E.A., Hermann, A.J., and Field, J.C. 2007. A spatially explicit ecosystem model of the California Current's food web and oceanography. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-84. Available from http://www.nwfsc.noaa.gov/publications/index.cfm [accessed 14 January 2009] .

Dufault, A.M., K.M. Marshall, and I.C. Kaplan. 2009. A synthesis of diets and trophic overlap of marine species of the California Current in the Northern California Current. NOAA Technical Memorandum NMFS-NWFSC-103. Available online: http://www.nwfsc.noaa.gov/assets/25/ 7024_12212009_134730_DietsCalCurrentTM103WebFinal.pdf

Fulton, E. A. 2001. The effects of model structure and complexity on the behavior and performance of marine ecosystem models. Doctoral thesis, University of Tasmania, Hobart, Tasmania, Australia.

Fulton, E. A. 2004. Biogeochemical marine ecosystem models II: The effect of physiological detail on model performance. Ecol. Model. 173,371–406.

Fulton, E. A., Punt, A.E., and Smith, A.D.M. 2005. Which ecological indicators can robustly detect effects of fishing? ICES J. Mar. Sci. 62,540–551.

Fulton, E.A., Smith, A.D.M., and Smith, D.C. 2007. Alternative Management Strategies for Southeast AustralianCommonwealth Fisheries: Stage 2: Quantitative Management Strategy Evaluation. Australian Fisheries Management Authority, Fisheries Research and Development Corporation. Available from http://atlantis.cmar.csiro.au/ [accessed 5 October 2009].

Hermann, A. J., Curchitser, E.N., Haidvogel, D. B. and Dobbins, E.L. 2009. A comparison of remote versus local influence of El Nino on the coastal circulation of the Northeast Pacific. Deep Sea Research II., in press.

Horne. P, I. C. Kaplan, C. J. Harvey, P. S. Levin, and E. A. Fulton. In press. An ecsosystem model of the California Current, focusing on Central California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-XXXXX.

Kaplan, I.C., P.S. Levin, M. Burden, and E.A. Fulton. Submitted to Canadian Journal of Fisheries and Aquatic Science. Fishing Catch Shares in the Face of Global Change: A Framework for Integrating Cumulative Impacts and Single Species Management .

Kaplan, I.C., and Levin, P.S. 2009. Ecosystem based management of what? An emerging approach for balancing conflicting objectives in marine resource management.In R.J. Beamish and B.J. Rothschild, eds. The Future of Fisheries In North America. Springer, NY 736 pages.

Pacific Coast Fisheries Information Network (PacFIN). 1981-2009 W-O-C All Species Reports(Rpt #307). Available from http://www.psmfc.org/pacfin/data/r307.woc08 [accessed 17 May 2009] .

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Pacific Fishery Management Council (PFMC). 2003. Minutes of the 170th meeting of the Pacific Fishery Management Council: Bycatch Model Review Workshop Report. 7700 NE Ambassador Place, Suite 101, Portland OR 97220.

Pacific Fishery Management Council (PFMC). 2008. Pacific Coast Groundfish Fishery Stock Assessment and Fishery Evaluation, Volume 1. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220. Available from http://www.pcouncil.org/groundfish/gfsafe0308/SAFE_2008_March.pdf [accessed 17 May 2009]

Pacific Fishery Management Council (PFMC) and National Marine Fisheries Service (NMFS). 2009. Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific Coast Groundfish Fishery Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. January 2009. Available from http://www.pcouncil.org/groundfish/gfspex/gfspex09-10.html [accessed 17 May 2009]

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Table 1. Diets of marine mammal and bird groups in the California Current. From Dufault et al. (in prep). The first column lists prey items, the second column is adult diet composition (% wet weight), and third column is juvenile diet composition.

Baleen whale		
	Adult	Juvenile
Large zooplankton	0.3539	0.3539
Small planktivores	0.0501	0.0501
Deep vertical migrators	0.0049	0.0049
Cephalopods	0.0049	0.0049
Deposit feeders	0.5863	0.5863
Sea otters		
	Adult	Juvenile
Other benthic filter feeders	0.5760	0.5760
Benthic herbivorous grazers	0.2596	0.2596
Deep macrozoobenthos	0.0008	0.0008
Megazoobenthos	0.1631	0.1631
Shallow macrozoobenthos	0.0005	0.0005
Pinnipeds (seals, sea lions)		
	Adult	Juvenile
Deposit feeders	0.0000	0.0214
Shallow macrozoobenthos	0.0000	0.0172
Cephalopods	0.4531	0.3719
Shallow small rockfish	0.0068	0.0000
Juv. shallow small rockfish	0.0000	0.0005
Deep small rockfish	0.0384	0.0000
Juv. Deep small rockfish	0.0000	0.0034
Deep misc. fish	0.0000	0.0616
Misc. nearshore fish	0.0000	0.0207
Juv. small flatfish	0.0000	0.0212
Deep large rockfish	0.0109	0.0000
Juv. Deep large rockfish	0.0000	0.0012
Midwater rockfish	0.0358	0.0000
Juv. midwater rockfish	0.0000	0.0041
Hake	0.0967	0.0000
Juv. Hake	0.1035	0.0428
Sablefish	0.0046	0.0000
Juv. Sablefish	0.0000	0.0086
Large planktivores	0.0018	0.0000
Small planktivores	0.1214	0.3196
Salmon	0.0116	0.0000
Juv. Salmon	0.0000	0.0482
Juv. small demersal sharks	0.0550	0.0311
Shallow large rockfish	0.0054	0.0000
Juv. shallow large rockfish	0.0000	0.0006
Juv. skates and rays	0.0550	0.0199
Gelatinous zooplankton	0.0000	0.0060

Table 1 continued.

	Adult	Juvenile
Toothed whale		
Deposit feeders	0.0316	0.0316
Megazoobenthos	0.0316	0.0316
Cephalopods	0.6740	0.6740
Small planktivores	0.0236	0.0236
Large planktivores	0.0236	0.0236
Deep vertical migrators	0.0724	0.0724
Hake	0.0397	0.0397
Sablefish	0.0000	0.0000
Salmon	0.0639	0.0639
Large flatfish	0.0001	0.0001
Deep misc. fish	0.0397	0.0397
Shallow large rockfish	0.0000	0.0000
Migrating seabirds (sooty shearwaters)	Adult	Juvenile
Small planktivores	0.5786	0.5786
Large zooplankton	0.0347	0.0347
Cephalopods	0.0720	0.0720
Juv. Hake	0.0813	0.0813
Deep misc. fish	0.0227	0.0227
Deep vertical migrators	0.1293	0.1293
Juv. shallow small rockfish	0.0039	0.0039
Juv. Deep small rockfish	0.0271	0.0271
Juv. canary rockfish	0.0028	0.0028
Juv. midwater rockfish	0.0327	0.0327
Juv. shallow large rockfish	0.0050	0.0050
Juv. Deep large rockfish	0.0099	0.0099
Small cetaceans (porpoise, dolphins)	Adult	Juvenile
Deposit feeders	0.0276	0.0276
Megazoobenthos	0.0276	0.0276
Cephalopods	0.3334	0.3334
Deep vertical migrators	0.1580	0.1580
Misc. nearshore fish	0.0710	0.0710
Misc. nearshore fish	0.0710	0.0710
Hake	0.0710	0.0710
Large planktivores	0.0847	0.0847
Small planktivores	0.0847	0.0847
Salmon	0.0710	0.0710

Table 1 continued.

	Adult	Juvenile
Diving seabirds (murres, auklets, cormorants)		
Cephalopods	0.1016	0.1016
Deep vertical migrators	0.0755	0.0755
Shallow small rockfish	0.0466	0.0466
Juv. shallow small rockfish	0.0173	0.0173
Deep misc. fish	0.0084	0.0084
Misc. nearshore fish	0.0910	0.0910
Small flatfish	0.0337	0.0337
Misc. nearshore fish	0.0000	0.0000
Juv. midwater rockfish	0.1117	0.1117
Hake	0.0395	0.0395
Juv. canary rockfish	0.0095	0.0095
Small planktivores	0.3549	0.3549
Salmon	0.0091	0.0091
Shrimp	0.0019	0.0019
Juv. shallow large rockfish	0.0170	0.0170
Surface seabirds (gulls, pelicans, petrels)		
	Adult	Juvenile
Other benthic filter feeders	0.0200	0.0200
Cephalopods	0.1193	0.1193
Carrion	0.0608	0.0608
Juv. shallow small rockfish	0.0063	0.0063
Juv. deep small rockfish	0.0444	0.0444
Juv. misc. nearshore fish	0.0268	0.0268
Juv. deep large rockfish	0.0163	0.0163
Juv. midwater rockfish	0.0536	0.0536
Juv. Hake	0.0439	0.0439
Small planktivores	0.5130	0.5130
Juv. shallow large rockfish	0.0082	0.0082
Gelatinous zooplankton	0.0264	0.0264
Large zooplankton	0.0610	0.0610
Transient orcas		
	Adult	Juvenile
Pinnipeds	0.7890	0.7890
Toothed whale	0.0494	0.0494
Baleen whale	0.0893	0.0893
Small cetaceans	0.0709	0.0709
Diving seabirds	0.0001	0.0001
Sea otters	0.0012	0.0012

Table 2. *Case Study 1. Biomass at the end of 25 year simulation, relative to initial (2009) biomass. Forage species values are bold.*

	Fishing Mortality Rate on Harvested Species										
Functional Group	**0**	**0.01**	**0.03**	**0.05**	**0.075**	**0.1**	**0.15**	**0.2**	**0.3**	**0.5**	**0.7**
Large planktivores (mackerel)	1.10	1.05	1.03	1.01	0.98	0.94	0.85	0.71	0.00	0.00	0.00
Canary rockfish	3.67	4.02	3.73	4.10	3.84	4.24	3.86	4.23	4.26	3.60	3.92
Small pelagic fish (sardine, anchovy)	**1.57**	**1.52**	**1.53**	**1.48**	**1.46**	**1.40**	**1.36**	**1.24**	**1.12**	**0.00**	**0.00**
Large flatfish (arrowtooth)	0.87	0.80	0.74	0.62	0.53	0.27	0.00	0.00	0.00	0.00	0.00
Lg. demersal predators (lingcod)	2.66	2.50	2.25	1.95	1.33	0.00	0.00	0.00	0.00	0.00	0.00
Salmon	5.89	5.89	2.30	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Large pelagic predators (tuna)	52.18	52.00	52.07	51.88	51.90	51.65	51.51	51.02	50.06	45.69	45.21
Shearwaters	9.44	9.91	9.40	9.86	9.35	9.80	9.24	9.57	9.22	5.30	5.40
Hake	1.06	1.11	1.05	1.10	1.04	1.08	1.01	1.03	0.97	0.89	0.85
Sablefish	1.25	1.24	1.20	1.14	1.02	0.99	0.91	0.80	0.51	0.17	0.13
Deep vert.migrators (myctophids)	1.78	1.74	1.78	1.75	1.78	1.75	1.79	1.75	1.81	1.77	1.79
Deep misc. fish (slickhead, eelpout)	0.65	0.53	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Misc. nearshore fish (croaker, sculpin)	0.40	0.34	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Midwater rockfish	2.62	2.63	2.48	2.44	2.11	1.52	0.00	0.00	0.00	0.00	0.00
English sole	0.88	0.87	0.88	0.88	0.90	0.93	0.97	0.97	0.99	0.99	1.05
Shallow small rockfish	0.28	0.26	0.22	0.21	0.21	0.20	0.19	0.17	0.00	0.00	0.00
Deep small rockfish (longspine)	0.82	0.74	0.54	0.42	0.39	0.35	0.23	0.00	0.00	0.00	0.00
Deep large rockfish (shortspine)	1.11	1.00	0.73	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small flatfish (petrale, dover etc)	1.27	1.16	0.97	0.82	0.67	0.41	0.00	0.00	0.00	0.00	0.00
Small demersal sharks (dogfish)	1.35	1.26	1.07	0.89	0.64	0.38	0.00	0.00	0.00	0.00	0.00
Lg. demersal sharks (sixgill etc)	0.87	0.86	0.86	0.85	0.86	0.84	0.85	0.83	0.82	0.82	0.81
Pelagic sharks	1.95	1.89	1.66	1.50	1.07	0.15	0.00	0.00	0.00	0.00	0.00
Shallow large rockfish	1.58	1.52	1.41	1.34	1.22	1.11	0.91	0.81	0.60	0.07	0.00
Skates and rays	1.42	1.29	1.06	0.82	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Surface feed birds (gulls)	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.30	1.06	1.06
Diving birds	1.15	1.14	1.15	1.14	1.15	1.15	1.15	1.14	1.13	0.80	0.78

Pinnipeds	3.90	3.90	3.89	3.88	3.86	3.85	3.83	3.80	3.74	3.31	3.30
Transient orcas	2.30	2.44	2.30	2.44	2.30	2.44	2.30	2.44	2.44	2.29	2.43
Baleen whales	1.37	1.40	1.37	1.40	1.37	1.40	1.37	1.40	1.40	1.37	1.40
Toothed whales	2.42	2.56	2.42	2.56	2.41	2.55	2.41	2.54	2.54	2.39	2.53
Otters	8.08	8.50	8.08	8.50	8.08	8.50	8.07	8.50	8.49	8.07	8.49
Squid	**2.46**	**2.52**	**2.35**	**2.39**	**2.18**	**2.10**	**1.71**	**1.51**	**1.21**	**0.46**	**0.43**
Shallow benthic filter feeders	86.62	92.95	86.64	92.97	86.68	93.02	86.80	93.10	93.46	87.26	94.73
Other benthic filter feeders	0.72	0.81	0.72	0.81	0.72	0.82	0.73	0.82	0.83	0.78	0.86
Deep benthic filter feeders	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.87	0.88	0.88
Urchins	11.90	11.89	11.90	11.89	11.90	11.89	11.90	11.89	11.89	11.89	11.88
Deep macrozoobenthos	0.93	0.92	0.93	0.92	0.93	0.92	0.93	0.92	0.92	0.98	0.96
Large crabs	2.31	2.33	2.30	2.32	2.29	2.31	2.27	2.31	2.30	2.38	2.34
Octopus	0.15	0.14	0.15	0.14	0.16	0.14	0.16	0.15	0.15	0.17	0.16
Shrimp	0.83	0.81	0.83	0.81	0.84	0.83	0.86	0.85	0.85	0.85	0.83
Large zooplankton (euphausiid)	**1.20**	**1.23**	**1.20**	**1.23**	**1.21**	**1.23**	**1.21**	**1.23**	**1.23**	**1.25**	**1.24**
Deposit feeders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macroalgae (kelp)	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.27	0.27	0.28	0.27
Seagrass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carnivorous infauna	0.16	0.15	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Gelatinous zooplankton	4.04	3.90	3.77	3.61	3.41	3.19	2.74	2.27	1.53	0.04	0.03
Large phytoplankton	4.94	5.06	4.98	5.12	5.04	5.20	5.14	5.36	5.48	6.41	6.29
Small phytoplankton	3.51	4.17	3.42	4.03	3.30	3.82	3.07	3.39	3.05	1.17	1.25
Mesozooplankton (copepods)	7.72	7.32	7.69	7.29	7.66	7.26	7.60	7.19	7.20	6.71	6.99
Microzooplankton	2.74	2.62	2.73	2.61	2.73	2.61	2.73	2.61	2.61	3.15	3.09
Pelagic bacteria	12.02	12.20	12.01	12.18	11.98	12.15	11.95	12.09	12.02	12.39	12.10
Benthic bacteria	17.89	18.24	17.85	18.17	17.80	18.08	17.69	17.95	17.88	18.41	18.09
Meiobenthos	0.76	0.73	0.76	0.73	0.76	0.73	0.75	0.72	0.73	0.87	0.85
Labile detritus	0.25	0.26	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.26	0.26
Refractory detritus	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Carrion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dissolved inorganic N	0.99	0.99	0.99	0.98	0.99	0.98	0.99	0.98	0.98	0.99	0.98

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Table 3. Case Study 2: *Biomass of functional groups at year 20, for each harvest scenario. Biomass is relative to biomass at year 20 in the Status Quo harvest. Forage species values are bold.*

Functional Group	Status Quo	Scen. 1	Scen. 2	Scen. 3	No Fishing
Large planktivores (mackerel)	1.00	1.00	1.00	1.00	1.01
Canary rockfish	1.00	1.00	1.01	1.01	1.02
Small pelagic fish (sardine, anchovy)	**1.00**	**1.00**	**1.00**	**1.00**	**1.23**
Large flatfish (arrowtooth)	1.00	0.67	0.67	0.68	1.94
Chilipepper rockfish	1.00	1.00	0.37	0.37	1.00
Lg. demersal predators (lingcod)	1.00	1.00	0.16	0.00	1.51
Salmon	1.00	1.00	1.00	1.00	1.01
Large pelagic predators (tuna)	--	--	--	--	--
Shearwaters	1.00	1.00	1.00	1.00	1.00
Hake	1.00	1.00	1.00	1.00	10.47
Sablefish	1.00	1.00	1.00	1.00	1.29
Deep vert.migrators (myctophids)	1.00	1.00	1.00	1.00	1.00
Deep misc. fish (slickhead, eelpout)	1.00	1.00	1.00	1.00	1.03
Misc. nearshore fish (croaker, sculpin)	1.00	1.01	1.02	1.02	0.99
Midwater rockfish	1.00	1.00	1.00	0.00	5.79
Bocaccio rockfish	1.00	1.00	0.94	0.94	1.08
English sole	1.00	0.92	0.85	0.85	0.98
Shallow small rockfish	1.00	1.00	1.00	1.00	1.07
Deep small rockfish (longspine)	1.00	0.94	0.94	0.94	1.02
Deep large rockfish (shortspine)	1.00	0.94	0.93	0.93	1.06
Small flatfish (petrale, dover etc)	1.00	0.91	0.89	0.82	1.13
Small demersal sharks (dogfish)	1.00	1.00	1.00	1.00	4.00
Lg. demersal sharks (sixgill etc)	1.00	1.00	1.00	1.00	1.00
Pacific Ocean perch	--	--	--	--	--
Pelagic sharks	1.00	1.00	1.00	1.00	1.01
Shallow large rockfish	1.00	1.00	1.00	1.00	1.06
Skates and rays	1.00	1.00	1.00	1.01	2.58
Surface feed birds (gulls)	1.00	0.99	0.98	0.98	1.04
Diving birds	1.00	1.00	1.00	1.00	1.00
Pinnipeds	1.00	1.00	1.00	1.00	1.00
Transient orcas	1.00	1.00	1.00	1.00	1.00
Baleen whales	1.00	1.00	1.00	1.00	1.00
Widow rockfish	1.00	1.00	1.00	0.98	1.01
Toothed whales	1.00	1.00	1.00	1.00	1.00
Otters	1.00	1.00	1.00	1.00	0.99
Squid	**1.00**	**1.00**	**1.00**	**1.00**	**21.10**
Shallow benthic filter feeders	1.00	1.01	1.02	1.02	0.89
Other benthic filter feeders	1.00	1.01	1.01	1.01	0.97
Deep benthic filter feeders	1.00	1.00	1.00	1.00	0.99
Urchins	1.00	1.00	1.01	1.02	1.00
Deep macrozoobenthos	1.00	1.00	1.02	1.01	0.83

Large crabs	--	--	--	--	--
Octopus	1.00	1.00	1.00	1.00	0.97
Shrimp	1.00	1.00	1.00	1.00	1.67
Large zooplankton (euphausid)	**1.00**	**1.00**	**1.00**	**1.00**	**0.97**
Deposit feeders	--	--	--	--	--
Macroalgae (kelp)	1.00	1.00	1.00	1.00	1.01
Seagrass	1.00	1.00	1.00	1.00	1.00
Carnivorous infauna	1.00	1.00	1.00	1.00	1.00
Gelatinous zooplankton	1.00	1.00	1.00	1.00	1.00
Large phytoplankton	1.00	1.00	1.00	1.00	0.97
Small phytoplankton	1.00	1.00	1.00	1.00	1.00
Mesozooplankton (copepods)	1.00	1.00	1.00	1.00	1.00
Microzooplankton	1.00	1.01	1.01	1.00	0.99
Pelagic bacteria	1.00	1.02	1.03	1.03	0.79
Benthic bacteria	1.00	1.02	1.08	1.05	0.41
Meiobenthos	1.00	1.01	1.06	1.03	0.45
Labile detritus	1.00	1.02	1.08	1.05	0.40
Refractory detritus	1.00	1.02	1.08	1.03	0.35
Carrion	1.00	1.00	1.00	1.00	1.00
Dissolved inorganic N	1.00	1.00	1.00	1.00	1.00

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Table 4. Case Study 3: *Biomass of functional groups at year 20, for each management scenario. Biomass is relative to biomass at year 20 in the Status Quo harvest. Forage species values are bold.*

	Status Quo	Gear Shift	Closed Area	No Fishing
Large planktivores (mackerel)	1.00	1.02	1.13	0.98
Canary rockfish	1.00	1.02	1.11	0.85
Small pelagic fish (sardine, anchovy)	**1.00**	**1.00**	**1.01**	**0.80**
Large flatfish (arrowtooth)	1.00	1.27	1.58	1.68
Shortbelly rockfish	1	1.00	1.00	3.00
Lg. demersal predators (lingcod)	1	1.03	1.07	1.20
Salmon	1	1.04	1.21	1.29
Large pelagic predators (tuna)	1	1.00	1.00	1.23
Shearwaters	1	1.00	1.00	1.00
Hake	1	1.01	1.06	1.94
Sablefish	1	0.84	1.09	1.50
Deep vert.migrators (myctophids)	1	1.00	1.00	0.81
Deep misc. fish (slickhead, eelpout)	1	1.02	1.00	1.18
Misc. nearshore fish (croaker, sculpin)	1	0.97	1.08	0.55
Midwater rockfish	1	1.00	1.01	1.45
Surfperch and misc.	1	1.01	1.14	2.47
English sole	1	1.11	0.99	0.99
Shallow small rockfish	1	1.08	1.51	0.58
Deep small rockfish (longspine)	1	1.02	1.02	0.85
Deep large rockfish (shortspine)	1	1.03	1.05	1.04
Small flatfish (petrale, dover etc)	1	1.03	1.11	0.86
Small demersal sharks (dogfish)	1	1.03	1.18	1.02
Lg. demersal sharks (sixgill etc)	1	1.02	1.16	1.25
Yelloweye and cowcod	1	1.03	1.06	1.17
Pelagic sharks	1	1.00	1.03	2.36
Shallow large rockfish	1	1.10	1.66	1.12
Skates and rays	1	1.03	1.20	1.04
Surface feed birds (gulls)	1	1.00	1.00	0.88
Diving birds	1	1.01	1.10	0.98
Pinnipeds	1	1.00	1.00	1.05
Transient orcas	1	1.00	1.00	1.00
Baleen whales	1	1.00	1.00	1.04
Small whales and dolphins	1	1.00	1.03	1.13
Toothed whales	1	1.00	1.00	1.10
Otters	1	1.00	1.00	1.00
Squid	**1**	**1.65**	**50.93**	**63676.19**
Shallow benthic filter feeders	1	1.00	1.00	0.86
Other benthic filter feeders	1	1.00	0.99	0.90
Deep benthic filter feeders	1	1.02	1.21	2.59
Urchins	1	1.00	0.99	1.63
Deep macrozoobenthos	1	1.00	0.99	0.93

Large crabs	1	1.05	1.60	9.51
Octopus	1	1.00	1.01	0.97
Shrimp	1	1.25	2.54	0.01
Large zooplankton (euphausid)	**1**	**1.00**	**1.01**	**0.43**
Deposit feeders	1	1.01	1.14	1.35
Macroalgae (kelp)	1	1.00	1.00	0.96
Seagrass	1	1.00	1.00	1.00
Carnivorous infauna	1	1.00	1.02	0.99
Gelatinous zooplankton	1	0.99	0.99	0.99
Large phytoplankton	1	0.99	1.00	0.92
Small phytoplankton	1	1.00	1.00	0.09
Mesozooplankton (copepods)	1	0.96	1.02	1.03
Microzooplankton	1	1.00	0.99	1.44
Pelagic bacteria	1	1.00	1.03	0.49
Benthic bacteria	1	1.00	1.03	0.80
Meiobenthos	1	1.01	1.16	2.60
Labile detritus	1	1.00	1.00	0.72
Refractory detritus	1	1.03	1.23	1.18
Carrion	0	0	0	0
Dissolved inorganic N	1	1.00	1.00	1.03

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Figure 1. Spatial extent of the California Current Atlantis model. The region includes 62 spatial boxes (green), ranging from the coastline to 2400m. This spatial configuration applies to Brand et al. (2007), Kaplan and Levin (2009), and Kaplan et al. (submitted).

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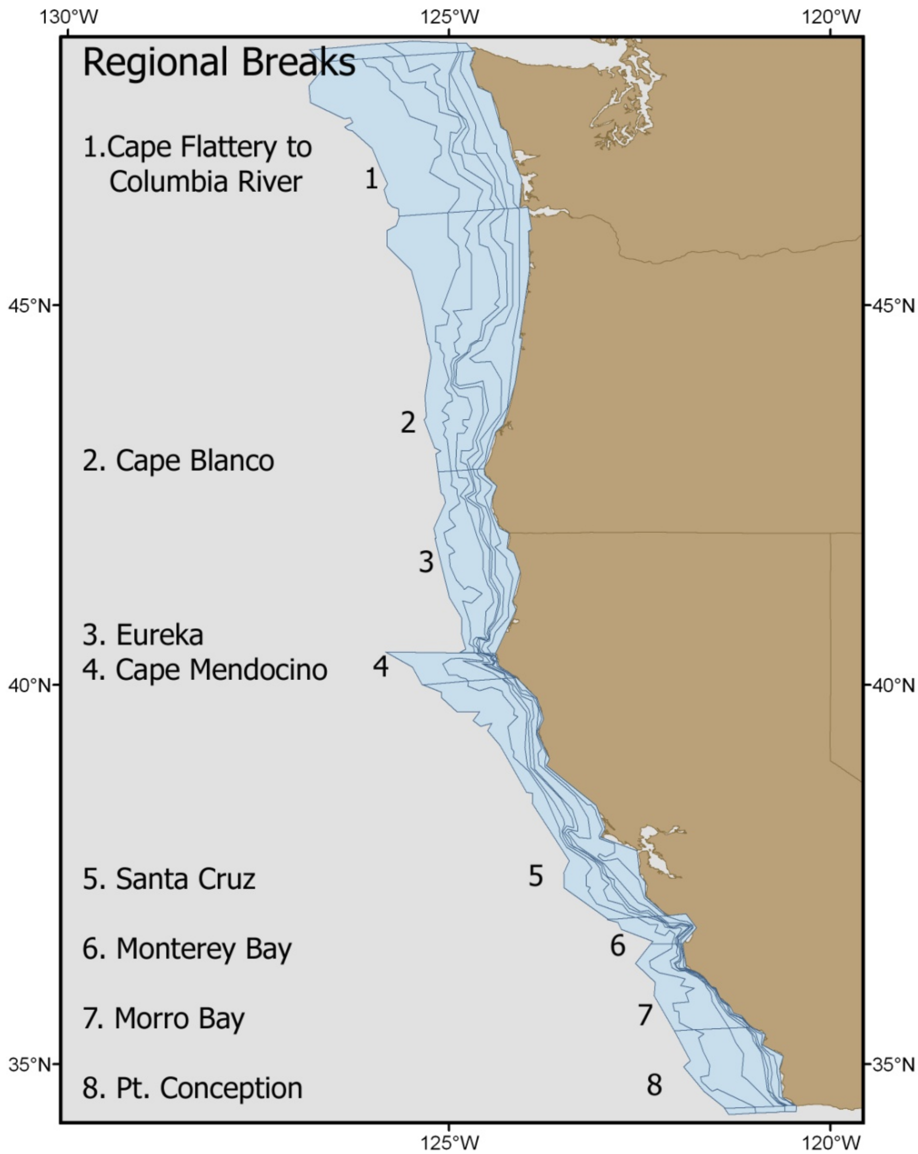

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Appendix

Table A1. *Alternative catch scenarios under individual quota, for Case Study 2. Catches of species in bold font vary between scenarios, with lowest catches in Status Quo and highest catches in Scenario 3. Catches are in metric tons per year.*

Status Quo: No improvement in targeting ability							
	North of 40° 10' N		40° 10'N to 36°N		South of 36°N		Total
	Shelf	Slope	Shelf	Slope	Shelf	Slope	
Sablefish	1,038.45	3,115.35	395.00	1,185.00	50.00	150.00	5,933.80
Longspine thornyhead	**-**	**614.00**	**-**	**210.00**	**-**	**14.00**	**838.00**
Shortspine thornyhead	**90.00**	**510.00**	**23.55**	**133.45**	**22.05**	**124.95**	**904.00**
Dover sole	**1,218.75**	**3,656.25**	**325.00**	**975.00**	**81.25**	**243.75**	**6,500.00**
Arrowtooth flounder	**2,240.00**	**960.00**	**5.11**	**2.19**	**-**	**-**	**3,207.30**
Petrale sole	756.00	1,134.00	180.00	270.00	40.00	60.00	2,440.00
Other flatfish	**1,171.50**	**-**	**328.02**	**-**	**62.48**	**-**	**1,562.00**
Yellowtail rockfish	**51.40**	**-**	**-**	**-**	**-**	**-**	**51.40**
Chilipepper rockfish	**-**	**-**	**17.80**	**-**	**-**	**-**	**17.80**
Slope rockfish	**21.40**	**192.60**	**12.00**	**108.00**	**4.80**	**43.20**	**382.00**
Dogfish	450.00	-	-	-	-	-	450.00
Pacific cod	**400.00**	**-**	**-**	**-**	**-**	**-**	**400.00**
Lingcod	**240.00**	**60.00**	**40.00**	**10.00**	**12.00**	**3.00**	**365.00**
Canary rockfish	34.20	3.80	5.40	0.60	-	-	44.00
Pac. Ocean perch	**-**	**75.00**	**-**	**-**	**-**	**-**	**75.00**
Darkblotch rockfish	**34.50**	**195.50**	**4.96**	**28.08**	**-**	**-**	**263.04**
Widow rockfish	**221.00**	**39.00**	**17.00**	**3.00**	**-**	**-**	**280.00**
Bocaccio	**-**	**-**	**63.00**	**7.00**	**-**	**-**	**70.00**
Yelloweye rockfish	9.00		4.00				13.00
Pacific whiting	115,401.25	115,401.25	6,073.75	6,073.75			242,950.00

Scenario 1: Pessimistic about improvements in targeting ability							
	North of 40° 10’N		40° 10’N to 36°N		South of 36°N		Total
	Shelf	Slope	Shelf	Slope	Shelf	Slope	
Sablefish	1,038.45	3,115.35	395.00	1,185.00	50.00	150.00	5,933.80
Longspine thornyhead	**-**	**1,314.09**	**-**	**756.41**	**-**	**180.00**	**2,250.50**
Shortspine thornyhead	**175.70**	**995.62**	**67.50**	**382.50**	**33.00**	**187.00**	**1,841.32**
Dover sole	**2,495.62**	**7,486.85**	**462.50**	**1,387.50**	**50.00**	**150.00**	**12,032.47**
Arrowtooth flounder	**3,454.92**	**1,480.68**	**5.11**	**2.19**	**-**	**-**	**4,942.90**
Petrale sole	756.00	1,134.00	180.00	270.00	40.00	60.00	2,440.00
Other flatfish	**2,300.00**	**-**	**700.00**	**-**	**170.00**	**-**	**3,170.00**
Yellowtail rockfish	**51.40**	**-**	**-**	**-**	**-**	**-**	**51.40**
Chilipepper rockfish	**-**	**-**	**17.80**	**-**	**-**	**-**	**17.80**
Slope rockfish	**41.33**	**371.99**	**21.79**	**196.09**	**10.00**	**90.00**	**731.20**
Dogfish	450.00	-	-	-	-	-	450.00
Pacific cod	**723.40**	**-**	**-**	**-**	**-**	**-**	**723.40**
Lingcod	**240.00**	**60.00**	**40.00**	**10.00**	**12.00**	**3.00**	**365.00**
Canary rockfish	34.20	3.80	5.40	0.60	-	-	44.00
Pac. ocean perch	**-**	**75.00**	**-**	**-**	**-**	**-**	**75.00**
Darkblotch rockfish	**34.50**	**195.50**	**4.96**	**28.08**	**-**	**-**	**263.04**
Widow rockfish	**255.00**	**45.00**	**17.00**	**3.00**	**-**	**-**	**320.00**
Bocaccio	**-**	**-**	**63.00**	**7.00**	**-**	**-**	**70.00**
Yelloweye rockfish	9.00		4.00				13.00
Pacific whiting	115,401.25	115,401.25	6,073.75	6,073.75			242,950.00

Scenario 2: Moderate improvements in targeting ability							
	North of 40° 10’N		40° 10’N to 36°N		South of 36°N		Total
	Shelf	Slope	Shelf	Slope	Shelf	Slope	
Sablefish	1,038.45	3,115.35	395.00	1,185.00	50.00	150.00	5,933.80
Longspine thornyhead	**-**	**1,314.09**	**-**	**756.41**	**-**	**180.00**	**2,250.50**
Shortspine thornyhead	**175.70**	**995.62**	**67.50**	**382.50**	**33.00**	**187.00**	**1,841.32**
Dover sole	**2,495.62**	**7,486.85**	**462.50**	**1,387.50**	**50.00**	**150.00**	**12,032.47**
Arrowtooth flounder	**3,454.92**	**1,480.68**	**5.11**	**2.19**	**-**	**-**	**4,942.90**
Petrale sole	756.00	1,134.00	180.00	270.00	40.00	60.00	2,440.00
Other flatfish	**3,721.30**	**-**	**1,078.70**	**-**	**170.00**	**-**	**4,970.00**
Yellowtail rockfish	**51.40**	**-**	**-**	**-**	**-**	**-**	**51.40**
Chilipepper rockfish	**-**	**-**	**2,000.00**	**-**	**-**	**-**	**2,000.00**
Slope rockfish	**72.03**	**648.26**	**37.97**	**341.74**	**10.00**	**90.00**	**1,200.00**
Dogfish	450.00	-	-	-	-	-	450.00
Pacific cod	**1,200.00**	**-**	**-**	**-**	**-**	**-**	**1,200.00**
Lingcod	**574.68**	**143.67**	**65.32**	**16.33**	**12.00**	**3.00**	**815.00**
Canary rockfish	34.20	3.80	5.40	0.60	-	-	44.00
Pac. ocean perch	**-**	**150.00**	**-**	**-**	**-**	**-**	**150.00**
Darkblotch rockfish	**39.35**	**222.97**	**5.65**	**32.03**	**-**	**-**	**300.00**
Widow rockfish	**255.00**	**45.00**	**17.00**	**3.00**	**-**	**-**	**320.00**
Bocaccio	**-**	**-**	**108.00**	**12.00**	**-**	**-**	**120.00**
Yelloweye rockfish	9.00		4.00				13.00
Pacific whiting	115,401.25	115,401.25	6,073.75	6,073.75			242,950.00

Scenario 3: Optimistic about improvements in targeting ability							
	North of 40° 10’ N		40° 10’N to 36°N		South of 36°N		Total
	Shelf	Slope	Shelf	Slope	Shelf	Slope	
Sablefish	1,038.45	3,115.35	395.00	1,185.00	50.00	150.00	5,933.80
Longspine thornyhead	**-**	**1,314.09**	**-**	**756.41**	**-**	**180.00**	**2,250.50**
Shortspine thornyhead	**175.70**	**995.62**	**67.50**	**382.50**	**33.00**	**187.00**	**1,841.32**
Dover sole	**3,422.21**	**10,266.64**	**634.22**	**1,902.66**	**68.56**	**205.69**	**16,500.00**
Arrowtooth flounder	**3,454.92**	**1,480.68**	**5.11**	**2.19**	**-**	**-**	**4,942.90**
Petrale sole	756.00	1,134.00	180.00	270.00	40.00	60.00	2,440.00
Other flatfish	**3,721.30**	**-**	**1,078.70**	**-**	**170.00**	**-**	**4,970.00**
Yellowtail rockfish	**1,000.00**	**-**	**-**	**-**	**-**	**-**	**1,000.00**
Chilipepper rockfish	**-**	**-**	**2,000.00**	**-**	**-**	**-**	**2,000.00**
Slope rockfish	**72.03**	**648.26**	**37.97**	**341.74**	**10.00**	**90.00**	**1,200.00**
Dogfish	450.00	-	-	-	-	-	450.00
Pacific cod	**1,200.00**	**-**	**-**	**-**	**-**	**-**	**1,200.00**
Lingcod	**705.13**	**176.28**	**80.14**	**20.04**	**14.72**	**3.68**	**1,000.00**
Canary rockfish	34.20	3.80	5.40	0.60	-	-	44.00
Pac. ocean perch	**-**	**150.00**	**-**	**-**	**-**	**-**	**150.00**
Darkblotch rockfish	**39.35**	**222.97**	**5.65**	**32.03**	**-**	**-**	**300.00**
Widow rockfish	**796.88**	**140.63**	**53.13**	**9.38**	**-**	**-**	**1,000.00**
Bocaccio	**-**	**-**	**108.00**	**12.00**	**-**	**-**	**120.00**
Yelloweye rockfish	9.00		4.00				13.00
Pacific whiting	115,401.25	115,401.25	6,073.75	6,073.75			242,950.00

Appendix B -- Analysis of spatial and temporal overlap of WCGF fisheries and protected cetacean species

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Introduction

Cetaceans around the world face a myriad stresses on their populations. Commercial whaling was once the primary threat to many cetaceans, but with the international ban on numerous whaling operations, and the Marine Mammal Protection Act (MMPA) many populations have rebounded. Nevertheless, commercial whaling activities continue in some areas and numerous lethal and sublethal anthropogenic threats to the viability of cetaceans persist. The list includes, but is not limited to, anthropogenic stress [1,2], vessel collisions [3], noise [4,5], exposure to toxins (hydrocarbons, exhaust, etc. [6,7]), entanglement with fishing gear [8] and marine debris [9], resource competition and habitat disturbance from fishing [10,11,12], and global climate change [13].

There is substantial evidence in the literature documenting direct mortality of various cetaceans from interactions with commercial and recreational fishing gear [8]. For example, sperm whales (*Physeter macrocephalus*), are especially susceptible to deepwater gillnets and bottom-set longline gear [14,15,16,17,18]. They have been observed breaking through or carrying away fishing gear and may die or are seriously injured as a result. There has been considerable effort to reduce the mortality of commercial fishing activities on cetaceans (e.g., pingers on gillnets [19]). However, there is plenty of opportunity for significant sublethal and injurious consequences from exposure to commercial gear of all types, and this type of interaction is poorly documented and understood.

To date, there have not been any spatial analyses run on the overlap between a multiple cetacean species (some of which are ESA/IUCN listed) and fishing fleets operating in the California Current Ecosystem. While reviews of the literature suggest cetacean mortality due to fishing gear interaction is low, there is a significant exposure rate and a better understanding of the spatio-temporal overlap dynamics (magnitude, seasonality and frequency) seems prudent. Therefore, it is useful to quantify the potential for overlap between commercial fishing activities and cetaceans. Moreover, comparing interspecific exposure rates to various fishing gear types may facilitate a better understanding of the risks imposed by commercial fishing activities on cetacean species.

In this analysis, we intersected spatially explicit predictions of cetacean density for 12 different species, with heretofore unavailable and spatiotemporally extant field surveyed fishing effort data from three major fishing fleets within the California Current Ecosystem. From this intersection we quantified the potential overlap for each cetacean species/fishing fleet combination. We found that there was tremendous variation in the exposure rates for the various cetacean species and this variation was a function of seasonality and fleet type.

Methods

We overlaid two different geospatial datalayer types for these analyses: modeled cetacean density and commercial fishing effort. We compared general patterns of effort by three different commercial fleets by gear type (bottom trawl, at-sea hake midwater trawl and fixed gear fleets) with general patterns of 12 cetacean species density throughout the California Current Large Marine Ecosystem (CCLME).

Cetacean Data

We used cetacean density estimates, represented on a 23.6 - 26.8 km grid, that were generated by NOAA's Southwest Fisheries Science Center [20,21]. The models were generated using cetacean line-survey data collected from vessels that ran surveys from June through November in 1991, 1993, 1996, 2001 and 2005. They used Generalized Additive Models (GAMs) with nonparametric smoothing functions to predict cetacean densities from habitat variables. Habitat variables were a combination of in situ and remote sensed data, and included sea surface temperature (SST, remote sensed and in situ), sea surface salinity, surface chlorophyll and vertical properties of the water-column (in situ only). The grid covered most of the California Current Large Marine Ecosystem off the coast of Washington, Oregon and California. Twelve species of cetaceans were modeled by Barlow et al. ([21], Table CET1) and we used the predicted mean annual density (number of animals per km^2) for our analyses. For simplicity, these data are reported as "annual" means, even though they were collected during summer months of the year. Further, these geospatial datalayers do not purport to capture or represent intra-annual or seasonal variability in cetacean density, so they are reported as an "annual" mean. We used the composite mean annual density estimates (as opposed to the individual yearly estimates) based on data collected from 1991 – 2005 in order to represent general, overall patterns of cetacean distributions.

Commercial Fishing Effort

Fishing effort was represented on either 10 km (bottom trawl fleets [herein trawl] and at-sea hake midwater trawl [herein hake] fleets) or 20 km (fixed gear fleets [herein fixed]) grids. We used data that were provided by the At-sea Hake Observer Program (A-SHOP) and the West Coast Groundfish Observer Program (WCGOP) under NOAA's Northwest Fisheries Science Center, Fishery Resource Analysis and Monitoring (FRAM) Division.

At-sea hake midwater trawl fishing effort was collected directly by the A-SHOP [22]. The A-SHOP collects information on total catch (fish discarded and retained) from all vessels that process Pacific hake at-sea. All data were collected according to standard protocols and data quality control established by the ASHOP.

Bottom trawl fishing effort [23] was derived by the FRAM Division from fleet-wide logbook data submitted by state agencies to the Pacific Fisheries Information Network (PacFIN) regional database, maintained by the Pacific States Marine Fisheries Commission (PSMFC). A common-format logbook is used by Washington, Oregon, and California. Electronic logbook data is submitted by state agencies to the PacFIN regional database. Trawl logbook data is regularly used in analyses of the bottom trawl groundfish fishery observed by the WCGOP.

For both the trawl and hake survey data, a trawl towline model (line drawn from the start to end location of a trawl tow) was used to allocate data to 10 x 10 kilometer grid cells for calculation of commonly used fishing effort metrics.

Fixed gear fishing effort was collected directly by the WCGOP from the following fixed gear sectors: the limited entry sablefish primary (target – sablefish), limited entry non-sablefish endorsed (target – groundfish), open access fixed gear (target – groundfish), and Oregon and California state-permitted nearshore fixed gear (target – nearshore groundfish). The observed portion of overall fixed gear varies by coverage level in each sector (Table CET2). Coverage rates are calculated for each sector as the observed retained catch of target species divided by the sector-wide landings of target species. Since all fishing operations are not observed, neither the maps nor the data can be used to characterize the fishery completely. Both the observed fixed gear set (start location of fishing) and haul (location of gear retrieval) were assigned to 20 x 20 kilometer grid cells for calculation. The fishing effort associated with each fixed gear fishing event was divided equally between the set and haul locations. Commonly used fishing effort metrics were then calculated for each grid cell.

There are a variety of fixed gear types recorded by WCGOP, and we used the types that we deemed most likely (based on reviews of the literature) to cause harm to a cetacean, should an individual encounter that gear type. The types we used included: historic longline, vertical hook and line, other hook and line, pot, and longline (fixed hook), longline (snap gear). We decided that both pole and troll gear did not pose a significant risk to the cetaceans in this analysis, so those two gear types were excluded from the analyses.

Fishing effort was expressed as the cumulative number of hours a given fishing fleet (trawl, hake, or fixed) had gear deployed in the water. All of the fishing effort data were reported as monthly sums for each fishing gear type, so we calculated cumulative fishing effort (in hours) from June through November of each year, which corresponded to the months over which the data were collected for building the predictive cetacean model.

For the hake and trawl fleets, the data represents all (100%) of the total fishing effort. All at-sea hake vessels (catcher-processors and motherships) over 125 feet are required to carry two observers, while vessels under 125 feet carry only one. PacFIN fleet-wide logbook data is assumed to represent the entire bottom trawl fleet for our analysis. However, all fishing operations may not necessarily be recorded in logbooks and logbook submission may not be complete. For the fixed gear fleet, observers are not present on every vessel, so we calculated a correction factor (C) in order to extrapolate the effort of the entire fixed gear fleet. Catch data are reported on an annual basis, so we ran the calculation across all years (2002-2009) by multiplying the data reported for each sector by the proportion that that sector represented over the entire study area. We used the following formula to make the calculation:

$$C = \sum_{s=1}^{5}\left(\frac{t_s}{T} \times \frac{W_{s(obs)}}{W_{s(land)}}\right)$$

where *s* corresponded to each of the five sectors, *t* was the total time (in hours) a given sector was observed with gear in the water, *T* was the total time (in hours) all five of the sectors were observed with gear in the water, *w* was the total weight of fish caught on vessels with observers present (reported by sector) and *W* was the total weight of fish landed on all vessels (reported by sector).

The commercial fishing effort data are subject to restrictions that preserve confidentiality as required under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. As such, data cannot be presented to the general public unless it represents information from three or more vessels. We ran all of the analyses in our research on the full set of fishing fleet data. However, in order to comply with confidentiality restrictions, gridcells in the final overlap maps that contained data from two or fewer boats are not displayed in this paper.

Cetacean and Fishery Overlap

We created overlap index maps (annually and from 2002-2009) for each of the cetacean species as well as overlap index plots by year, which showed interannual variability in the overlap between the species and fleets. We also calculated the population overlap for each species with each of the three fleet types as well as a cumulative overlap index.

We used a simple formula to calculate a predicted overlap index (R, animal hours/km^2):

$$R = t*\rho$$

where *t* is fishing effort (total time, in hours, gear was in the water), and ρ is the predicted density of cetaceans (animals/km^2).

<u>Maps</u>

We calculated the overlap indices for each year (2002 – 2009) and for each of the species and fleet type combinations (12 X 3 = 36) throughout the study area. Since the gridcell size of the cetacean data (~25 km) was not the same as the fishing effort data (10 or 20 km), we calculated an area weighted mean cumulative fishing effort for each year that corresponded to each respective cetacean gridcell. First, we combined the cetacean grid with the three fishing fleet grids using the INTERSECT command in ArcGIS (v. 9.3), a geographic information (GIS) software package developed by the Environmental Systems Research Institute (ESRI). Then, we used the information from this intersection to calculate an area weighted mean (AWM) fishing effort for each cetacean gridcell using the following equation:

$$t_{awm} = \left[\sum_{1}^{n} t_n(a_n)\right] \Big/ A$$

where t is the fishing effort in hours for a given portion of a given cetacean gridcell, a is the corresponding area for that effort and A is the total area of the corresponding cetacean gridcell. We repeated this procedure for each year (2002-2009) of the fishing fleet data.

Finally, we multiplied the AWM fishing effort, t, for each gridcell by the corresponding cetacean density (ρ), which yielded the final overlap index value. We used ArcGIS to join the corresponding predicted overlap index for each species and gear type combination to the original cetacean density grid in order to create 36 gridded maps, which we used to explore spatiotemporal patterns of cetacean and fishing fleet overlap.

Population Overlap Index

In order to compare inter- specific and fishery overlap relative to all of the modeled individuals in a given species, we calculated what fraction of each cetacean species' modeled population overlapped with areas where commercial fishing occurred using:

$$R_p = \sum_{1}^{n} \rho_n(a_n) \Big/ \sum_{1}^{n} \mathrm{P}_n(a_n)$$

where ρ is the modeled cetacean density for a given gridcell that experienced commercial fishing by a given fleet, a is the area of the corresponding gridcell, and P is the modeled cetacean density for a given gridcell, regardless of whether or not that gridcell experienced commercial fishing from any of the fleets.

Cumulative Overlap Index

We calculated a cumulative overlap index over the entire study area for each cetacean species/fishing fleet combination, by year and for all years from 2002-2009 using the following equation:

$$R_c = \sum_{1}^{n} R(a_n) \Big/ A$$

where R is the predicted overlap index for a given 25 km gridcell, a_n is the area of the corresponding gridcell, and A is the total area over which a given fleet operated. This allowed us to compare patterns of inter- specific, annual, and fishery overlap.

Results

Commercial Fishing Effort

Overall, the spatiotemporal patterns of fishing fleet levels of effort varied widely over the study area. The cumulative level of effort during the months of June through November from 2002 – 2009 for the fixed, hake and trawl fleets was 187,015; 24,132; and, 287,886 hours, respectively.

For the fixed gear fleet, the effort captured by observers varied across sectors (Table CET2). In general, observers captured approximately 17.57% of the total fixed gear effort (as a function of the cumulative hours gear was deployed) that occurred over the entire study area, based on the 2002-2009 proportion of effort from each observed sector and the WCGOP coverage rate by sector for all years combined.

<u>Interannual patterns</u>

Cumulative annual effort varied considerably over time for each of the fleets (Figure CET1). Fixed gear cumulative efforts had peaks in 2003 and 2005, with a downward trend from 2005 to 2009 (Figure CET1). Hake fleets gradually increased in cumulative effort level until 2008 and dropped down again in 2009 (Figure CET1). Trawl fleets had a drop in cumulative annual fishing effort in 2004, but returned to 2002 levels of effort by 2009 (Figure CET1).

<u>Monthly inter- and intraannual patterns</u>

There was considerable inter- and intraannual, and inter-fishery variability in the cumulative effort, based on the monthly data (Figure CET2). Fixed gear fleets had the greatest interannual and intraannual variability in their effort. They generally had peak efforts during the summer months (Figure CET2-A). However, there was usually a second peak of effort in the fall (Figure CET2-A). Effort was lowest during the months of January, February, November and December (Figure CET2-A). Hake fleets had the least interannual but the greatest intraannual variability in their effort. Hake fleets do not fish from January to April each year, but they clearly have their maximum effort in May and June, with a smaller peak often occurring in the late fall (Figure CET2-B). Trawl fleets had higher interannual but moderate intraannual variability in their effort. Trawl fleets generally have considerable and consistent effort year round, but tend to taper towards the end of the year (Figure CET2-C). In 2002, however, there was a strong peak of effort from October through November.

Spatiotemporal patterns

There was considerable inter-fishery variability in the spatial extent of cumulative effort (Figure CET3). For the period 2002-2009, various fixed gear efforts occurred from the US/Mexico border, north to the US/Canada border (Figure CET3). There were concentrations of effort off the coasts of Los Angeles, San Diego, Caspar, Eureka, and the northern half of the Oregon coast (Figure CET3). Hake fishing efforts occurred over a much smaller region, spanning Oregon and Washington State (Figure CET3). The hake fleet was not as patchy compared with the fixed gear fleets, but there were areas of increased effort (Figure CET3). However, given that the effort sampled by observers for the fixed gear fleet was not consistent across all of the reporting sectors, some of the patchiness in the apparent fixed gear effort may be due to patchiness of the observer spatial coverage itself. The trawl fleet efforts were not quite as widespread as the fixed gear fleets, occurring consistently from Point Conception, CA, north to the US/Canada border (Figure CET3). Like the hake fleets, effort was more consistent along the range of activity.

Interannual spatial variability was greatest and most patchy for the fixed gear fleets (figures unavailable due to confidentiality restrictions). In some years (e.g., 2002), large expanses, 100s of kms or more, had no effort whatsoever. The Hake fleet also became more patchy when examined on an annual basis, but there were few large areas that were unexploited in a given year (figures unavailable due to confidentiality restrictions). The trawl fleet had the most consistent efforts over space and time of the three gear types (figures unavailable due to confidentiality restrictions). However, there were still considerable interannual variability between various 10 km gridcells.

Cetacean and Fishing Overlap Mapping

Generally, there was low overlap spatially between the 12 cetacean species and the three commercial fishing fleets (Figures CET4 to CET15). Given that most of the fishing fleets operate within 100 km of shore, they overlap in a small portion of the modeled spatial domain of cetacean density.

Where there was overlap between the various cetacean species and the three commercial fishing fleets, there was considerable variation in the overlap index. Not surprisingly, cetacean species with higher modeled densities that coincided with longer durations of commercial fishing operations had higher overlap index scores.

Blue whale

The highest degree of spatial overlap with WCGF fisheries occurs with the fixed gear sector, with some local overlap index values exceeding 20 animal hours/km^2 near San Diego just north of Cape Mendocino (Figure CET4). Overlap with the trawl sector is much lower, with a few overlap indices exceeding ~4 animal hours/km^2 near Cape Mendocino and off of the San Francisco Bay (Figure CET4). Overlap with the hake sector was very limited, an was <0.5 animal hours/km^2 in all locations (Figure CET4).

Fin whale

The highest areas of spatial overlap with the fishery occur from the Columbia River mouth area northward, with overlap indices for the fixed gear sector of >20 animal hours/km^2 near the Columbia River mouth, and indices for the trawl sector >3 animal hours/km2 along the Washington Coast (Figures CET5). The highest overlap index with the hake sector was < 2 animal hours/km^2, off the northern Washington Coast (Figure CET5).

Baird's beaked whale

Fixed gear fishing fleets overlapped the most (Figure CET6) with Baird's beaked whale (>3.1 animal hours/km^2) near the mouth of the Columbia River, the Stonewall Bank, OR, and the Trinidad Canyon, CA. Overlap with the hake fleet was considerably lower, with maxima occurring just west of Ozette Island, WA (0.239 animal hours/km^2, Figure CET6). For the trawl fleets, overlap was generally higher in the northern two thirds of the fleet operational area, with maxima occurring just west of Ozette Island, WA, and north of Cape Mendocino, CA (>0.65 animal hours/km^2, Figure CET6)

Short-beaked common dolphin

Short-beaked common dolphins overlapped the most with the fixed gear fleets from south of the Channel Islands down to the US/Mexico border (>1,076 animal hours/km^2, Figure ##). Overlap with the hake fleets was greatest just west of Ozette Island, WA, near the mouth of the Columbia River and near the Astoria Sea Channel, OR (>17 animal hours/km^2, Figure ##). Trawl fleets overlapped fairly consistently along the entire fishing domain, with maximum overlap occurring just west of Ozette Island, WA, just north of Cape Mendocino and off the coast of San Francisco (>83 animal hours/km^2, Figure CET7).

Risso's dolphin

Fixed gear fleet overlap with Risso's dolphin was greatest near the mouth of the Columbia River, the Stonewall Bank, OR, just north of Cape Mendocino, CA, and from the Northeast Bank south to the US/Mexico border (>129 animal hours/km^2, Figure CET8). Overlap with the hake fleet was greatest just west of Ozette Island, WA, and over the stretch from the mouth of the Columcia River south to the Stonewall Bank, OR, (>7 animal hours/km^2, Figure CET8). Maximal overlap with the trawl fleets occurred over farily large areas near Ozette Island, WA, and in a fairly large area of the Columbia River plume (>23 animal hours/km^2, Figure CET8).

Pacific white-sided dolphin

Pacific white-sided dolphin overlap with the fixed gear fishing fleets occurred near the mouth of the Columbia River, the Stonewall Bank, OR, and near Trinidad Canyon, CA (>289 animal hours/km^2, Figure CET9). Overlap with the hake and trawl fleets was most pronounced near Neah Bay, WA (>28 and >128 animal hours/km^2, respectively, Figure CET9).

Northern right whale dolphin

Maximum overlap between northern right whale dolphin and the fixed gear fleets occurred near the mouth of the Columbia River and Trinidad Canyon, OR (>115 animal hours/km^2, Figure CET10). The hake fleets overlapped the most near Neah Bay, WA (>9 animal hours/km^2, Figure CET10), and trawl fleet efforts overlapped the most near Neah Bay, WA, but had a pretty consistent overlap all the way south to Cape Mendocino and beyond (33 animal hours/km^2, Figure CET10).

Humpback whale

For the fixed gear portion of the fishery, peak areas of overlap (>17 animals hours/km^2) occur north of Cape Mendocina, off the central Oregon coast, and off the Columbia River mouth (Figure CET11). For the trawl fishery, the highest overlap indices occur along the north portion of the coast from Cape Mendocina to Cape Flattery, with areas of overlap > 3 animals hours/km2 (Figure CET11). The highest overlap indices for the hake fishery occur near Cape Flattery, and are < 2 animal hours/km2 (Figure CET11)

Dall's porpoise

Overlap with the fixed gear fishery and Dall's porpoises was concentrated from the mouth of the Columbia River south to around the Stonewall Bank, OR (>630 animal hours/km^2, Figure CET12). Maximum overlap with the hake fleets was near Neah Bay, WA, and in the region from the Columbia River plume south to around Heceta Valley (>40 animal hours/km^2, Figure CET12). The trawl fleets overlapped pretty consistently from Neah Bay, WA, all the way south to Cape Mendocino (>124 animal hours/km^2, Figure CET12).

Sperm whale

Overlap indices between the sperm whale distribution and the fishery are generally lower than for other whales. For the fixed gear sector, the maximum values are < 6 animal hours/km^2, and occur in only a few places north of Cape Mendocino (Figure CET13). Overlap indices for the trawl sector are fairly low and uniform from San Francisco to Cape Flattery, and generally < 1 animal hours/km^2 (Figure CET13). Overlap indices for the hake sector are all < 0.3 animal hours/km^2 (Figure CET13).

Striped dolphin

Striped dolphin overlapped most with the fixed gear fleets near the mouth of the Columbia, Stonewall Bank, OR, Trinidad Canyon, CA, and over a fairly large area running south of Cape Mendocino down to just north of the Cordell Bank (>3 animal hours/km^2, Figure CET14). In contrast, overlap with the hake fleets was concentrated over a fairly large area from the mouth of the Columbia River south to the Oregon/California border (>0.06 animal hours/km^2, Figure CET14). Overlap with the trawl fleets was also fairly homogeneous, and was consistently high from the 45th parallel south to Santa Lucia Bank (>0.7 animal hours/km^2, Figure CET14)

<u>Small beaked whales</u>

Maximum fixed gear fleet overlap with small beaked whales occurred in the Columbia River plume, Stonewall Bank, OR, and the Trinidad Canyon, Vizcaino Knoll, and off the San Diego coast, CA (>11 animal hours/km^2, Figure CET15). Overlap coincided the most with hake fleet efforts that occurred near Neah Bay, WA, the mouth of the Columbia River and the Stonewall Bank, OR (>0.6 animal hours/km^2, Figure CET15). Finally, trawl fleet operations overlapped the most near Neah Bay, WA, the Columbia River plume, Stonewall Bank, OR, Siltcoos Bank, OR, Trinidad Canyon, CA, south of Cape Mendocino, CA, and off the coast of San Francisco, CA (>2 animal hours/km^2, Figure CET15).

Population Overlap Index

There was considerable variability in the proportion of each modeled cetacean population that overlapped with the three fleet types for the years 2002-2009 (Figure CET16, top panel). In general, the proportion of populations exposed to fixed gear fleets was highest, but not always (Short-beaked common dolphin, Pacific white-sided dolphin and northen right whale dolphin, Figure CET16, top panel). Short-beaked common dolphin, Pacific white-sided dolphin, northen right whale dolphin and humpback whale had the greatest proportion of their populations overlapping with commercial fishing activity. It's important to note that the proportions displayed by the bars in Figure CET16 (top panel) cannot be summed, as there was overlap between the different fleet types. Overlap with fixed gear fleets was greatest for blue whale, Pacific white-sided dolphin, humpback whale, and Pda, while maximum population overlap with hake fleets occurred in Pacific white-sided dolphin, humpback whale, and Dall's porpoise, and trawl fleets overlapped the most with Short-beaked common dolphin, Pacific white-sided dolphin, and humpback whale (Figure CET16, top panel).

Cumulative Overlap Index

<u>Overall patterns</u>

Overall, there were marked differences in the overlap indices of the different cetacean species (Figure CET16, bottom panel). The largest overlap indices occurred in the fixed gear fleet, which was about 40 times that of the hake fleet and 2.5 times that of the trawl fleet. Short-beaked common dolphin had the highest overlap index when combining all of the fleet types and Baird's beaked and sperm whales, and striped dolphin had the lowest (Figure CET16, bottom panel). Within the three fleet types, there was considerable variability in the overlap indices with dolphins and porpoises experiencing the highest overlap indices, while whales had the lowest overlap values (Figure CET16, bottom panel).

Interannual patterns

As was the case with the overall cumulative overlap indices, there was considerable interspecific variation (Figure CET17). Overall, cumulative overlap indices (COI) were higher for the fixed gear fleets, compared with the hake and trawl fleets. For the fixed gear fleet, many cetacean species (Dall's porpoise, Pacific white-sided dolphin, northen right whale dolphin, Risso's dolphin) had marked increases in their COI in 2003 and 2005, and most species, with the exception of short-beaked common dolphin, generally had a lower COI in 2009 compared with 2002. Short-beaked common dolphin show a strong increase in the COI from 2002 from 2009, rising nearly 10 fold during this time period. Cumulative overlap indices for most species increased consistently from 2003-2008 for the hake fleets, but dropped off markedly in 2009 (Figure CET17B). Dall's porpoise, short-beaked common dolphin and Pacific white-sided dolphin consistently had the greatest COI of all the 12 modeled cetacean species, whereas Baird's beaked whale, blue whale, fin whale, humpback whale, sperm whale, striped dolphin and small beaked whales had the lowest COI (Figure CET17B). Finally, the trawl fleets COI were markedly different from the fixed and hake fleets. Aside from 2004, COI values were fairly consistent over time, or slightly declining (e.g., short-beaked common dolphin, Figure CET17C). The COI for all 12 cetacean species was significantly lower in 2004, with around 20 – 30% drops occurring in most species.

Discussion

Overall, it is clear that commercial fishing activities from the fixed, hake and trawl fleets operating in the California Current Large Marine Ecosystem overlap with the 12 cetaceans modeled in our analyses. There are pronounced inter- fleet and specific differences in overlap, and these overlap patterns are not consistent over time. For some species, the overlap rates have been increasing over time, whereas in others it is relatively stable.

Implications for cetaceans

It's important to note that while we quantified the relative level of exposure to the gear deployed by the three fishing fleets, we could not make conclusions about the actual impact this exposure might have on a given species. We know from the literature that cetacean interaction with commercial fishing gear occurs. We also know that some of these interactions cause harm or mortality. We cannot, however, infer or quantify the level of harm or mortality from our analyses. Rather, our results suggest that certain cetacean species have significantly more exposure to the gear deployed by commercial fishing fleets.

There are numerous sublethal or stress inducing mechanisms through which exposure to commercial fishing activities could alter cetacean ecology, including: vessel collisions, physical disturbance, acoustic disturbance, entanglement in nets or lines, pollution from exhaust or spills, and direct or indirect reduction of prey. These can all be considered "sensitivities" in a formal risk assessment, but were not quantified for our analyses. Quantifying said impacts would be difficult for many of the species, as the information on a given commercial fishing influence is often anecdotal or poorly understood. However, it is appropriate in the context of this discussion to provide a brief overview of the aforementioned stressors to provide insights into the inter- specific and fleet type variability.

Vessel collisions are less common with actively fishing vessels since their velocities decrease while gear is actively deployed. However, collisions are more likely when vessels are transiting between various fishing sites or ports. Overall, however, it appears as though collusions are one of the least harmful consequences of cetacean/fishing fleet interactions.

Large expanses of surface, pelagic and benthic habitats are actively fished commercially, in some cases year round, and this most certainly has an impact on habitat where cetaceans co-occur. Bottom trawl activity has been shown to dramatically alter the physical structure of benthic habitats, whereas surface and midwater trawls present significant physical disturbance to the waters where they are deployed.

There is considerable evidence that changes in marine ambient noise patterns have consequences for cetaceans. Cetaceans are obviously highly dependent on their active and passive auditory systems for prey and predator detection, communication, and navigation. Noise from commercial fishing vessels alters and increases the magnitude of ambient noise that cetaceans are exposed to.

Entanglement with the various fishing gear types can often be fatal for many cetaceans, but may also leave animals in a compromised condition where feeding, mating and/or predator avoidance abilities are diminished. Entanglement also varies tremendously by species and gear type (see other sections in risk assessment for detailed information).

Direct or indirect resource competition imposed by commercial fishing fleets is a real concern for many cetaceans. With the increase in ecosystem and entire food web based modeling efforts as of late, it is clear that commercial fishing operations than have impacts that propagate through food webs in both directions (i.e., top down, vs. bottom up). Even if a given fishing fleet is not targeting the same prey item as a given cetacean species, the consequences of a trophic cascade induced by fishing activity is a significant problem.

Given the variety of disturbance types associated with commercial fishing activity, cetaceans may avoid, be attracted to, or pay no attention to a given vessel. Avoidance may be due to noise, general disturbance or past experience. Attraction frequently occurs in those species that depredate fishing gear while it is in the water, which may increase the likelihood of entanglement.

Future spatiotemporal shifts in fishing fleet effort

For the years we analyzed in our analyses, the fishing fleets were operating under the traditional open access system, where any given vessel was permitted to catch as many fish up until a quota was reached for a given fishery in a given year. Under the newly adopted catch share program, a given vessel is given a quota, and if this quota is exceeded, the fisher must pay a severe penalty. This shift in fisheries management approach may affect the three fleets considered in these analyses in different ways. Fishers might switch over to a different type (such as fixed gear) in order to maximize the economic benefit of their catch share quota. Intensity of effort is likely to shift over time and space. For example, under the open access system, a given fisher would fish for a target species intensively until the entire fishery quota was met or an open fishing time period ended. This could mean changes in the future in the amount of time that gear is deployed. Under the catch share program, a given fisher may not deploy their gear for as long, so the apparent local effort from a given fisher might be lower.

There is only one example of gear switching that has occurred in other fishers that have implemented a catch share or ITQ program [24]. Gear switching is allowed within the WCGF but it remains to be seen if switching will occur in response to the new catch shares [25].

Limitations

We did not consider drift- and gillnet fisheries, or halibut, sablefish and other fleets, which may pose a greater threat to cetacean species compared with bottom and mid-water trawlers, and fixed gear fisheries. There is evidence that gillnet fisheries pose a greater risk to some cetacean species compared with other gear types. There is also better data, which have been used to assess mortality rates in some species [26]. Given the higher observed rates of mortality associated with gillnet based fishing fleets, pingers have been attached to gillnet fishing gear in order to repel cetacean and pinniped species [19].

We assumed a given fishing fleet and cetacean species were randomly distributed in any given gridcell, so did not account for cetaceans avoiding (i.e., noise, general disturbance) or being attracted to (depredation by cetaceans in longline and gillnet fisheries) commercial fishing activities. The former would reduce the apparent influence of commercial fishing activity whereas the latter would increase the potential effect.

This was not a formal risk assessment where you calculate a change in population growth as a function of a given fishing influence. This could be viewed as a "relative" risk assessment, in that we calculated the overlap of exposure to the various fleet types. Using a common currency of fishing effort expressed as time and cetacean density expressed as the mean number of animals predicted to occupy a given area each year. We did not explicitly address the two most common aspects of as risk assessment: vulnerability and sensitivity [27]. However, we argue that our analyses directly address vulnerability, in that a given cetacean species is vulnerable to the potential negative consequences of a given fishing fleet type when it is in fact exposed to the vessels and gear from that fleet.

Further work on the sensitivity of these species to the stressors induced by commercial fishing activities is needed before a more formal risk assessment can be made.

References Cited

1. Fair PA, Becker PR (2000) Review of stress in marine mammals. Journal of Aquatic Ecosystem Stress and Recovery 7: 335-354.
2. Curry BE (1999) Stress in mammals: The potential influence of fishery-induced stress on dolphins in the Eastern Tropical Pacific Ocean. La Jolla, CA USA: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. NOAA-TM-NMFS-SWFSC-260 NOAA-TM-NMFS-SWFSC-260. 132 p.
3. Panigada S, Pesante G, Zanardelli M, Capoulade F, Gannier A, et al. (2006) Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin 52: 1287-1298.
4. Romano TA, Keogh MJ, Kelly C, Feng P, Berk L, et al. (2004) Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. Canadian Journal of Fisheries and Aquatic Sciences 61: 1124-1134.
5. Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals (2003) Ocean Noise and Marine Mammals. Washington, D.C.: National Academies Press. 220 p.
6. Jarman WM, Norstrom RJ, Muir DCG, Rosenberg B, Simon M, et al. (1996) Levels of Organochlorine Compounds, Including PCDDS and PCDFS, in the Blubber of Cetaceans from the West Coast of North America. Marine Pollution Bulletin 32: 426-436.
7. Marsili L, Caruso A, Fossi MC, Zanardelli M, Politi E, et al. (2001) Polycyclic aromatic hydrocarbons (PAHs) in subcutaneous biopsies of Mediterranean cetaceans. Chemosphere 44: 147-154.
8. Read AJ, Drinker P, Northridge S (2006) Bycatch of Marine Mammals in U.S. and Global Fisheries. Conservation Biology 20: 163-169.
9. Williams R, Ashe E, O'Hara PD (2011) Marine mammals and debris in coastal waters of British Columbia, Canada. Marine Pollution Bulletin 62: 1303-1316.
10. Dayton PK, Thrush SF, Agardy MT, Hofman RJ (1995) Environmental effects of marine fishing. Aquatic Conservation: Marine and Freshwater Ecosystems 5: 205-232.
11. Herr H, Fock HO, Siebert U (2009) Spatio-temporal associations between harbour porpoise Phocoena phocoena and specific fisheries in the German Bight. Biological Conservation 142: 2962-2972.
12. DeMaster DP, Fowler CW, Perry SL, Richlen MF (2001) Predation and Competition: The Impact of Fisheries on Marine-Mammal Populations over the Next One Hundred Years. Journal of Mammalogy 82: 641-651.
13. MacLeod CD (2009) Global climate change, range changes and potential implications for the conservation of marine cetaceans: a review and synthesis. Endangered Species Research 7: 125-136.
14. Di Natale A, Notarbartolo di Sciara G (1994) A review of the passive fishing nets and trap fisheries in the Mediterranean Sea and of the cetacean bycatch. In:

Perrin WF, Donovan GP, Barlow J, editors. Gillnets and cetaceans: Reports of the International Whaling Commission, Special Issue 15. pp. 189-202.
15. Haase B, Felix F (1994) A note on the incidental mortality of sperm whales (*Physeter macrocephalus*) in Ecuador. In: Perrin WF, Donovan GP, Barlow J, editors. Gillnets and cetaceans: Reports of the International Whaling Commission, Special Issue 15. pp. 481–483.
16. Félix F, Haase B, Davis JW, Chiluiza D, Amador P (1997) A note on recent strandings and bycatches of sperm whales (*Physeter macrocephalus*) and humpback whales (*Megaptera novaeangliae*) in Ecuador. In: Perrin WF, Donovan GP, Barlow J, editors. Gillnets and cetaceans: Reports of the International Whaling Commission, Special Issue 47. pp. 917–919.
17. Hill PS, Laake JL, Mitchell EAD (1999) Results of a pilot program to document interactions between sperm whales and longline vessels in Alaska waters. Seattle, WA: United States Department of Commerce. NMFS-AFSC-108 NMFS-AFSC-108. 42 p.
18. Straley J, O'Connell T, Mesnick S, Behnken L, Liddle J (2005) Sperm Whale and Longline Fisheries Interactions in the Gulf of Alaska. North Pacific Research Board.
19. Barlow J, Cameron GA (2003) Field experiments show that acoustic pingers reduce marine mammal bycatch in the California drift gill net fishery. Marine Mammal Science 19: 265-283.
20. Barlow J, Ferguson MC, Becker EA, Redfern JV, Forney KA, et al. (2009) Predictive Modeling of Cetacean Densities in the Eastern Pacific Ocean. La Jolla, CA USA: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. NOAA-TM-NMFS-SWFSC-444 NOAA-TM-NMFS-SWFSC-444. 229 p.
21. Barlow J, Forney KA (2007) Abundance and population density of cetaceans in the California Current ecosystem. Fishery Bulletin 105: 509-526.
22. National Oceanic and Atmospheric Administration (NOAA) (2011) At-Sea Hake Observer Program, Observer Sampling Manual. Seattle, WA: Northwest Fisheries Science Center, Fishery Resource Analysis and Monitoring Division. 47 p.
23. National Oceanic and Atmospheric Administration (NOAA) (2010) West Coast Groundfish Observer Training Manual. Seattle, WA: Northwest Fisheries Science Center, West Coast Groundfish Observer Program. 665 p.
24. Boyd RO, Dewees CM (1992) Putting theory into practice: individual transferable quotas in New Zealand's fisheries. Society and Natural Resources 5: 179–198.
25. Pacific Fishery Management Council, National Marine Fisheries Service (2010) Groundfish Fishery Management Plan Amendment 20 (Trawl Rationalization). Portland, OR & Seattle, WA: The Pacific Fishery Management Council & The National Marine Fisheries Service. 53 p.
26. Carretta JV, Price T, Read R, Petersen D (2004) Estimates of Marine Mammal, Sea Turtle, and Seabird Mortality in the California Drift Gillnet Fishery for Swordfish and Thresher Shark, 1996-2002. Marine Fisheries Review 66.

27. Zacharias MA, Gregr EJ (2005) Sensitivity and Vulnerability in Marine Environments: an Approach to Identifying Vulnerable Marine Areas. Conservation Biology 19: 86-97.

Figure Legends

Figure CET1. Interannual trends in fishing effort, expressed as cumulative number of hours per year (June through November months, 2002-2009) fishing gear was deployed in the water for each of the three fleet types.

Figure CET2. Monthly trends in fishing effort, expressed as cumulative number of hours per month (from 2002-2009) fishing gear was deployed in the water for each of the three fleet types. Panel A = fixed; Panel B = hake; and, Panel C = trawl.

Figure CET3. Patterns of fishing effort along the west coast of the United States, expressed as cumulative number of hours per gridcell (all months from 2002-2009) fishing gear was deployed in the water for each of the three fleet types.

Figure CET4. Left map: modeled blue whale mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for blue whale with the fixed, hake and trawl fleets.

Figure CET5. Left map: modeled fin whale mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for fin whale with the fixed, hake and trawl fleets.

Figure CET6. Left map: modeled Baird's beaked whale mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for Baird's beaked whale with the fixed, hake and trawl fleets.

Figure CET7. Left map: modeled short-beaked common dolphin mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for short-beaked common dolphin with the fixed, hake and trawl fleets.

Figure CET8. Left map: modeled Risso's dolphin mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for Risso's dolphin with the fixed, hake and trawl fleets.

Figure CET9. Left map: modeled Pacific white sided dolphin mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for Pacific white sided dolphin with the fixed, hake and trawl fleets.

Figure CET10. Left map: modeled Northern right whale dolphin mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for Northern right whale dolphin with the fixed, hake and trawl fleets.

Figure CET11. Left map: modeled humpback whale mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for humpback whale with the fixed, hake and trawl fleets.

Figure CET12. Left map: modeled Dall’s porpoise mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for Dall’s porpoise with the fixed, hake and trawl fleets.

Figure CET13. Left map: modeled sperm whale mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for sperm whale with the fixed, hake and trawl fleets.

Figure CET14. Left map: modeled striped dolphin mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for striped dolphin with the fixed, hake and trawl fleets.

Figure CET15. Left map: modeled small beaked whales mean density expressed as the number of individuals/yr/km^2 (based on survey data collected from 1991 – 2005) within the EEZ off the west coast of the United States. Three narrow maps: overlap values for small beaked whales with the fixed, hake and trawl fleets.

Figure CET16. Modeled proportion (%) of each cetacean species population that overlaped with each of the three commercial fishing fleets (from 2002-2009), for each of the 12 cetacean species. B ba = Baird's beaked whale; B mu = blue whale; B ph = fin whale; D de = short-beaked common dolphin; G gr = Risso's dolphin; L bo = northern right whale dolphin; L ob = Pacific white-sided dolphin; M no = humpback whale; P da = Dall's porpoise; P ma = sperm whale; S co = striped dolphin; and, Zsm = small beaked whales.

Figure CET17. Cumulative annual commercial fishing fleet overlap indices (from 2002-2009) for each of the 12 cetacean species. Panels A, B, and C are the fixed, hake and trawl fleets, respectively. B ba = Baird's beaked whale; B mu = blue whale; B ph = fin whale; D de = short-beaked common dolphin; G gr = Risso's dolphin; L bo = northern right whale dolphin; L ob = Pacific white-sided dolphin; M no = humpback whale; P da = Dall's porpoise; P ma = sperm whale; S co = striped dolphin; and, Zsm = small beaked whales.

Table CET1. Twelve species of cetaceans represented in predicted cetacean density geospatial datalayer [20,21].

EN = endangered; LC = least concern; VU = vulnerable;

Common name	Genus species	ESA Status	IUCN	Suborder	Family
Blue whale	*Balaenoptera musculus*	Endangered	EN	Mysticeti (baleen)	Balaenopteridae
Fin whale	*Balaenoptera physalus*	Endangered	EN	Mysticeti (baleen)	Balaenopteridae
Baird's beaked whale	*Berardius bairdii*		Data Deficient	Odontoceti (toothed)	Ziphiidae (beaked)
Short-beaked common dolphin	*Delphinus delphis*		LC	Odontoceti (toothed)	Delphinidae (dolphins)
Risso's dolphin	*Grampus griseus*		LC	Odontoceti (toothed)	Delphinidae (dolphins)
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*		LC	Odontoceti (toothed)	Delphinidae (dolphins)
Northern right whale dolphin	*Lissodelphis borealis*		LC	Odontoceti (toothed)	Delphinidae (dolphins)
Humpback whale	*Megaptera novaeangliae*	Endangered	LC	Mysticeti (baleen)	Balaenopteridae
Dall's porpoise	*Phocoenoides dalli*		LC	Odontoceti (toothed)	Phocoenidae (porpoises)
Sperm whale	*Physeter macrocephalus*	Endangered	VU	Odontoceti (toothed)	Physeteridae (sperm whales)
Striped dolphin	*Stenella coeruleoalba*		LC	Odontoceti (toothed)	Delphinidae (dolphins)
Small beaked whales	*Ziphius* and *Mesoplodon.*			Odontoceti (toothed)	Ziphiidae (beaked)

Table CET2. Fixed gear fishing effort represented in West Coast Groundfish Observer Program (WCGOP) data by sector observed, and the proportion of total effort (cumulative hours gear was deployed) represented by year.

Sector (2002-2009)	% of Total Duration by Sector	Sector Coverage Rate	Proportion of Duration Represented
Limited Entry Sablefish Primary	59.38%	26.12%	15.51%
Limited Entry Non-Tier-Endorsed Fixed Gear	17.00%	7.41%	1.26%
Open Access Fixed Gear	18.63%	3.00%	0.56%
Oregon Nearshore Fixed Gear	3.83%	5.20%	0.20%
California Nearshore Fixed Gear	1.16%	3.43%	0.04%

Sum total percentage of duration represented = 17.57%

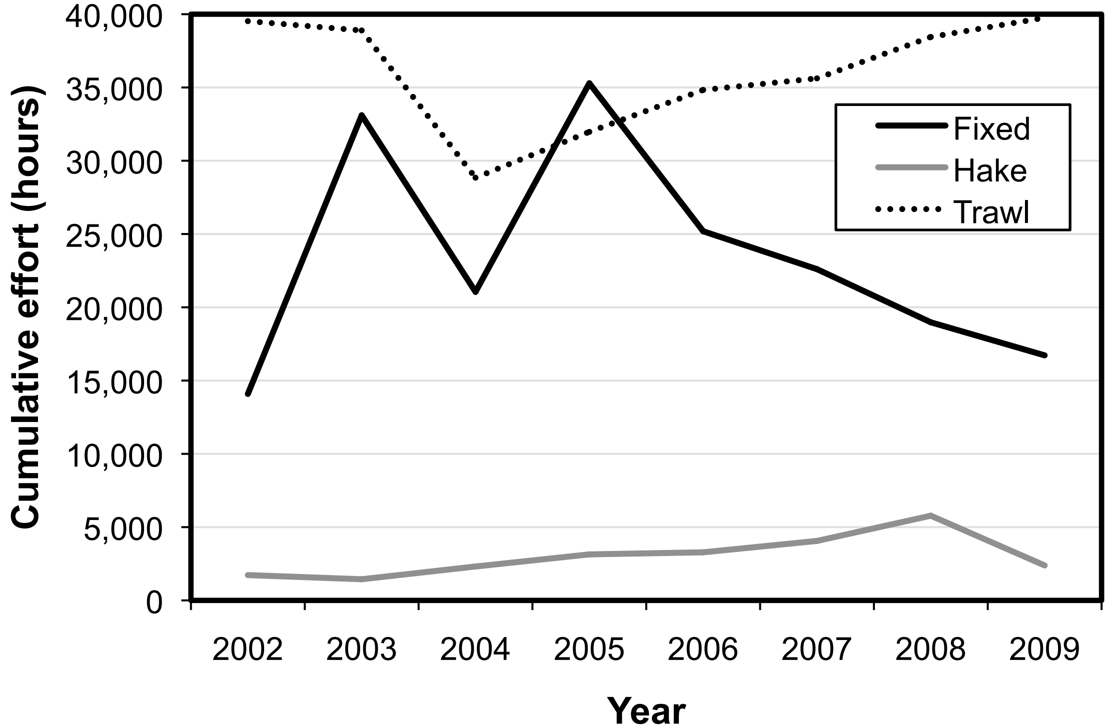

40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Cumulative effort (hours)
2002
2003
2004
2005
2006
2007
2008
2009
Year
Fixed
Hake
Trawl

Figure CET1

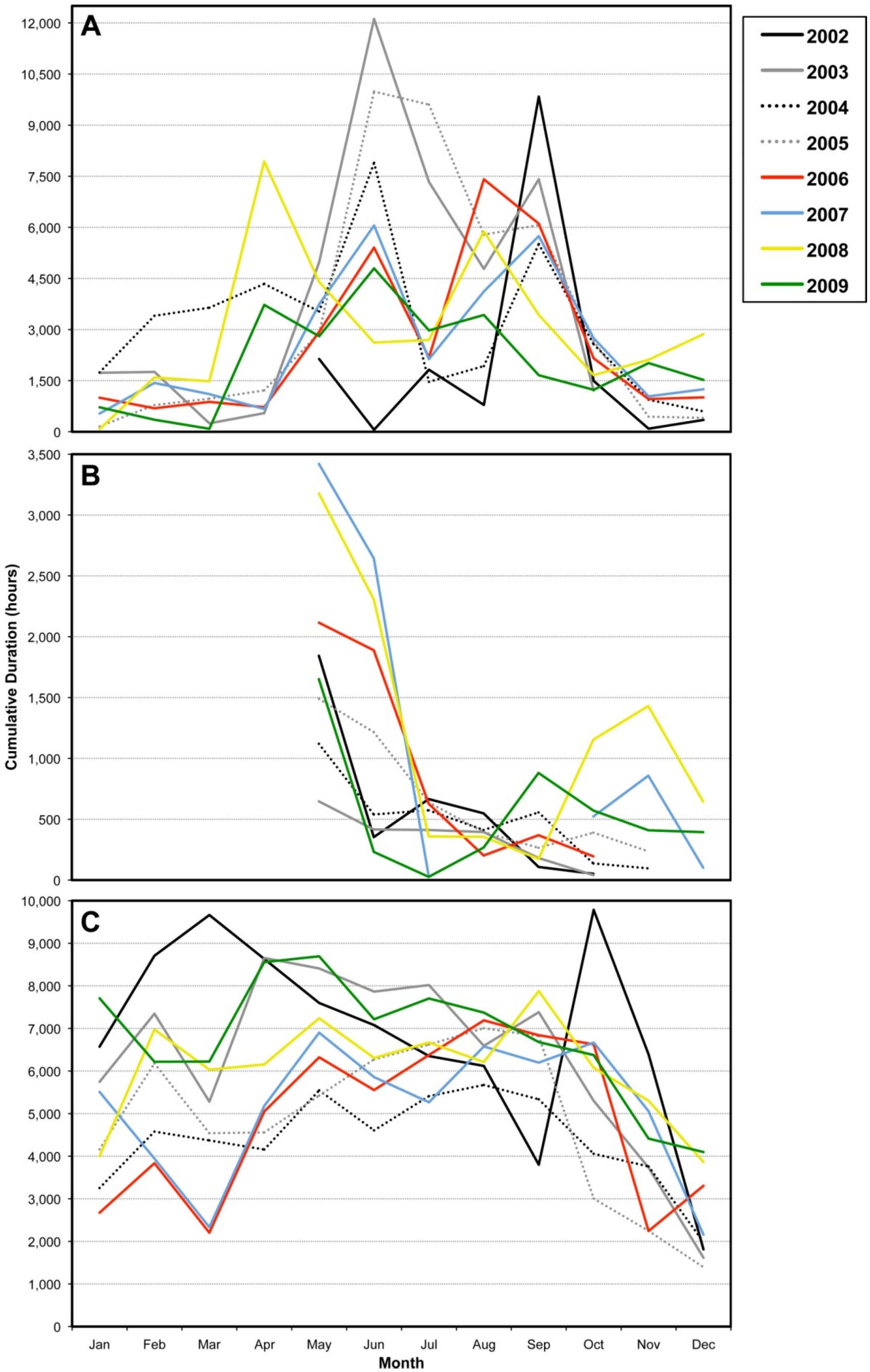
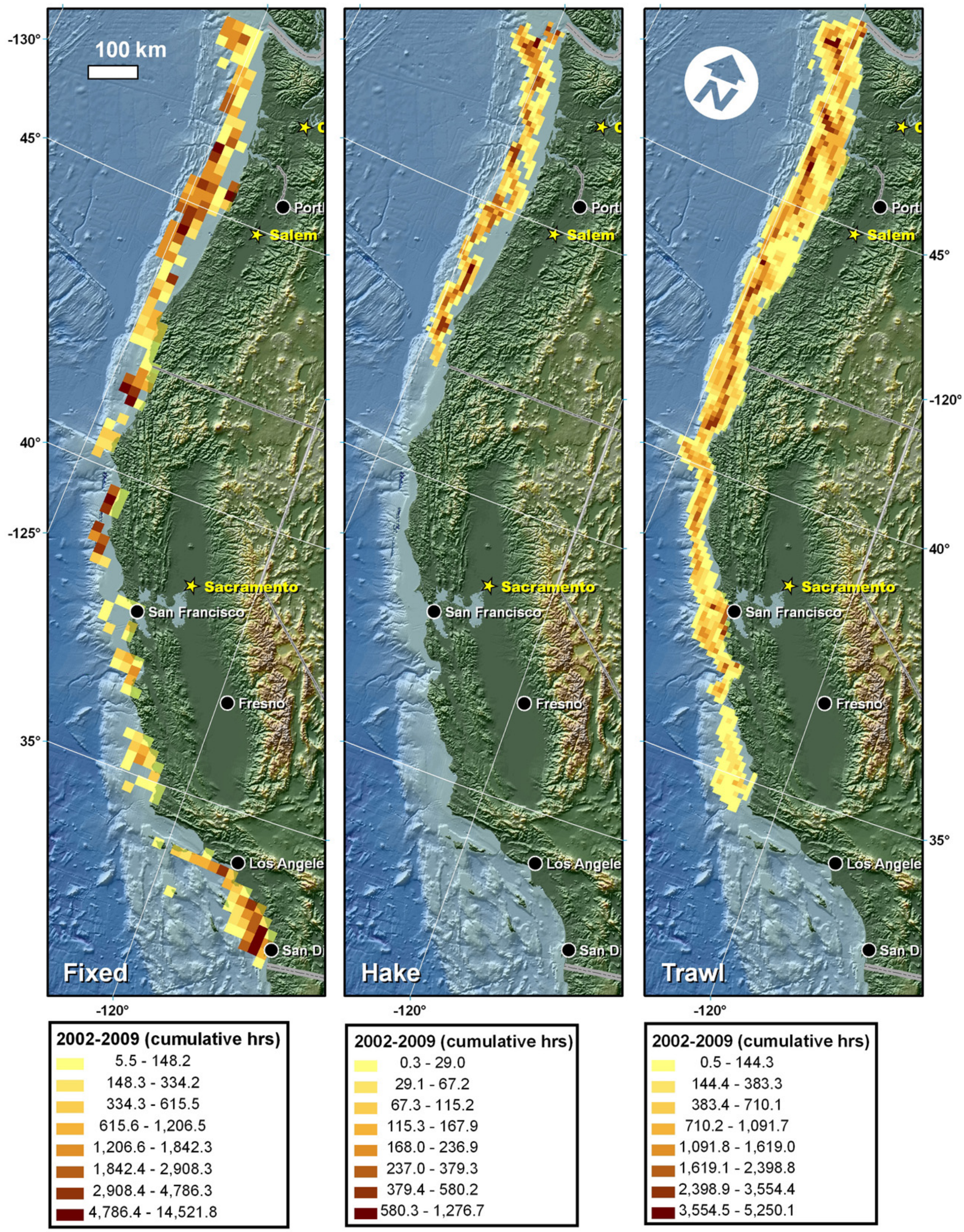

A
B
C
2002
2003
2004
2005
2006
2007
2008
2009
Cumulative Duration (hours)
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
12,000
10,500
9,000
7,500
6,000
4,500
3,000
1,500
0
3,500
3,000
2,500
2,000
1,500
1,000
500
0
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0

Figure CET2



100 km
-130°
45°
40°
-125°
35°
-120°
-120°
45°
40°
35°
Portl
Salem
Sacramento
San Francisco
Fresno
Los Angele
San Di
Fixed
Hake
Trawl
2002-2009 (cumulative hrs)
5.5 - 148.2
148.3 - 334.2
334.3 - 615.5
615.6 - 1,206.5
1,206.6 - 1,842.3
1,842.4 - 2,908.3
2,908.4 - 4,786.3
4,786.4 - 14,521.8
2002-2009 (cumulative hrs)
0.3 - 29.0
29.1 - 67.2
67.3 - 115.2
115.3 - 167.9
168.0 - 236.9
237.0 - 379.3
379.4 - 580.2
580.3 - 1,276.7
2002-2009 (cumulative hrs)
0.5 - 144.3
144.4 - 383.3
383.4 - 710.1
710.2 - 1,091.7
1,091.8 - 1,619.0
1,619.1 - 2,398.8
2,398.9 - 3,554.4
3,554.5 - 5,250.1

Figure CET3

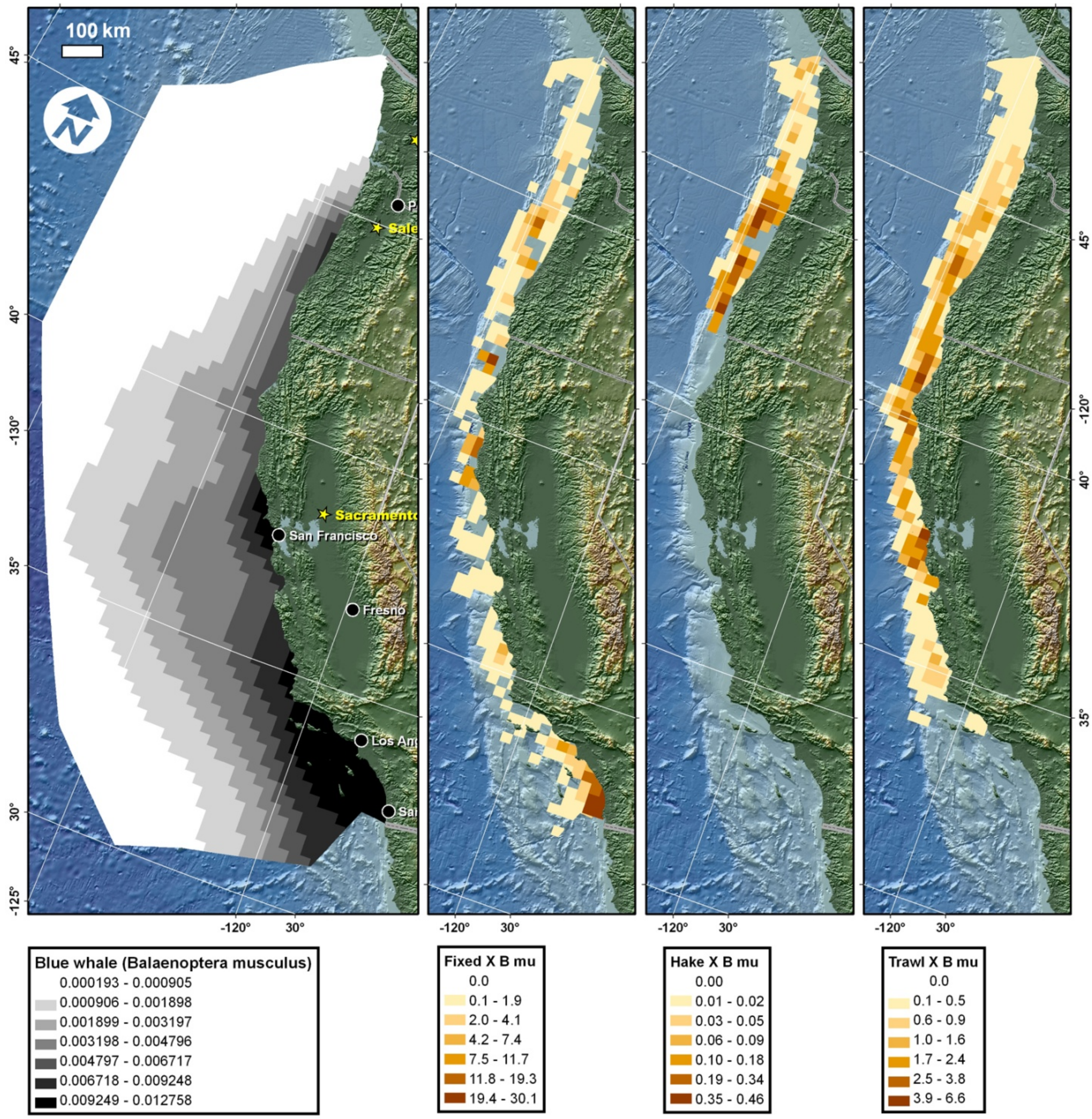

100 km
45°
40°
-130°
35°
30°
-125°
-120°
30°
-120°
45°
40°
35°
San Francisco
Sacramento
Fresno
Blue whale (Balaenoptera musculus)
0.000193 - 0.000905
0.000906 - 0.001898
0.001899 - 0.003197
0.003198 - 0.004796
0.004797 - 0.006717
0.006718 - 0.009248
0.009249 - 0.012758
Fixed X B mu
0.0
0.1 - 1.9
2.0 - 4.1
4.2 - 7.4
7.5 - 11.7
11.8 - 19.3
19.4 - 30.1
Hake X B mu
0.00
0.01 - 0.02
0.03 - 0.05
0.06 - 0.09
0.10 - 0.18
0.19 - 0.34
0.35 - 0.46
Trawl X B mu
0.0
0.1 - 0.5
0.6 - 0.9
1.0 - 1.6
1.7 - 2.4
2.5 - 3.8
3.9 - 6.6

Figure CET4

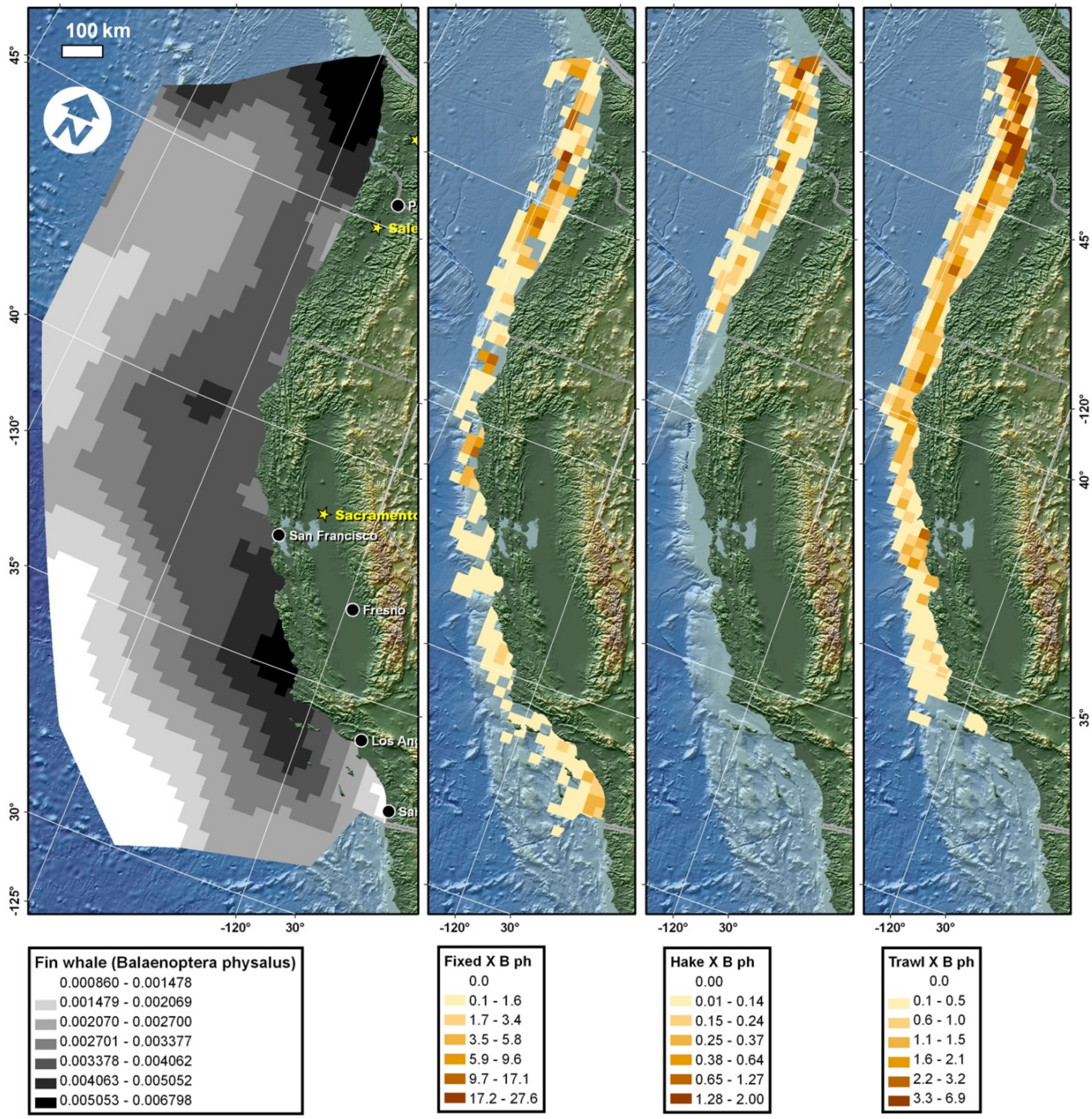
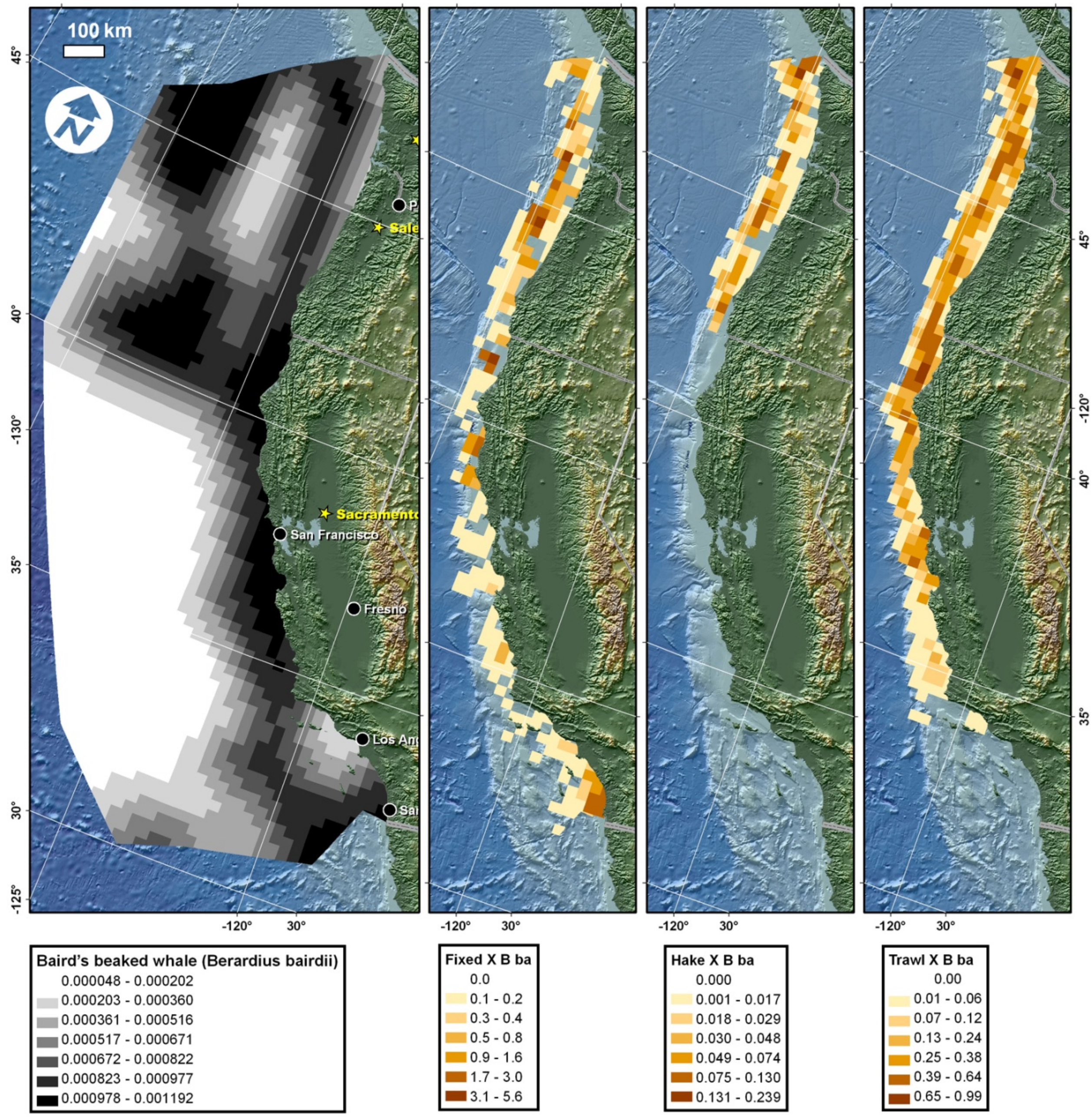
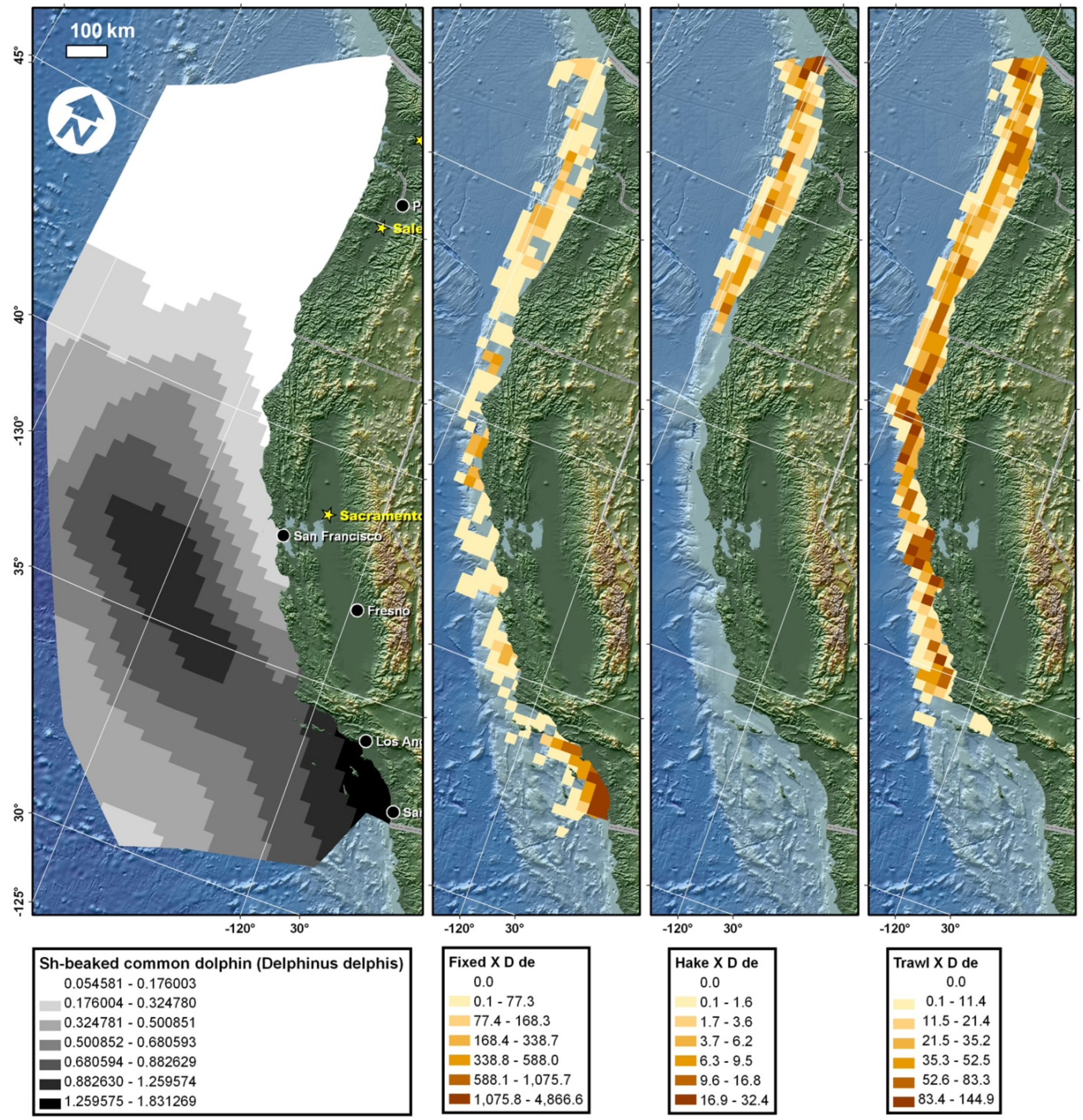

100 km
San Francisco
Sacramento
Fresno
Fin whale (Balaenoptera physalus)
0.000860 - 0.001478
0.001479 - 0.002069
0.002070 - 0.002700
0.002701 - 0.003377
0.003378 - 0.004062
0.004063 - 0.005052
0.005053 - 0.006798
Fixed X B ph
0.0
0.1 - 1.6
1.7 - 3.4
3.5 - 5.8
5.9 - 9.6
9.7 - 17.1
17.2 - 27.6
Hake X B ph
0.00
0.01 - 0.14
0.15 - 0.24
0.25 - 0.37
0.38 - 0.64
0.65 - 1.27
1.28 - 2.00
Trawl X B ph
0.0
0.1 - 0.5
0.6 - 1.0
1.1 - 1.5
1.6 - 2.1
2.2 - 3.2
3.3 - 6.9

Figure CET5



100 km
Sacramento
San Francisco
Fresno
Baird's beaked whale (Berardius bairdii)
0.000048 - 0.000202
0.000203 - 0.000360
0.000361 - 0.000516
0.000517 - 0.000671
0.000672 - 0.000822
0.000823 - 0.000977
0.000978 - 0.001192
Fixed X B ba
0.0
0.1 - 0.2
0.3 - 0.4
0.5 - 0.8
0.9 - 1.6
1.7 - 3.0
3.1 - 5.6
Hake X B ba
0.000
0.001 - 0.017
0.018 - 0.029
0.030 - 0.048
0.049 - 0.074
0.075 - 0.130
0.131 - 0.239
Trawl X B ba
0.00
0.01 - 0.06
0.07 - 0.12
0.13 - 0.24
0.25 - 0.38
0.39 - 0.64
0.65 - 0.99

Figure CET6



100 km
San Francisco
Sacramento
Fresno
Los An
Sh-beaked common dolphin (Delphinus delphis)
0.054581 - 0.176003
0.176004 - 0.324780
0.324781 - 0.500851
0.500852 - 0.680593
0.680594 - 0.882629
0.882630 - 1.259574
1.259575 - 1.831269
Fixed X D de
0.0
0.1 - 77.3
77.4 - 168.3
168.4 - 338.7
338.8 - 588.0
588.1 - 1,075.7
1,075.8 - 4,866.6
Hake X D de
0.0
0.1 - 1.6
1.7 - 3.6
3.7 - 6.2
6.3 - 9.5
9.6 - 16.8
16.9 - 32.4
Trawl X D de
0.0
0.1 - 11.4
11.5 - 21.4
21.5 - 35.2
35.3 - 52.5
52.6 - 83.3
83.4 - 144.9

Figure CET7

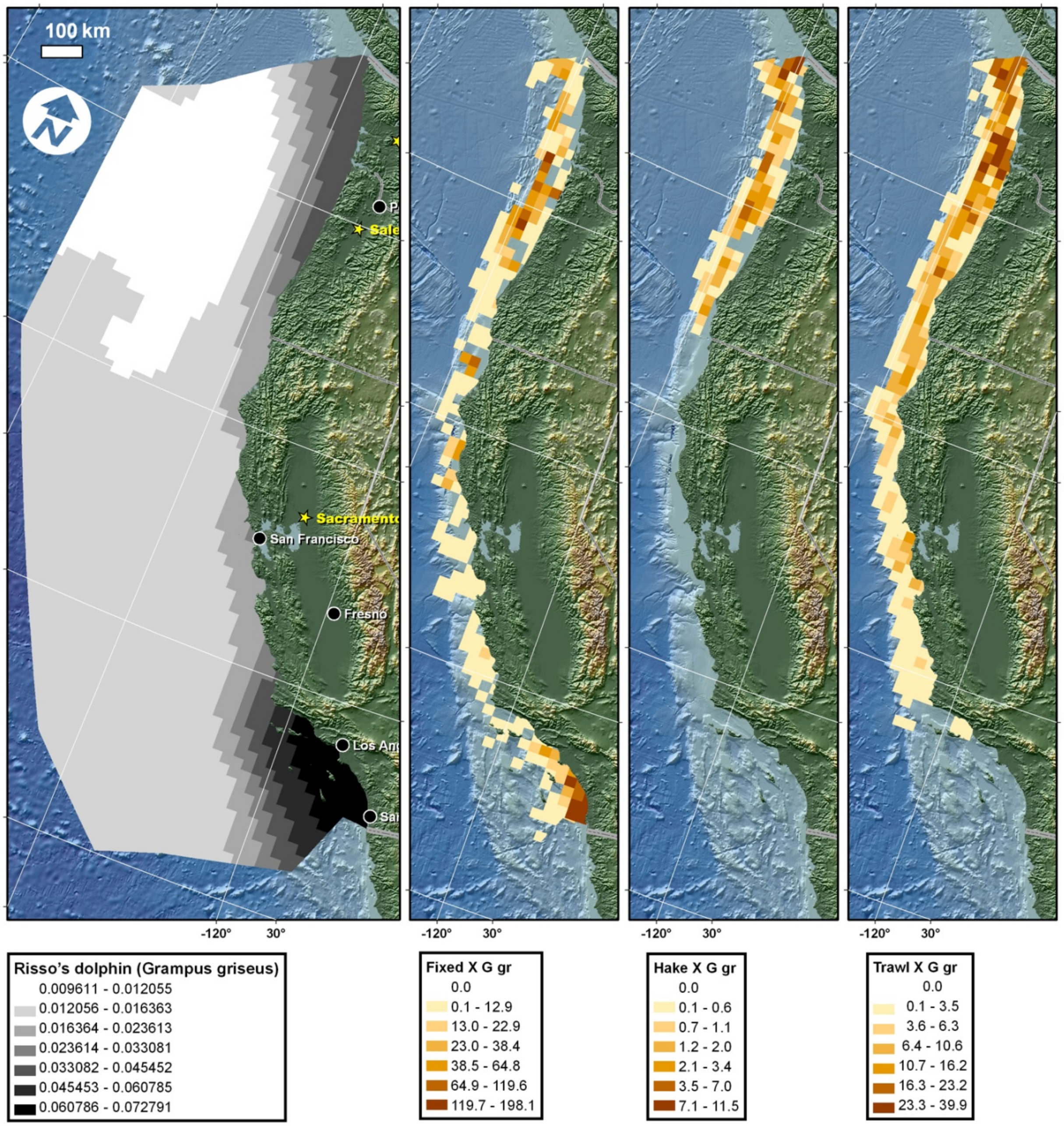
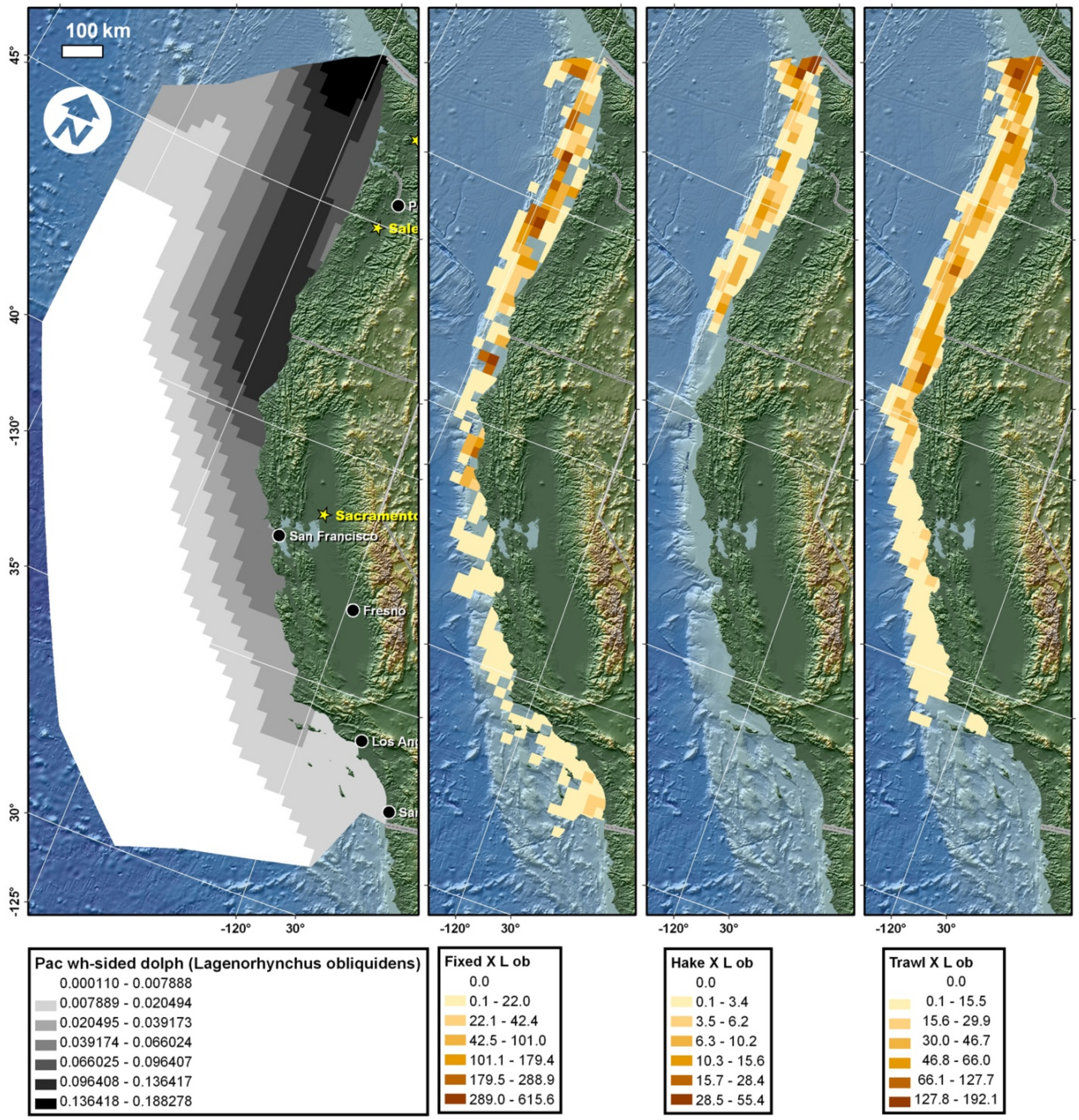
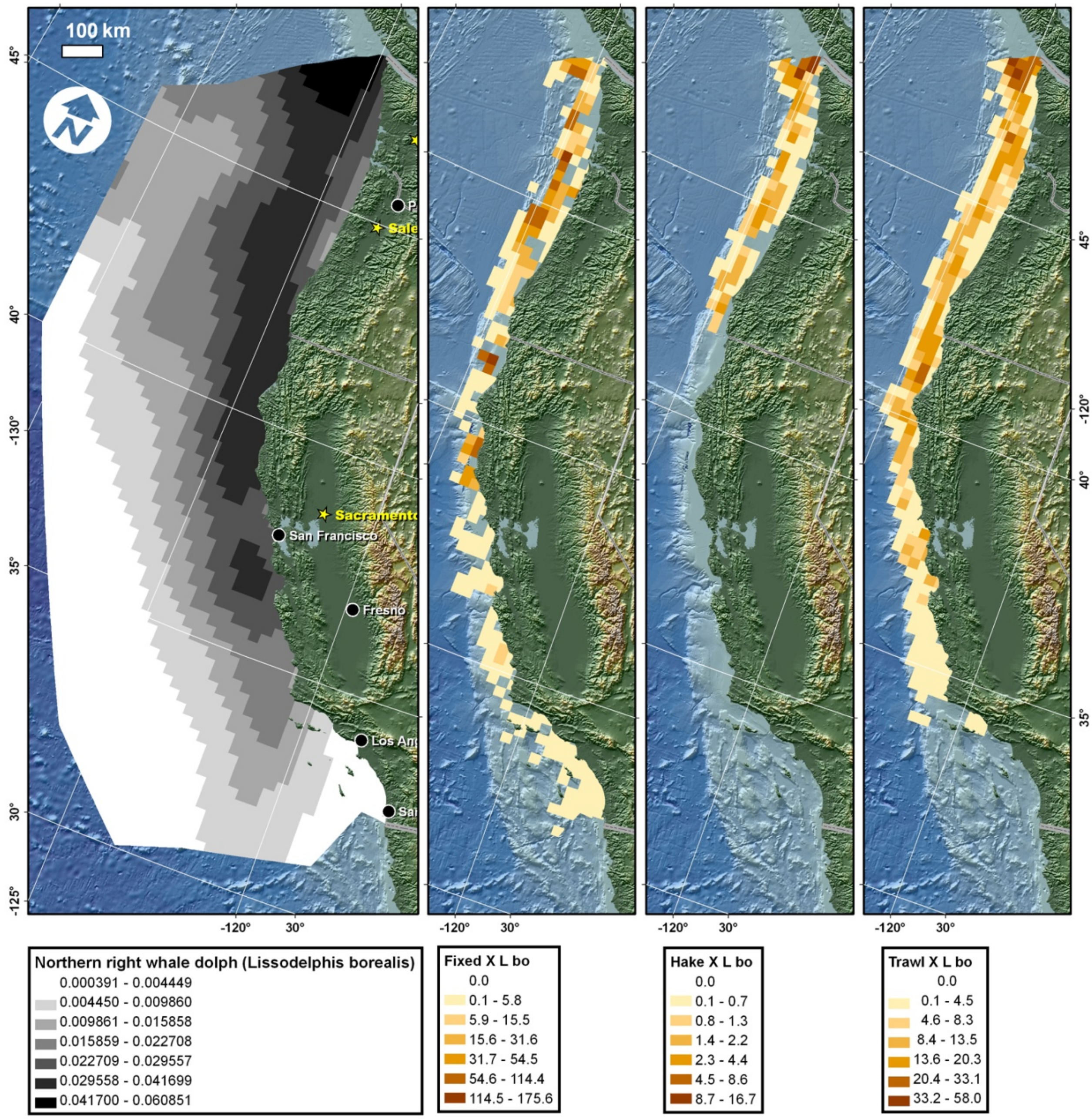

100 km
San Francisco
Fresno
Sacramento
Risso's dolphin (Grampus griseus)
0.009611 - 0.012055
0.012056 - 0.016363
0.016364 - 0.023613
0.023614 - 0.033081
0.033082 - 0.045452
0.045453 - 0.060785
0.060786 - 0.072791
Fixed X G gr
0.0
0.1 - 12.9
13.0 - 22.9
23.0 - 38.4
38.5 - 64.8
64.9 - 119.6
119.7 - 198.1
Hake X G gr
0.0
0.1 - 0.6
0.7 - 1.1
1.2 - 2.0
2.1 - 3.4
3.5 - 7.0
7.1 - 11.5
Trawl X G gr
0.0
0.1 - 3.5
3.6 - 6.3
6.4 - 10.6
10.7 - 16.2
16.3 - 23.2
23.3 - 39.9

Figure CET8



100 km
Pac wh-sided dolph (Lagenorhynchus obliquidens)
0.000110 - 0.007888
0.007889 - 0.020494
0.020495 - 0.039173
0.039174 - 0.066024
0.066025 - 0.096407
0.096408 - 0.136417
0.136418 - 0.188278
Fixed X L ob
0.0
0.1 - 22.0
22.1 - 42.4
42.5 - 101.0
101.1 - 179.4
179.5 - 288.9
289.0 - 615.6
Hake X L ob
0.0
0.1 - 3.4
3.5 - 6.2
6.3 - 10.2
10.3 - 15.6
15.7 - 28.4
28.5 - 55.4
Trawl X L ob
0.0
0.1 - 15.5
15.6 - 29.9
30.0 - 46.7
46.8 - 66.0
66.1 - 127.7
127.8 - 192.1
San Francisco
Fresno
Sacramento

Figure CET9



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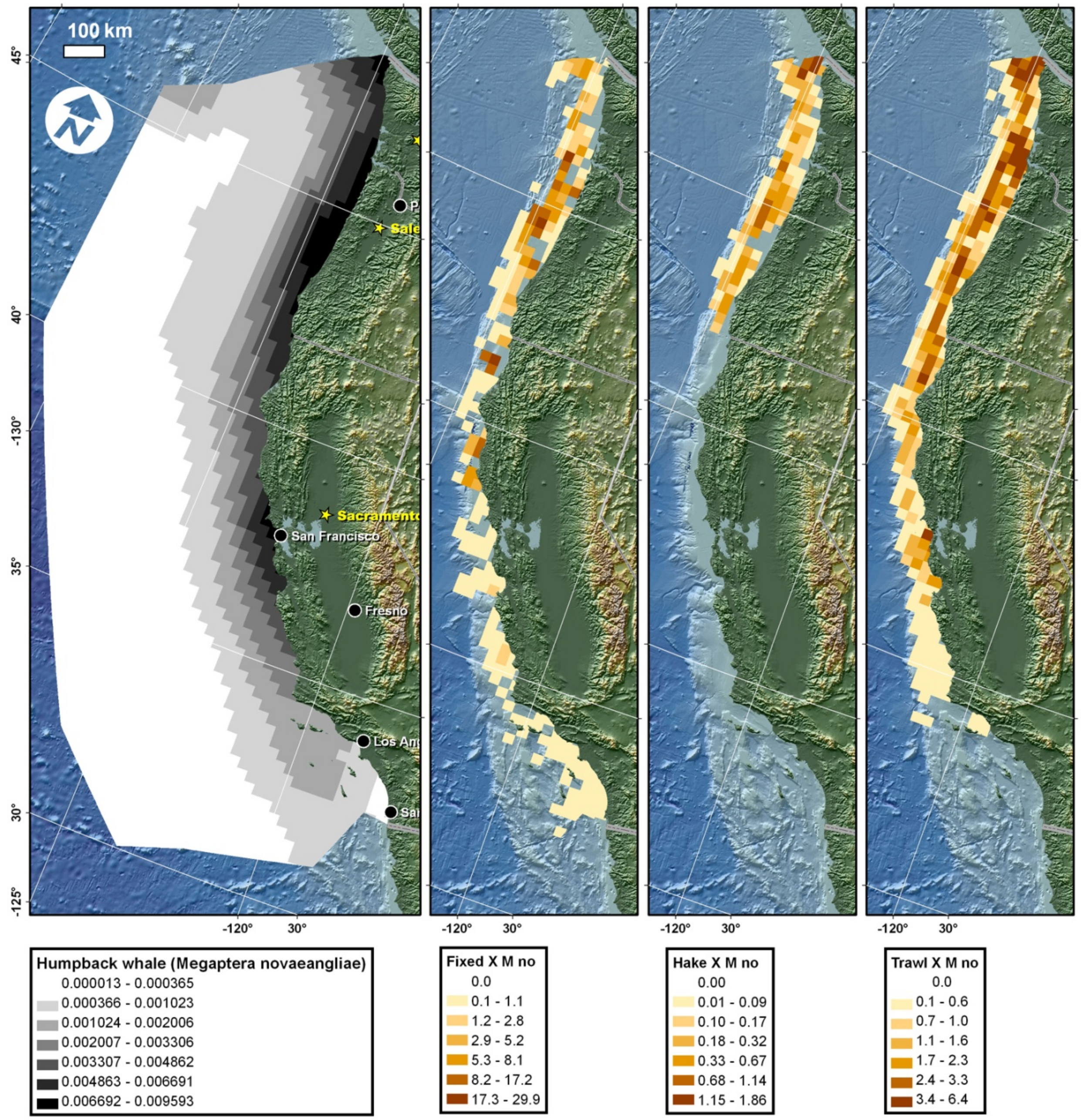

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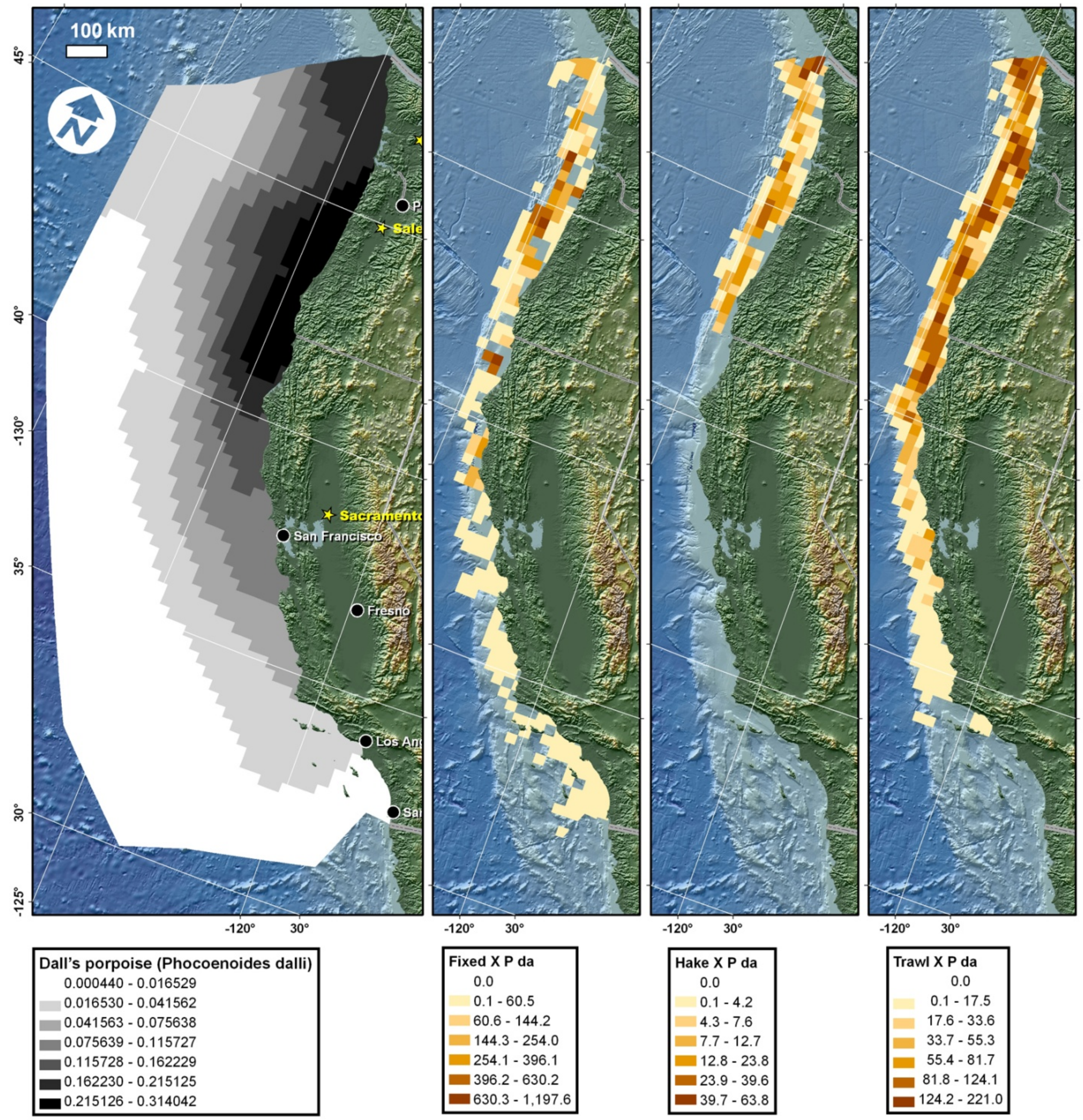
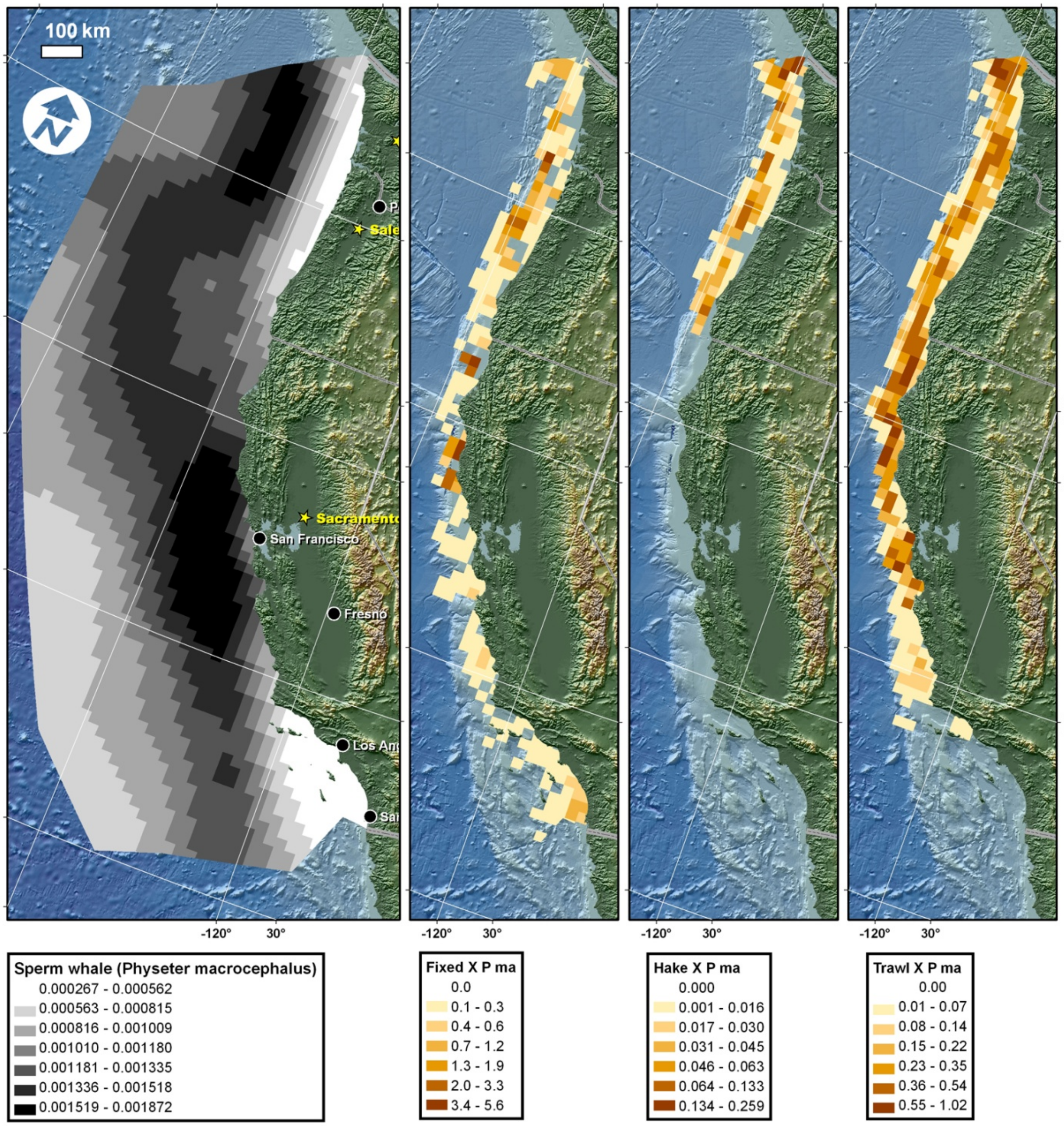


Figure CET12



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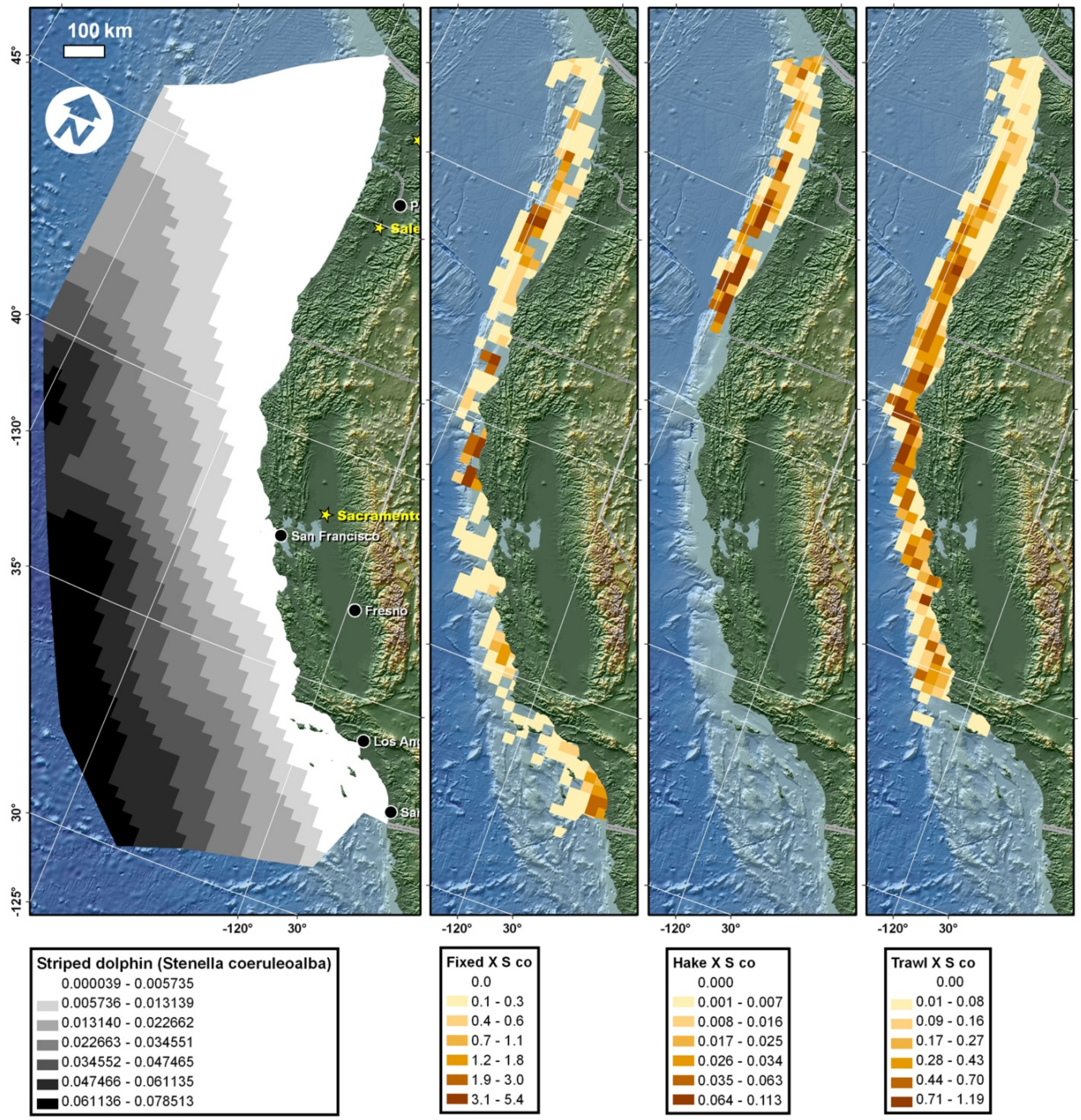

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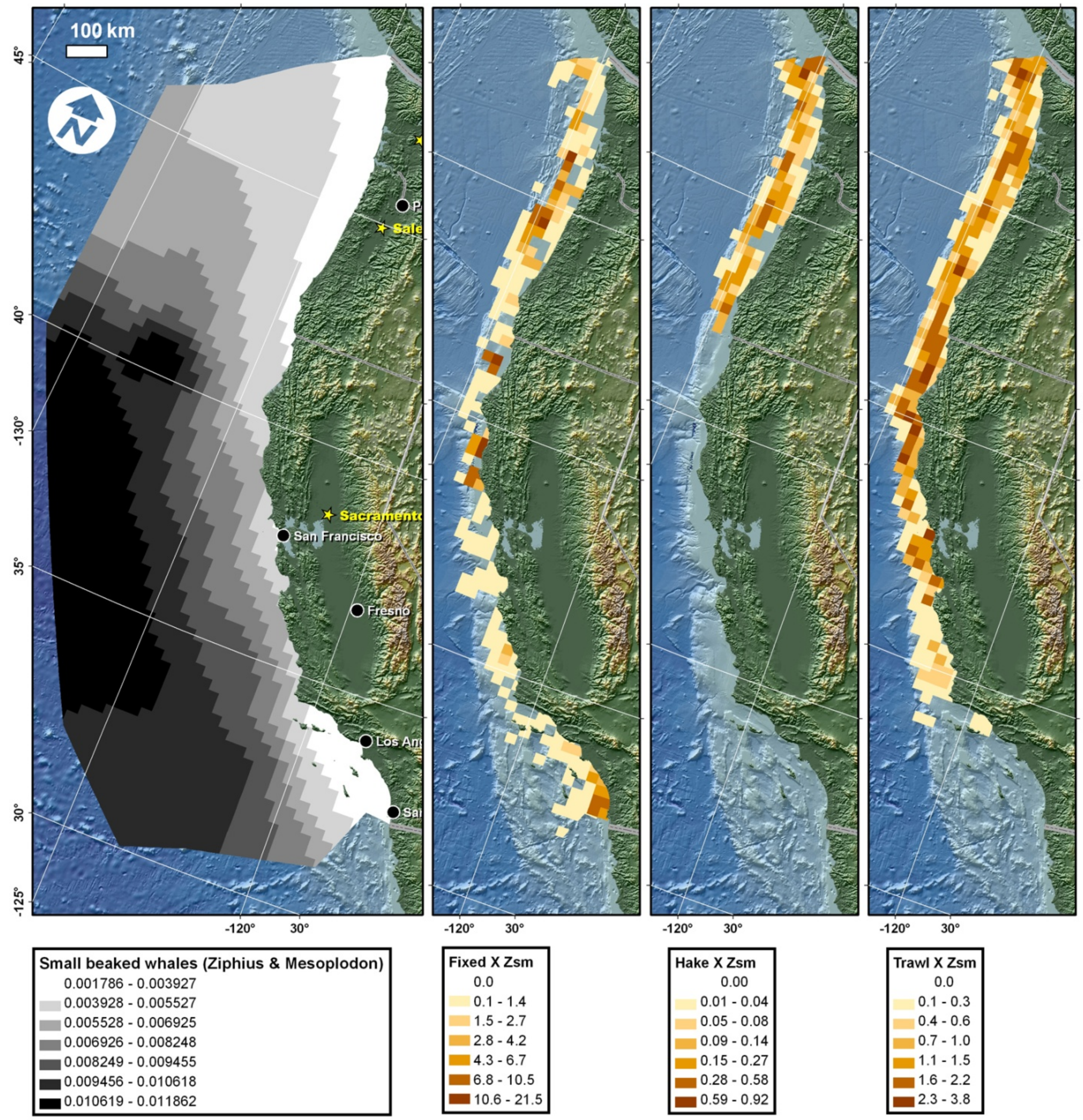

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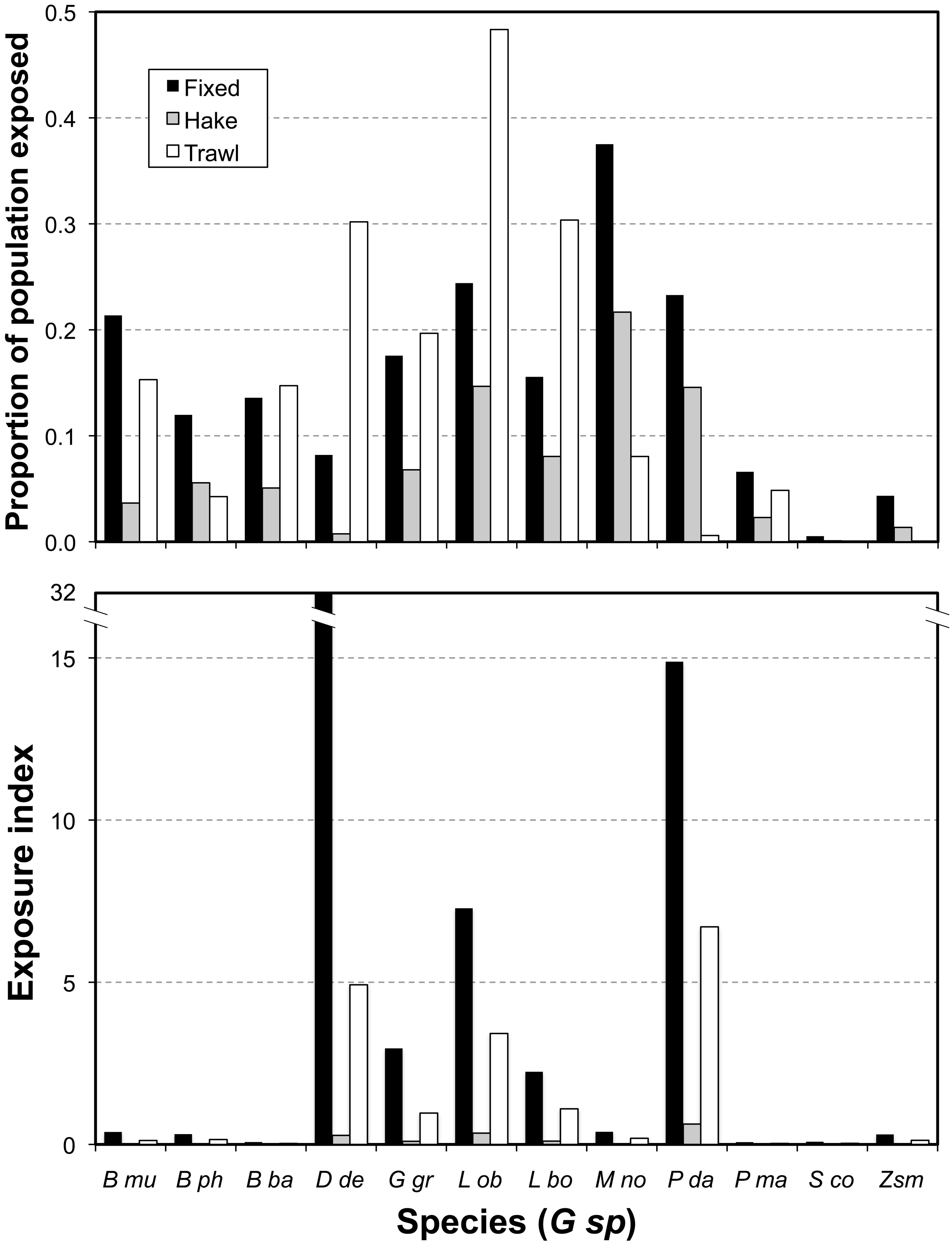

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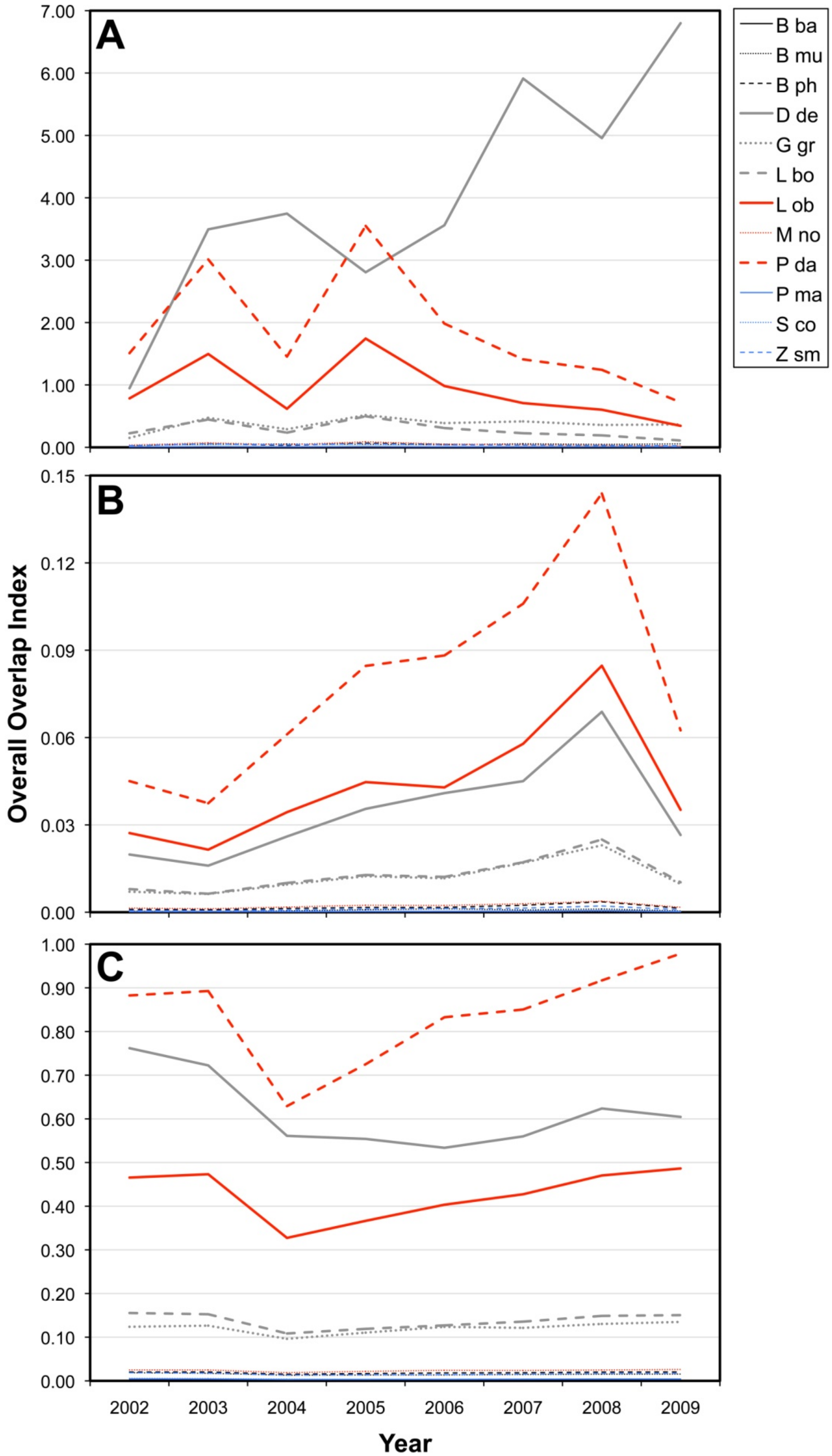

Figure CET17

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way NE
Seattle, Washington 98115

Agenda Item F.3.b
Attachment 3
March 2012

Refer to NMFS No:
2011/06358

February 9, 2010

Donald McIsaac
Executive Director
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Re: Endangered Species Act Biological Opinion and Not Likely to Adversely Affect Determinations for Operation of the Pacific Coast Groundfish Fishery in 2012.

Dear Mr. McIsaac,

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) Protected Resources Division (PRD) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of the operation of the Pacific coast groundfish fishery in 2012. In this Opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of green sturgeon (*Acipenser medirostris*), eulachon (*Thaleichthys pacificus*), humpback whales (*Megaptera novaeangliae*), Steller sea lions (*Eumetopias jubatus*), and leatherback sea turtles (*Dermochelys coriacea*). NMFS also concludes that the proposed action is not likely to destroy or adversely modify designated critical habitat of green sturgeon or leatherback sea turtles.

Furthermore, NMFS concludes that the proposed action may affect, but is not likely to adversely affect the following species and designated critical habitat:

- Sei whales (*Balaenoptera borealis*),
- North Pacific Right whales (*Eubalaena japonica*),
- Blue whales (*Balaenoptera musculus*),
- Fin whales (*Balaenoptera physalus*),
- Sperm whales (*Physter macrocephalus*),
- Southern Resident killer whales (*Orcinus orca*),
- Guadalupe fur seals (*Arctocephalus townsendi*),
- Green sea turtles (*Chelonia mydas*),
- Olive ridley sea turtles (*Lepidochelys olivacea*),
- Loggerhead sea turtles (*Carretta carretta*),
- Critical habitat of Southern Resident killer whales, and
- Critical habitat of Steller sea lions

NMFS does not include an incidental take statement for leatherback sea turtles, because take of this species is unlikely to occur over the opinion term. The annual estimated level of serious injury or mortality incidental to proposed fishing was less than one individual, and this opinion term is one year. NMFS issues placeholder incidental take statements for Steller sea lions and humpback whales. These take statements will remain placeholders until the provisions of MMPA 101(a)(5) are met.

If you have questions regarding this consultation, please contact Alison Agness of my staff at 206-526-6152 or alison.agness@noaa.gov.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination

Operation of the Pacific Coast Groundfish Fishery in 2012

Action Agency: National Marine Fisheries Service

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Green Sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	No
Eulachon (*Thaleichthys pacificus*)	Threatened	Yes	No	No
Humpback whales (*Megaptera novaeangliae*)	Endangered	Yes	No	N/A
Steller sea lions (*Eumetopias jubatus*)	Threatened	Yes	No	No
Leatherback sea turtles (*Dermochelys coriacea*)	Endangered	Yes	No	No

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Issued By:

William W. Stelle, Jr.
Regional Administrator

Date: February 9, 2011

PCTS Number: F/NWR/2011/06358

List of Acronyms

ACL- Annual Catch Limits

AKR- Alaska Region

A-SHOP- At-Sea Hake Observer Program

BC- British Columbia

BRT- Biological Review Team

CDFG- California Department of Fish and Game

CHTG- California Halibut Trawl Grounds

CPFVs- Commercial Passenger Fishing Vessels

CPUE- Catch Per Unit Effort

DPS- Distinct Population Segment

EEZ- Exclusive Economic Zone

EFH- Essential Fishing Habitat

EFPs- Exempt Fishing Permits

ESA- Endangered Species Act

FMP- Fishery Management Plan

GMT- Groundfish Management Team

IFQ- Individual Fishing Quota

IPHC- International Pacific Halibut Commission

ITS- Incidental Take Statement

LE- Limited Entry

MMPA- Marine Mammal Protection Act

MMHSRP- Marine Mammal Health and Stranding Response Program

MSA- Magnuson-Stevens Act

NID- Negligible Impact Determination

NMFS- National Marine Fisheries Service

NWFSC- Northwest Fisheries Science Center

NWR- Northwest Region

OA- Open Access

ODFW- Oregon Department of Fish and Wildlife

OYs- Optimum Yields

PacFIN- Pacific Fisheries Information Network

PBR- Potential Biological Removal

PCE- Primary Constituent Element

PFMC- Pacific Fishery Management Council

PRD- Protected Resources Division

PSMFC- Pacific States Marine Fisheries Commission

QSM- Quota Species Monitoring

RCA- Rockfish Conservation Area

RecFIN- Recreational Fisheries Information System

SFD- Sustainable Fisheries Division

SWR- Southwest Region

SHOP- Shoreside Hake Observation Program

VMS- Vessel Monitoring Systems

WCGF- West Coast Groundfish Fishery

WDFW- Washington Department of Fish and Wildlife

WCGOP- West Coast Groundfish Observer Program

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5. APPENDICES

Appendix A. Anticipated lethal and non-lethal take of leatherback sea turtles, based on active incidental take statements.

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The biological opinion (opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402.

The opinion and incidental take statement are each in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) et seq.) and they underwent pre-dissemination review.

1.2 Consultation History

This biological opinion is based on information provided by NMFS Northwest Region (NWR) Sustainable Fisheries Division (SFD) to NWR Protected Resources Division (PRD) in the December 1, 2011 biological assessment. Additional resources provided include a draft risk assessment from NMFS Northwest Fisheries Science Center (NWFSC), email/telephone discussions with SFD and NWFSC during December 2011, SFD's responses to PRD's additional information requests on December 16, 2011 and other sources of information. Due to the location of the Pacific Coast Groundfish fishery and presence of listed species, NMFS SFD determined that the fishery may affect the following listed species:

- Humpback whales (*Megaptera novaeangliae*),
- Sei whales (*Balaenoptera borealis*),
- North Pacific Right whales (*Eubalaena japonica*),
- Blue whales (*Balaenoptera musculus*),
- Fin whales (*Balaenoptera physalus*),
- Sperm whales (*Physter macrocephalus*),
- Southern Resident killer whales (*Orcinus orca*),
- Guadalupe fur seals (*Arctocephalus townsendi*),

- Steller sea lions (*Eumetopias jubatus*),
- Eulachon (*Thaleichthys pacificus*)
- Green sturgeon (*Acipenser medirostris*)
- Leatherback sea turtles (*Dermochelys coriacea*)
- Green sea turtles (*Chelonia mydas*),
- Olive ridley sea turtles (*Lepidochelys olivacea*), and
- Loggerhead sea turtles (*Carretta carretta*)

as well as designated critical habitat of green sturgeon, Steller sea lions and leatherback sea turtles, and therefore initiated consultation. NMFS has conducted past consultations on the effects of the Pacific Coast Groundfish fishery on ESA-listed salmonids. The most recent consultation on effects to ESA-listed salmonids was completed in 2006 and remains current (NMFS 2006a). A complete record of this consultation is on file at NMFS NWR in Seattle, WA.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The action proposed here is the adoption of Federal harvest specifications and management measures governing the federal Pacific Coast groundfish fishery for 2012 (76 FR 77415). The regulated fisheries may affect ESA listed species and their critical habitat. NMFS is currently working on a risk assessment that will inform a longer-term consultation on the ongoing management of Pacific Coast groundfish fishery, and anticipates completing the longer-term consultation prior to the expiration of this opinion for 2012 (i.e., by December 31, 2012). The following discussion describes all of the groundfish fisheries governed by the regulations that are the subject of this consultation. We describe all of these fisheries to provide context for assessing the direct and indirect effects of the Federal actions covered by this consultation. The discussion focuses on those attributes of the west coast groundfish fisheries that influence the exposure of listed species to the fishery and potential outcomes including:

- Gear Type and Target Species – Configuration of gear, including the potential for direct interaction with listed species and their critical habitat.

- Seasonality and Geographic Extent – When and where the gear is deployed for comparison with the distribution of listed species.
- Fishing Effort – The amount of fishing effort, particularly in areas of overlap with listed species.
- Catch- Indirect effects of fishery catch and bycatch on the prey base of listed species.

Additional consideration is given to monitoring strategies, data sources, and management jurisdiction.

Overview of the Groundfish Fishery[1]

The West Coast Groundfish Fishery (WCGF) is diverse and includes over 90 different fish species in the Pacific Coast Groundfish Fishery Management Plan (FMP) that are caught by multiple commercial and recreational fisheries using many different gear types along the entire coast.

Managed species include the following:

- Rockfish – The plan covers 64 different species of rockfish, including widow, yellowtail, canary, shortbelly, vermilion, bocaccio, chilipepper, cowcod, yelloweye, thornyheads, and Pacific Ocean perch.
- Flatfish – The plan covers 12 species of flatfish, including various soles, starry flounder, arrowtooth flounder, and sanddab.
- Roundfish – The six species of roundfish included in the Fishery Management Plan are lingcod, cabezon, kelp greenling, Pacific cod, Pacific whiting (hake), and sablefish.
- Sharks and skates – The six species of sharks and skates are leopard shark, soupfin shark, spiny dogfish, big skate, California skate, and longnose skate.
- Other species – These include ratfish, finescale codling, and Pacific rattail grenadier.

The National Marine Fisheries Service (NMFS) manages the fishery in partnership with the Pacific Fishery Management Council (PFMC), and the states of California, Oregon, and Washington. A major emphasis of the current fishery management framework is focused on rebuilding overfished species. The management framework includes a variety of fixed elements and routine management measures that may be adjusted through a biennial harvest specifications process. The management measures are intended to constrain the total fishing mortality to within Annual Catch Limits (ACL). Additionally, they are designed to achieve other goals and objectives that pertain to socioeconomics and equitable utilization of the resource.

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[1] Adapted from PFMC 2011, pp. xiii-ix and West Coast Observer Program reports: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm

Regulations for the groundfish fishery are recommended by the PFMC and implemented by NMFS. Active management of the fishery began in the early 1980s with the establishment of optimum yields (OYs) for several managed species and trip limits for widow rockfish, the *Sebastes* complex, and sablefish. The objective of trip limits has been to slow the pace of landings to maintain year-round fishing, processing, and marketing opportunities. Since the 1980s, regulations have evolved to further separate individual groundfish species for management purposes and led to the current use of cumulative two-month trip limits and individual fishing quotas for most species (PFMC 2008). Cumulative trip limits are a specified weight of fish that can be landed during a particular time period.

Under the FMP, the groundfish fishery is defined as consisting of four management components:

- Limited Entry (LE) – The LE component includes all commercial fishers who hold a Federal limited entry permit. The total number of limited entry permits available is capped, and permitted vessels are allotted a larger portion of the total allowable catch for commercially desirable species than non-permitted vessels.

- Open Access (OA) – The OA component includes commercial fishers who are not federally permitted. However, state agencies (California Department of Fish and Game and Oregon Department of Fish and Wildlife) have instituted permit programs for certain OA fisheries.

- Recreational – This component includes recreational anglers who target or catch groundfish species.

- Tribal – This component includes native tribal treaty fisheries in Washington State

These four components can then be further subdivided into sectors based on gear type, target species, and various regulatory factors. Commercial LE and OA sectors have traditionally caught the largest quantities of groundfish and are observed by Federal at-sea observer programs.

Groundfish Fishery Sectors

Managers identify groundfish fishery sectors, around which regulations are structured. Commercial fisheries are identified based on the regulatory status, gear types, and target strategy of the vessels comprising each sector. From a regulatory standpoint, groundfish fisheries are identified based on whether vessels possess a Federal groundfish limited access ("limited entry") permit and the particular endorsements on that permit. In addition, Washington coastal Indian Tribes prosecute groundfish fisheries based on treaty rights. Given their sovereign status, these fisheries are considered separately from other commercial fishery sectors.

An important reason for identifying fishery sectors relates to the allocation of catch opportunity. Overall catch limits by management unit (a stock, stock complex, or geographic subdivision of either) determined by the ACL may be divided among sectors for the purpose of management. These allocations may be "formal" or "informal." Formal allocations identified in the regulations and management measures are generally crafted in order to ensure that a sector has the opportunity to catch the portion of the ACL determined by an allocation. Informal or implicit allocations are a function of the particular management measures established as part of the biennial process for stocks that do not have a formal allocation. The way in which these management measures constrain catch opportunities creates functional allocations of the stocks available for harvest. In addition to allocations, managers also consider "set asides." These divisions of harvest opportunity play more of a bookkeeping function so that managers can estimate the total catch that is likely to occur during the management period. Set asides are an accounting device applied primarily to research catches and fisheries prosecuted under an exempted fishing permit (see below). Treaty fisheries are also accorded a set aside, because the sovereign status of the tribes means that their fisheries are independently managed in coordination with the PFMC.

The following provides a list of sectors comprising the groundfish fishery, which are further described later in the section. An analysis of anticipated changes is included at the end of this section. The following non-tribal commercial fishery sectors are identified for the purposes of management:

1. Catcher-processor vessels targeting Pacific whiting using mid-water trawl gear and processing their catch at sea.

2. Catcher vessels targeting Pacific whiting using mid-water trawl gear and delivering to at-sea mothership processors (referred to as the mothership sector).

3. Catcher vessels targeting Pacific whiting using mid-water trawl gear and delivering to processing plants on land (referred to as the shoreside whiting sector).

4. Vessels using bottom trawl gear to target groundfish species other than Pacific whiting, with their catch landed onshore (referred to as the non-whiting trawl sector).

5. Vessels using longline or pot gear under gear switching provisions in the individual fishing quota (IFQ) program.

6. Vessels using longline or pot gear (referred to as fixed gear) to target groundfish and possessing a Federal limited entry permit with this gear endorsement (referred to as the limited entry fixed gear sector).

7. Vessels using legal groundfish gear other than trawl (principally longline and pot gear) to target groundfish but not possessing a Federal limited entry permit (referred to as the "directed open access sector").

8. Incidental open access sector vessels using a variety of gear types that catch groundfish incidentally, usually defined by catch composition rather than regulatory status.

In addition to the above-mentioned sectors, a variety of fisheries are also considered in the groundfish management process as follows:

- The exempted trawl fisheries—pink shrimp, spot prawn, ridgeback prawn, and California halibut—incidentally catch groundfish. Vessels in this sector (often referred to as the "incidental open access sector,") are subject to the same trip limits and management measures imposed on the directed open access sector, and special measures may apply to particular fisheries, such as pink shrimp and California halibut trawl.
- Recreational groundfish fisheries, including charter vessels (commercial passenger fishing vessels [CPFVs]) and private recreational vessels (individuals fishing from their own or rented boats).
- Tribal fisheries are those fisheries prosecuted by Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) in their usual and accustomed grounds and stations, under treaties with the Federal government.
- Exempted Fishing Permits (EFPs) allocate groundfish harvest to a vessel, which has the effect of allowing the vessel to engage in an activity that would otherwise be prohibited by the MSA or other fishery regulations, for the purpose of collecting limited experimental data.

Pacific Whiting

Pacific whiting form dense, semi-pelagic schools so that vessels targeting the species generally encounter only small amounts of bycatch. However, overfished rockfish and salmon can be caught incidentally, either because they co-occur with Pacific whiting or because vessel operators mistakenly set the gear on the wrong species. The at-sea whiting sectors are managed through a season and quota structure. The season opens around May 1 each year (and occasionally a few weeks earlier off of central California). The third whiting sector (shoreside), is managed with IFQs. Pacific whiting is allocated among the three whiting sectors after a portion is set aside for expected catch in tribal fisheries. The season for each sector then runs until its allocation is used up. As with other groundfish fisheries, catch limits on overfished rockfish have created a constraint on whiting fisheries, resulting in a "race for bycatch"—competition among the whiting sectors to catch their target species quota before limits on overfished species are reached. As a result, beginning with the 2009–2010 management period, sector-specific bycatch limits have been put in place for canary rockfish, darkblotched rockfish, and widow rockfish.

The Pacific whiting fisheries encompass the first three sectors described above; however, beginning in 2011, the shoreside whiting sector is combined with the non-whiting trawl sector and managed with IFQs. The mothership sector is managed through a co-op structure with catcher vessels within a co-op delivering to a specified mothership. The catcher-processor sector operates as a voluntary co-op. Prior to 2011, most vessels in the shoreside fishery operated under EFPs (see below), where participants dumped unsorted catch directly into refrigerated tanks, rather than sorting the catch on deck. Individuals within this fishery may continue to maximize retention (i.e., dump all catch directly into refrigerated tanks) or sort their catch on deck, because 100% of IFQ Program trips are monitored by observers.

Commercial Limited Entry Bottom Trawl

The LE groundfish bottom trawl fishery off the west coast of the United States operates from the Canadian border to Morro Bay, California. In 2009, there were 178 LE trawl permits. Groundfish bottom trawl vessels range in size from 35 to 95 feet, with an average length of 65 feet. Vessels fish throughout the year in a wide range of depths and deliver catch to shoreside processors. Bottom trawlers often target species assemblages, which can result in diverse catch. A single groundfish bottom trawl tow often includes 15 to 20 species. It is expected that fleet size will be reduced considerably under the new IFQ Program (see below).

Commercial Limited Entry and Open Access Bottom Trawl – Targeting California Halibut

The California halibut trawl fishery is managed primarily by the state of California but certain Federal regulations also apply to participants in this fishery. Vessels that participate in the California halibut trawl fishery can belong to either the LE or OA sector of the Federal groundfish trawl fishery. Some vessels with a federal limited entry groundfish trawl permit also have a state California Halibut Bottom Trawl Vessel Permit, and these vessels primarily operate in federal waters out of the ports of Monterey and San Francisco. Federal LE groundfish-permitted vessels targeting California halibut are subject to Federal allocations for groundfish, depth-based conservation area closures, declaration requirements, and trip limits for groundfish, and they must participate in a vessel monitoring system for enforcement purposes.

The California halibut trawl fishery generally operates out of U.S. ports from San Francisco to Los Angeles. Under state law, commercial bottom trawling is prohibited in California State waters, with the exception of the California Halibut Trawl Grounds (CHTG). The fishing season within the CHTG covers two calendar years. Regulations for vessels operating in the CHTG include minimum mesh sizes of 7.5 inches in length to reduce bycatch, a three-month closed season during California halibut spawning (March 15–June 15), a 500 pound possession limit on the incidental take of fish other than California halibut, a 22-inch minimum size limit for retained California halibut, and mandated Federal observer coverage. A comprehensive review of the California halibut bottom trawl fishery in the CHTG was published by the California Department of Fish and Game (CDFG 2008). In Federal waters, trawling for California halibut can occur year-round, but a state permit is required (as of 2006) to land more than 150 pounds of California halibut per trip.

Vessels range in size from 29 to 71 feet, with an average length of 46 feet. Fishing generally occurs in less than 30 fathoms of water, and fishers deliver their catch to shore-based processors.

Commercial Fixed Gear Sectors

There are four major sectors in the fixed gear groundfish fishery: the LE sablefish-endorsed sector, the LE non-sablefish-endorsed sector, the Federal open access sector, and the state-permitted nearshore fisheries. There were 227 LE fixed gear permits in 2009. LE fixed gear permits are either sablefish-endorsed or non-sablefish-endorsed. In addition, all LE fixed gear permits have gear endorsements (longline, pot/trap, or both). Of the 227 LE fixed gear permits in 2009, 164 had sablefish-endorsements. Of these, 132 were associated with longline gear, 32 were associated with pot/trap gear, and 4 were associated with both longline and pot/trap gear. The remaining 63 limited entry non-sablefish-endorsed permits were all associated with longline gear. The open access fixed gear sector does not require Federal or state permits. Therefore, the total number of participants varies widely from year to year. Open access vessels can use any type of hook-and-line or pot/trap gear, including longline, fishing pole, and vertical longline.

Limited Entry Sablefish Primary Tier-Endorsed Fixed Gear

Vessels participating in the LE sablefish-endorsed sector range in size from 33 to 95 feet and operate north of 36^{o} N. latitude. Fishing generally occurs in depths greater than 80 fathoms. Nearly all of the vessels participating in this sector deliver their iced catch to shoreside processors. Catch in the LE sablefish-endorsed fishery is composed mostly of sablefish, with bycatch primarily composed of spiny dogfish shark, Pacific halibut, rockfish species, and skates. LE sablefish-endorsed permits provide the permit holder with an annual share of the sablefish catch. Sablefish-endorsed permits are assigned to Tier 1, 2, or 3. Each Tier 1 permit receives 1.4% of the primary-season sablefish allocation, with Tiers 2 and 3 receiving 0.64% and 0.36%, respectively. Each year, these shares are translated into amounts of catch (in pounds), or "tier limits," which could be caught during the primary fishery. Regulations allow for up to three LE sablefish-endorsed permits to be 'stacked' on a single vessel. Permit stacking was implemented to increase the economic efficiency of the fleet and promote fleet capacity reduction. Stacking more than one sablefish-endorsed permit on a vessel allows the vessel to land sablefish up to the sum of the associated tier limits. However, permit stacking does not convey additive landing limits for any other species. LE sablefish-endorsed primary season fishing currently takes place over a seven-month period from April 1 to October 31. The seven-month season was first implemented in 2002. Permit holders land their tier limits at any time during the seven-month season. Once the primary season opens, all sablefish landed by a sablefish-endorsed permit is counted toward attainment of its tier limit. Vessels that have LE sablefish- endorsed permits can fish in the LE non-sablefish-endorsed fishery under trip limits once their quota of primary season sablefish has been caught or when the primary season is closed, from November 1 through March 31.

Limited Entry Non-Sablefish-Endorsed Fixed Gear

The LE non-sablefish-endorsed fixed gear sector occurs coastwide but operates primarily out of southern California ports. The fishery operates year-round, but the majority of fishing activity occurs during the summer months when weather conditions improve. Vessels in the LE non-sablefish-endorsed sector range in size from 17 to 60 feet, with an average length of 34 feet. Vessels catch a variety of groundfish species, including thornyheads, sablefish, rockfish, and flatfish. The fleet typically operates in depths greater than 80 fathoms. Nearly all of the vessels participating in this fishery deliver their iced catch to fresh fish markets. LE non-sablefish-endorsed fixed gear permits are subject to daily and weekly trip limits for sablefish, thornyheads, and other groundfish species.

Open Access Fixed Gear

As the open access sector of the fixed gear groundfish fishery does not require Federal or state permits (state requirements for commercial fishing licenses notwithstanding), characterizing the participants can be difficult. Vessels range in size from 10 to 97 feet, with an average length of 33 feet. Vessels catch a variety of groundfish species, including sablefish, spiny dogfish, and skates. Vessels operate out of all three coastal states and generally fish in waters shoreward of 30 fathoms or seaward of 100 fathoms. Open access fixed gear vessels are subject to daily and weekly trip limits for sablefish, spiny dogfish shark, and other groundfish species. Flatfish species—including dover sole, arrowtooth flounder, petrale sole, English sole, starry flounder, and all other flatfish—are managed as a single group for the open access fishery.

State-Permitted Nearshore Fixed Gear

The state-permitted nearshore groundfish sectors operate from northern Oregon to southern California. Vessels that participate in the state-permitted nearshore fixed gear fisheries can belong to either the Federal limited entry or open acces fixed gear sectors. Historically, nearshore fisheries were accessible to everyone. However, due to the increasing number of participants and concerns of overcapacity, California and Oregon began requiring state permits in 2003 and 2004, respectively. Regulations for the nearshore fisheries are set by both the PFMC and the states. The PFMC sets the ACL for groundfish species and harvest guidelines.

In addition to regulations set by the PFMC, each state manages its nearshore fishery independently by issuing state regulations on the cumulative trip limits of nearshore species in their state waters. Cumulative trip limits are a specified weight of fish that can be landed during a particular time period, usually two-months. Often, cumulative trip limits set by the states are more restrictive than the Federal limits. Additional management measures for each state are highlighted in the sections below. Further information on state nearshore fishery regulations can also be found online for Oregon at: (http://www.dfw.state.or.us/mrp/regulations/commercial_fishing/index.asp) and for California at: (www.dfg.ca.gov/marine/regulations.asp#commercial).

Vessels participating in the nearshore fisheries range in size from 10 to 50 feet, with an average length of 25 feet. They use a variety of fixed gear, including hand-lines, cable gear, fishing poles, longlines, and pots. In shallow water, fishers often fish in coves or drift along a reef. They set and retrieve their gear multiple times a day and generally land their fish on a daily basis. Quotas for the nearshore fisheries are small—generally between 100 to 2,000 pounds every two-months although can be higher for some species. Many of those who fish in shallow water participate in the live fish market, necessitating careful handling of retained fish.

Washington

The State of Washington does not allow commercial fishing within its territorial waters (0–3 miles from the coastline). This prohibition removes fishing grounds from access by commercial nearshore fishers.

Oregon

Oregon's nearshore commercial fishery typically occurs in shallow water (< 30 fathoms) and targets species, such as black rockfish, blue rockfish, china rockfish, copper rockfish, quillback rockfish, grass rockfish, cabezon, and greenlings. Oregon's nearshore permitting process assigns permits to vessels. State nearshore management employs minimum size limits for many nearshore species, as well as two-month cumulative trip limits and annual landing caps (maximum landed weight in a 12-month period), and annual harvest caps that include all sources of fisheries-mortality. Black rockfish trip limits are tied to four latitudinal Oregon Black Rockfish Zones. In 2004, Oregon began requiring that nearshore fishers complete a vessel logbook.

In 2009, Oregon issued 55 black/blue rockfish permits, which allow for the landing of black rockfish and blue rockfish, and 72 black/blue rockfish permits with a nearshore endorsement, which allows landing of black rockfish and blue rockfish along with 21 additional Oregon designated nearshore groundfish species. In 2010, Oregon issued 55 black/blue rockfish permits and 70 black/blue rockfish permits with a nearshore endorsement.

California

California state management designates four geographic zones along the coastline. State management has implemented seasonal closures in some south of 40°10'N latitude. The north coast area (north of 40°10’N latitude to the Oregon-California border) remained open year-round, except for seasonal closures of cabezon, greenlings, and California sheephead.

The State of California issues two permits for fishing within the nearshore area: (1) a shallow nearshore species fishery permit, and (2) a deeper nearshore species fishery permit. In 2009, there were a total of 319 California nearshore permits, and in 2010, there were 304 permits. The permits are assigned to an individual person and can only be used in the one regional management area specified on the permit. Fishers can either have a single nearshore permit (deeper or shallow) or hold both types of permits. A trap endorsement can also be tied to a shallow nearshore permit to allow for the use of trap gear when fishing for nearshore species. In addition, a nearshore fishery bycatch permit can be issued for trawl gear or entangling nets to allow for small amounts of nearshore landings per trip, but only in two management zones.

The deeper nearshore permit is required for landing black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish. The shallow nearshore permit is required for landing black-and-yellow rockfish, cabezon, California scorpionfish, California sheephead, china rockfish, gopher rockfish, grass rockfish, greenlings, and kelp rockfish. Lingcod is also commonly targeted in conjunction with shallow nearshore permit species. Most live fish landings consist of species in the shallow nearshore group. State nearshore management employs minimum size limits for many nearshore species and two-month cumulative trip limits. A limit on the number of hooks per vessel or line also exists for certain areas. California instituted a voluntary nearshore logbook program in 2005.

Recreational Fisheries

Recreational fisheries are primarily managed by the states, so catch and effort data are often grouped by state and sub-state region. A distinction is also made between charter vessels (commercial passenger fishing vessels, or CPFVs) and private recreational vessels (individuals fishing from their own or rented boats). As would be expected, participation is higher during warmer months. The number of marine angler trips peaks in the July–August period, but the seasonal concentration is more pronounced in northern areas. For example, in 2003, Washington State saw no trips recorded in November–December, and 36% of trips were in July–August, while in Southern California the proportions for the same periods were 12% and 30%, respectively (PFMC 2011).

Tribal Groundfish Fisheries

West Coast treaty tribes have formal allocations or set asides for sablefish, black rockfish, and Pacific whiting. The tribes also have harvest guidelines for Pacific cod and lingcod. Members of the four coastal treaty tribes participate in commercial, ceremonial, and subsistence fisheries for groundfish off the Washington coast. Participants in the tribal commercial fisheries use similar gear to non-tribal fishers. Groundfish caught in the tribal commercial fishery pass through the same markets as non-tribal commercial groundfish catch.

There are several groundfish species taken in tribal fisheries for which the tribes have no formal allocations and some species for which no specific allocation has been determined. Rather than try to reserve specific allocations of these species, the tribes recommend trip limits for these species to the PFMC, which then managed other sectors to accommodate these fisheries. Tribal trip limits for groundfish species without tribal allocations are usually intended to constrain direct catch as well as interactions of overfished species in the tribal groundfish fisheries.

Thirteen western Washington tribes possess and exercise treaty fishing rights to halibut, including the four tribes that possess treaty fishing rights to groundfish (fleet summary in Table 1). Tribal halibut allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence component.

Approximately one-third of the tribal sablefish allocation is taken during an open competition fishery, in which vessels from the sablefish tribes all have access to this portion of the overall tribal sablefish allocation. The open competition portion of the allocation tends to be taken during the same period as the major tribal commercial halibut fisheries in March and April. The remaining two-thirds of the tribal sablefish allocation is split among the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual tribes, beginning in March and lasting into the autumn, depending on vessel participation and management measures used. Participants in the halibut and sablefish fisheries tend to use hook-and-line gear, as required by the International Pacific Halibut Commission (IPHC). By agreement the tribes also use snap gear for equity reasons in the fully competitive sablefish fishery (i.e., someone participating in a fully competitive sablefish fishery who landed no halibut would not have to meet any IPHC requirements, but would still have to use snap line gear by tribal regulation).

In addition to these hook-and-line fisheries, the Makah tribe annually harvests a whiting allocation using mid-water trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes {50 CFR 660.385(e)}. The tribal allocation is subtracted from the whiting OY before allocation to the non-tribal sectors. From 1999 to 2009, the tribal allocation was based on a sliding scale related to the U.S. whiting OY. Since 2009, the tribal allocation has been based on estimated need by tribes anticipating participating in the fishery. To date, only the Makah tribe has conducted a whiting fishery.

Makah non-whiting vessels fit with mid-water trawl gear have also been targeting yellowtail rockfish in recent years. Tribal regulations specify the monthly limit of yellowtail, based on the number of vessels participating, as well as limits for canary rockfish (300 pounds per trip), and minor nearshore, shelf, and slope rockfish (300 pounds per trip combined) and interactions with widow rockfish (not to exceed 10% of yellowtail landings). This fishery is managed by both time and area to stay within projected impacts on overfished rockfish, primarily widow and canary, taken incidentally with yellowtail. Short test tows are taken in areas previously identified as having low bycatch rates before that area is open to fishing. If vessels in the fishery approach the limits established by tribal regulation, the area is closed to further fishing until there is a demonstrated reduction in bycatch rates. An observer program is in place to verify bycatch levels in the fishery, and assigned vessels must carry an observer to participate.

Table 1. Distribution of vessels engaged in tribal groundfish fisheries (Source PFMC 2011).

Treaty Tribe	**Number of Vessels in Groundfish Fishery**				**Port**
	Longline (length in ft)	**Whiting (length in ft)**	**Trawl (length in ft)**	**Total**	
Makah	31 (33'-62')	5 (95'-124')	5 (49'-62')	45	Neah Bay
Hoh	-	-	-	1	N/A
Quileute	8 (45’-68’)	-	-	8	La Push
Quinault	15(38'-62')	-	-	15	West Port

Exempted Fishing Permits

An EFP is a NMFS-issued Federal permit that authorizes a vessel to engage in an activity that is otherwise prohibited by the Magnuson-Stevens Fishery Conservation and Management Act, referred to as the Magnuson-Stevens Act (MSA) or other fishery regulations for the purpose of collecting limited experimental data. EFPs can be issued to Federal or state agencies, marine fish commissions, or other entities, including individuals.

The specific objectives of a proposed exempted fishery may vary. The Groundfish FMP provides for EFPs 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 management goals of the FMP. However, EFPs are commonly used to explore ways to reduce effort on depressed stocks, encourage innovation and efficiency in the fisheries, provide access to constrained stocks while directly measuring the bycatch associated with those fishing strategies, and evaluate current and proposed management measures. EFPs are adopted biennially with preliminary adoption by the PFMC at their November meeting and final approval in June. For additional information on EFP protocols, visit the PFMC website and review PFMC Operating Procedure 19 at: (www.pcouncil.org/operations/cops.html).

Seasonality

Groundfish are commercially harvested year-round with changes in effort related to management and markets. Seasonality of the groundfish fisheries varies by sector and is shown in Table 2. As described above, the seasonality of Pacific whiting fisheries is driven by regulations which open the season around May 1 each year (and occasionally a few weeks earlier off of central California). The season for each Pacific whiting sector then runs until its allocation is used up.

Table 2. Seasonality of non-whiting commercial groundfish landings—over 2005–2009 timeframe, average in metric tons per two-month seasons by sector (excerpted from PFMC 2011, p. F-14)

Sector	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Shoreside Non-whiting Trawl	3,637.56	3,672.64	3,918.75	3,988.75	3,788.83	2,659.96
Limited Entry Fixed Gear	101.90	261.88	678.20	759.48	718.41	119.06
Open Access Fixed Gear	101.82	142.69	266.89	280.65	289.08	187.65
Incidentally Caught	25.58	23.40	37.23	48.43	37.08	10.70
Tribal Shoreside Nonwhiting Groundfish	68.71	427.75	362.38	304.72	299.57	172.77

Recreational effort tends to peak during warmer months, particularly in Oregon and Washington where weather is more variable. Figure 1 shows the seasonal distribution of recreational fishing activity off the West Coast.

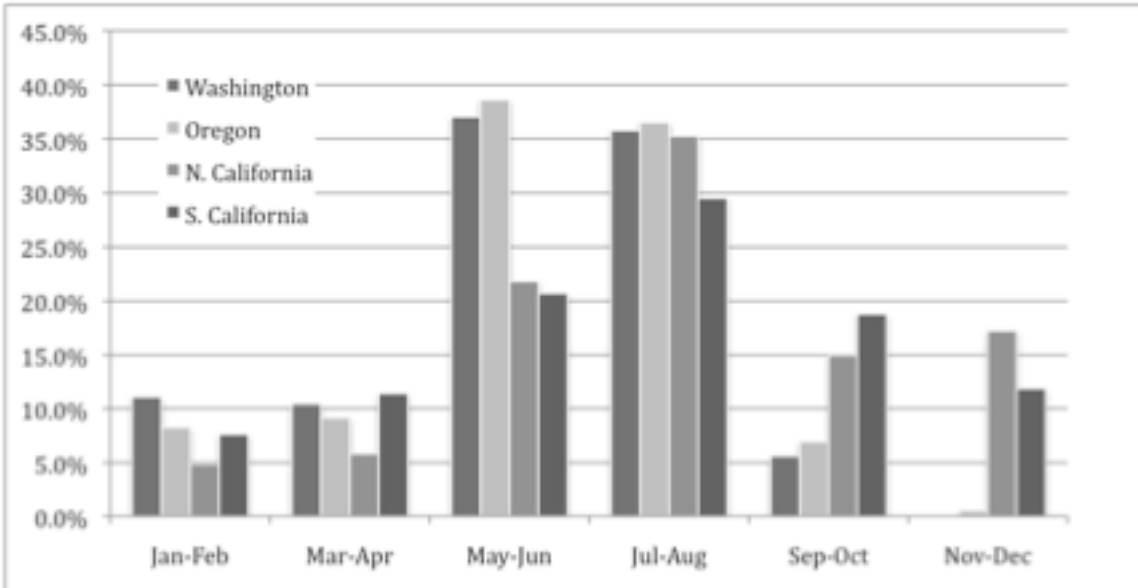


Figure 1. Seasonal distribution of marine angler trips in 2003 (Source PFMC 2011).

Geographic Extent

Groundfish are harvested coastwide in state and Federal waters. The fishery is constrained in some cases by established Marine Protected Areas, such as those to protect groundfish Essential Fish Habitat (EFH) (PFMC 2005). In other cases, area closures are implemented through the harvest specification process to protect overfished species (PFMC 2011). Table 3 shows groundfish landings by port group during 2009 (excerpted from PFMC 2011, p. F-24). Figure 2 shows several maps of commercial fishing effort for the WCGF fishery.

Table 3. Commercial groundfish landings (mt) by sector and port group for 2009 (x=excluded for data confidentiality) (excerpted from PFMC 2011, p. F-24).

Port Group	Shoreside Whiting Trawl	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Open Access Fixed Gear	Incidentally Caught Groundfish	Total
Puget Sound		1,295.5	257.4		x	x
North Washington Coast		x	220.2	23.1	1.7	x
South & Central	10,090.9	1,346.2	308.6	41.0	3.8	11,790.6

Washington Coast						
Astoria	14,085.8	8,406.4	148.3	16.5	5.1	22,662.2
Tillamook		x		34.5	0.2	x
Newport	12,993.0	3,774.6	525.1	42.4	11.8	17,347.0
Coos Bay	x	3,619.1	191.4	85.2	6.5	x
Brookings		1,201.1	263.5	276.9	1.8	1,743.3
Crescent City	1,489.4	982.5	108.0	81.4	0.4	2,661.7
Eureka	x	2,678.7	101.8	73.0	x	3,162.0
Fort Bragg		1,684.1	154.6	102.9	0.6	1,942.3
Bodega Bay		x	x	17.2	3.8	81.4
San Francisco		648.5	59.9	36.3	29.0	773.7
Monterey		x	108.2	72.3	0.7	x
Morro Bay		x	202.0	568.8	2.1	x
Santa Barbara			35.6	74.2	15.9	125.7
Los Angeles			117.7	12.9	12.7	143.2
San Diego			82.1	13.3	3.8	99.2
Total	40,580.1	26,164.7	x	1,571.1	104.7	71,314.5

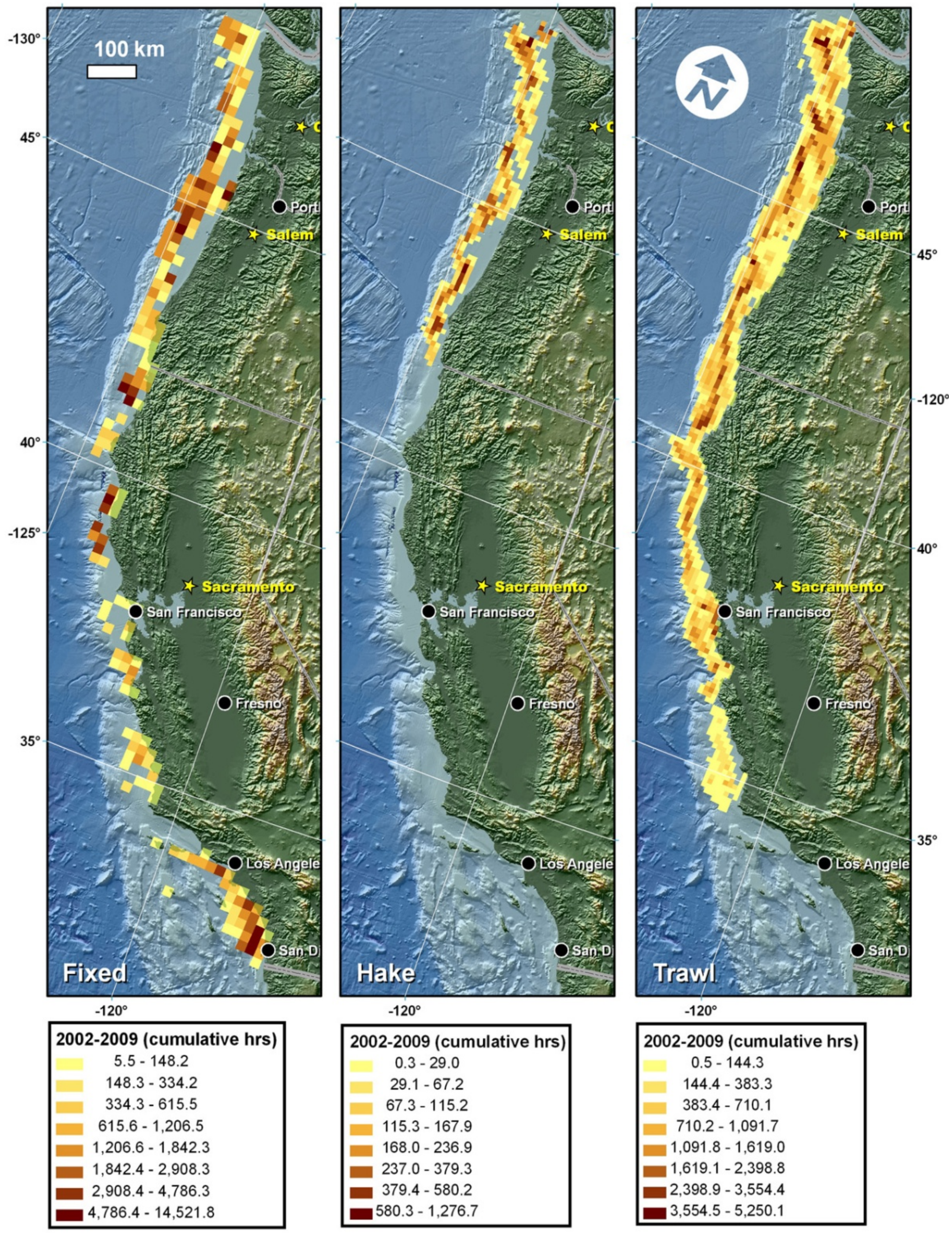


Figure 2. The figure demonstrates the general spatial distribution of fishing effort from 2002–2009 (as cumulative hours gear was deployed) in various sectors of the groundfish fishery for which spatial fishing effort information is available. Fixed represents the limited entry sablefish primary, limited entry non-sablefish endorsed, open access fixed gear, and state-permitted nearshore fixed gear sectors. Hake represents all at-sea hake sectors. Trawl represents the limited entry bottom trawl sector.

Gear Fished in the Groundfish Fishery

Many different types of fishing gear are used in West Coast fisheries and specifically in commercial, tribal, and recreational fisheries. Gear types include trawl nets, gillnets, longline, troll, jig, rod and reel, vertical hook and line, pots (also called traps), and other gear (e.g., spears, throw nets). Technical descriptions of each type of gear used on the West Coast (groundfish and non-groundfish fisheries) are available in the West Coast Observer Program Training Manual (NWFSC 2011) and are incorporated by reference. Table 4 summarizes the gear types used in the WCGF fishery.

Longline fisheries involve setting out 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). Figure 3 shows typical bottom longline gear deployed in the groundfish fishery.

Trawling involves the towing of a funnel shaped net or nets behind a fishing vessel. The trawl gear varies depending on the species sought and the size and horsepower of the boats used. Trawl gear may be fished on the bottom, near the bottom, or up in the water column to catch a large variety of species. Figure 4 shows trawl gear as it is generally deployed on the West Coast.

Table 4. Gear Types Used in the WCGF Fishery (Source PFMC 2005).

	Nets	**Longline, Pot, Hook and Line Gears**	**Other Gears**
Limited Entry	Bottom Trawl Mid-water Trawl Scottish Seine	Pot Longline Vertical hook/line Rod and reel Troll/dinglebar Jig Stick Gear	
Open Access –	Set Gillnet	Pot	

Directed	Sculpin Trawl	Longline Vertical hook/line Rod and reel Troll/dinglebar Jig Stick Gear	
Open Access – Incidental	Exempted Trawl (pink shrimp, spot and ridgeback prawn, Calif. halibut, sea cucumber) Setnet Driftnet Purse seine	Pot (Dungeness crab, sheephead, spot prawn) Longline Rod and reel Troll	Dive/spear Dive/hook and line Poke pole
Tribal	As above	As above	As above
Recreational	Dip net Throw net	Hook and Line Pots	Dive/spear

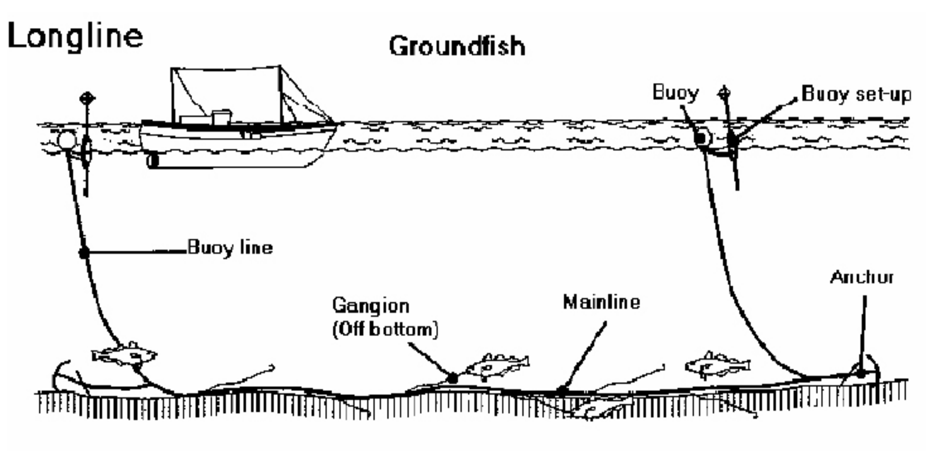


Figure 3. Schematic of groundfish longline gear (source NWFSC 2011).

To reduce take of seabirds, streamer lines (also called bird lines or tori lines) are sometimes deployed as the gear is set in the water (see Figure 5). A streamer line is a 50-fathom (or 90-meter) line that extends from a high point near the stern of the vessel to a drogue (usually a buoy with a weight). As the vessel moves forward, the drogue creates tension in the line, producing a span from the stern where the streamer line is aloft. The aloft section includes streamers made of UV-protected, brightly colored tubing spaced every 16 feet (5 meters). Streamers must be heavy enough to maintain a near-vertical fence in moderate to high winds. Individual streamers should extend to the water to prevent aggressive birds from getting to the groundline. When deployed in pairs—one from each side of the stern—streamer lines create a moving fence around the sinking groundline eliminating birds (Melvin 2000). Streamer lines have been effective at reducing seabird bycatch in Alaskan fisheries (USFWS 2008; Ed Melvin, personal communication; and, http://www.afsc.noaa.gov/Quarterly/amj2011/divrptsREFM4.htm). Seabird mitigation is not currently required in the WCGF fishery, although Washington Sea Grant has recently initiated a NMFS-funded program to promote voluntary use of streamer lines (WA Sea Grant 2011).

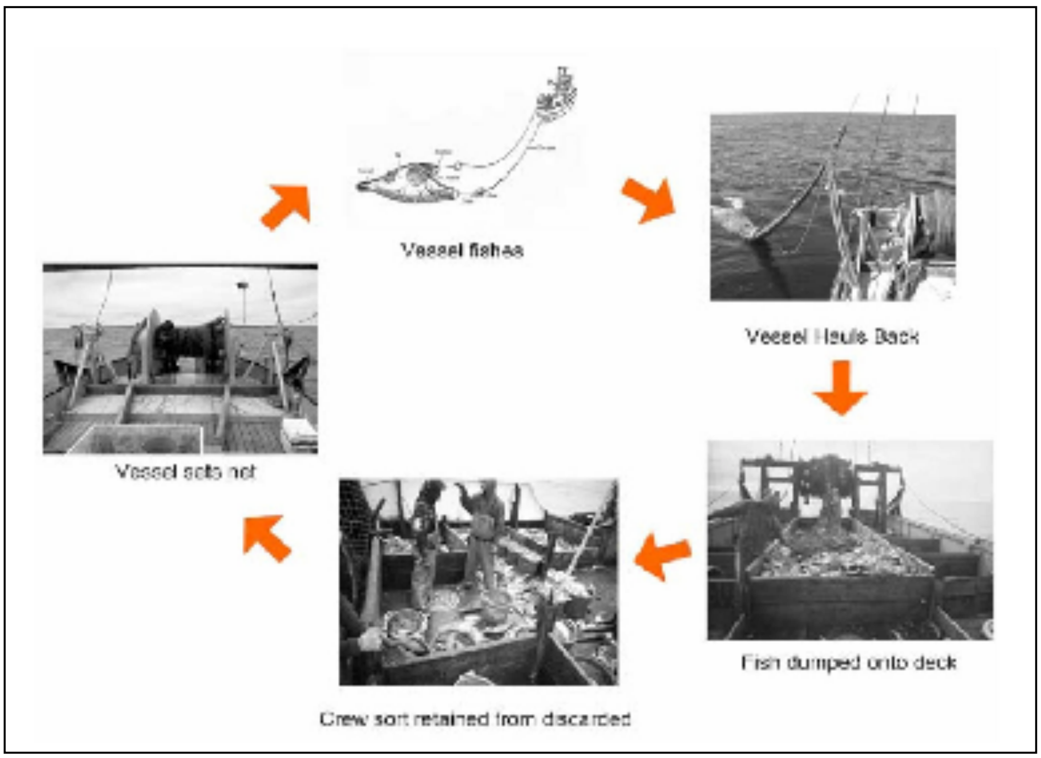


Figure 4. Typical activity on a groundfish trawl vessel (source NWFSC 2011).

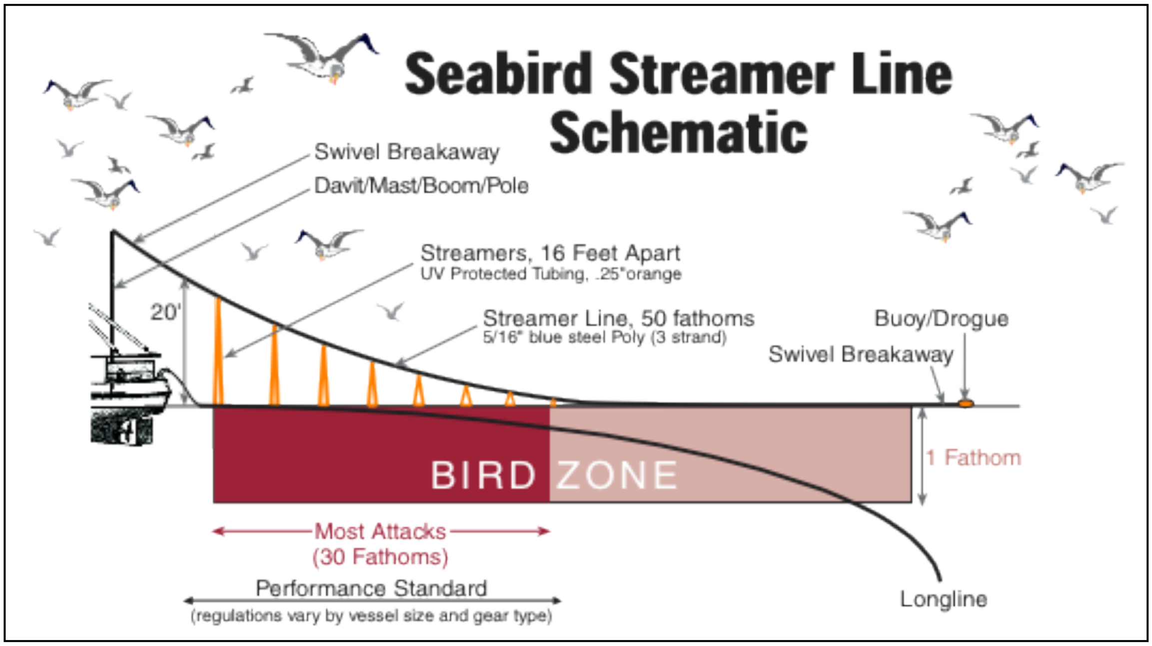


Figure 5. Schematic of streamer lines to reduce seabird bycatch (modified from Melvin 2000).

Catch Monitoring, Accounting, and Enforcement[2]

Establishing a standardized bycatch reporting methodology and limiting bycatch to the extent practicable are mandates of the MSA.[3] Effective bycatch accounting and control mechanisms are also critical for staying within ACLs. The first element in limiting bycatch is accurately measuring bycatch rates by time, area, depth, gear type, and fishing strategy.

At its November 2005 meeting, the PFMC approved Amendment 18 to the Groundfish FMP. The PFMC recommendation addresses National Standard 9 and Section 303(a)(11) of the MSA, which require practicable means to minimize bycatch and bycatch mortality and a standardized bycatch reporting methodology. The purpose of FMP Amendment 18 is to clearly and comprehensively describe measures that address these requirements, which have been established through long-term regulations and the biennial management process. The amendment also describes new measures that could be implemented by future regulatory or amendment actions. For additional information on Amendment 18, see the PFMC web page at: (www.pcouncil.org/groundfish/gffmp/gfa18.html).

Various state, Federal, and tribal catch monitoring systems are used in West Coast groundfish management. There are two components to total catch: (1) catch landed in port, and

[2] This Section Excerpted from Chapter 4 of PFMC 2008 with minor adaptations.
[3] For more information on bycatch, including NMFS' definition of bycatch, see: http://www.nmfs.noaa.gov/by_catch/SPO_final_rev_12204.pdf

(2) catch discarded at sea. A description of the relevant data systems used to monitor total catch and discards in commercial and recreational groundfish sectors follows.

Data Collection Programs – Commercial sectors

Monitoring Commercial Landings

Sorting requirements monitoring programs are in place for all groundfish species and species groups with IFQ, trip limits, harvest guidelines, or ACLs including all overfished species. This provides accounting for the weight of landed depleted species when catches are hailed at sea or landed. Limited entry groundfish trawl fishermen are also required to maintain state logbooks to record the start and haul locations, time, duration of trawl tows, and the total catch by species market category (i.e., those species and complexes with sorting requirements). Landings are recorded on state fish receiving tickets. Fish tickets are designed by the individual states, Pacific States Marine Fisheries Commission (PSMFC) coordinates record-keeping requirements between state and Federal managers. Poundage by sorted species category, area of catch, vessel identification number, and other data elements are required on fish tickets. Landings are also sampled in port by state personnel to 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 whiting fishery (by FMP Amendment 10 and an annual EFP in the Shoreside Whiting sector). Fish ticket landings, logbook data, and state port sampling data are reported as the season progresses to the regional commercial catch monitoring database and the Pacific Fisheries Information Network (PacFIN), managed by PSMFC (www.psmfc.org/pacfin/index.html).

The Groundfish Management Team (GMT - advisory body to the PFMC) and PSMFC manage the Quota Species Monitoring (QSM) dataset reported in PacFIN for the purpose of informing in season management. All landings of groundfish stocks of concern (e.g., overfished stocks) and target stocks and stock complexes in West Coast fisheries are tracked in QSM reports of landed catch. The GMT recommends prescribed landing limits and other in season management measures to the PFMC to attain, but not exceed, total catch ACLs of QSM species. Stock and complex landing limits are modified in season to control total fishing-related mortality; QSM reports and landed catch forecasts are used to control the landed catch component.

At-Sea Hake Observer Program

There are two Federal observer programs that collect information aboard groundfish vessels on the U.S. West Coast. These are separate programs because they deal with distinctly different components of the groundfish fishery: the Federally permitted sectors targeting Pacific hake using mid-water trawl gear which processes catch, and the Federal and state permitted sectors targeting non-hake species that deliver shoreside.

Observers were first deployed in the at-sea hake sectors in the late 1970s under the management of the North Pacific Groundfish Observer Program at NOAA's Alaska Fishery Science Center. NMFS made observer coverage mandatory for at-sea processors in July 2004 (65 FR 31751). The At-Sea Hake Observer Program (A-SHOP), now at NOAA's NWFSC, places fishery observers on all vessels that process Pacific hake at sea. The at-sea hake sector consists of 8 to 14 catcher-processor vessels and motherships, along with the associated catcher vessels, that begin fishing in mid-May of each year and continue until the hake quota is reached or until bycatch caps are met. All at-sea hake vessels (catcher-processors and motherships) over 125 feet are required to carry two observers, while vessels under 125 feet carry only one. As of January 2011, all catcher vessels delivering to at-sea processor/vessels require 100% observer coverage as well. At-sea hake observers monitor and record catch data in accordance with protocols detailed in the A-SHOP manual available online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm.

To increase the utilization of bycatch otherwise discarded as a result of trip limits, Amendment 13 to the Groundfish FMP implemented an increased utilization program on 1 June 2001, which allows catcher/processors and motherships in the whiting fishery to exceed groundfish trip limits without penalty, providing specific conditions are met. These conditions include provisions for 100% observer coverage, non-retention of prohibited species, and either donation of retained catch in excess of cumulative trip limits to a bona fide hunger relief agency or processing of retained catch into mince, meal, or oil products.

West Coast Groundfish Observer Program

Non-hake groundfish sectors are observed by the West Coast Groundfish Observer Program (WCGOP), which was established in May 2001 by NMFS in accordance with the Pacific Fishery Management Plan (50 CFR Part 660) (50 FR 20609). This regulation requires that all vessels that catch groundfish in the U.S. Exclusive Economic Zone (EEZ) from 3–200 miles offshore carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require that vessels, which only fish in the 0–3 mile state territorial zone, also carry observers. WCGOP observers are stationed along the U.S. West Coast from Bellingham, Washington to San Diego, California.

The WCGOP's goal is to improve estimates of total catch and discard by observing shoreside groundfish sectors along the U.S. West Coast (Table 5). Originally, the WCGOP focused observer effort in the LE bottom trawl and LE fixed gear sectors. In 2002, the WCGOP began deploying observers in open access sectors while increasing its coverage of the LE bottom trawl sector. In 2005, the WCGOP increased its coverage of the LE fixed gear sector, and in 2006, the WCGOP improved coverage of the nearshore sector. In 2010, the WCGOP coverage goal was to maintain, at a minimum, 20% coverage in the LE bottom trawl and LE fixed gear sectors by landings, while continuing to improve coverage in the open access sectors of the groundfish fishery. In 2011, WCGOP coverage of the LE bottom trawl sector increased to 100%

under the catch share management structure with IFQs. An observer coverage plan from the WCGOP is available at:
(http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm).

Additionally, the NWFSC has worked closely with the Council and NMFS Northwest Region (NWR) to coordinate the availability of WCGOP results into the management regime. The WCGOP has released annual reports since 2003 that describe the analysis of observer data for various fishery sectors and species collected under the program (Tables 5-8). These reports and background materials on the WCGOP are available on the Northwest Fisheries Science Center website at:
(http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observer_manuals.cfm).

Table 5-- Total trips, tows, vessels and groundfish landings observed in the limited entry groundfish bottom trawl fishery. Coverage rates are computed as the observed proportion of total FMP groundfish landings (excluding Pacific hake), summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

Coastwide Total						
Year	Observed				Fleet Total	Coverage Rate
	# of trips	# of tows	# of vessels	Groundfish landings (mt)	Groundfish landings (mt)	% landings observed
2002	559	3127	131	2583.7	20231.6	13%
2003	461	2284	125	2592.0	18625.6	14%
2004	613	3433	103	4300.7	17796.8	24%
2005	522	3460	105	4243.2	19372.6	22%
2006	476	2972	87	3438.4	17876.8	19%
2007	371	2515	88	3442.1	20513.6	17%
2008	438	3185	100	4889.6	24212.4	20%
2009	588	4381	101	6044.9	26159.5	23%
2010	348	2616	84	4100.3	22410.2	18%

Table 6 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the limited entry sablefish-endorsed fixed gear groundfish fishery during the primary season. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

Coastwide Total									
Year	Observed					Fleet Total		Coverage Rate	
	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002	91	638	31	273.3	298.6	1064.4	1287.0	26%	23%
2003	82	711	20	371.2	390.1	1504.7	1639.6	25%	24%
2004	58	459	19	261.8	272.0	1830.5	1919.6	14%	14%
2005	139	1154	32	762.6	813.9	1757.2	1889.2	43%	43%
2006	106	757	24	496.8	519.9	1855.9	1992.0	27%	26%
2007	105	671	26	388.6	461.4	1406.6	1563.5	28%	30%
2008	101	868	24	574.9	599.9	1343.9	1478.6	43%	41%
2009	73	354	12	164.7	177.2	1843.3	1986.6	9%	9%
2010	180	1068	27	511.2	541.6	1792.3	1929.9	29%	28%

Table 7 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the limited entry non-sablefish-endorsed fixed gear groundfish fishery. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

Coastwide Total									
Year	Observed					Fleet Total		Coverage Rate	
	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002	11	22	4	1.7	3.0	142.4	275.5	1%	1%
2003	130	219	17	14.3	32.1	135.7	309.2	11%	10%
2004	62	130	14	3.7	15.9	109.4	283.2	3%	6%
2005	35	60	11	2.4	9.3	134.3	306.7	2%	3%
2006	121	196	21	6.9	23.7	123.1	306.0	6%	8%
2007	158	303	36	16.5	37.5	113.1	260.2	15%	14%
2008	122	220	32	9.3	31.7	136.5	292.4	7%	11%
2009	138	271	34	12.0	30.3	279.9	444.8	4%	7%
2010	226	470	38	33.8	57.3	359.4	613.4	9%	9%

Table 8 -- Total trips, tows, vessels and sablefish and groundfish landings observed in the open access fixed gear groundfish fishery. Coverage rates are computed as the observed proportion of total sablefish or groundfish landings, summarized from fish ticket landing receipts. See **http://www.nwfsc.noaa.gov/research/divisions/fram/observer/sector_products.cfm#coverage-rates** for more detailed information.

Coastwide Total									
Year	Observed					Fleet Total		Coverage Rate	
	# of trips	# of tows	# of vessels	Sablefish landings (mt)	Groundfish landings (mt)	Sablefish landings (mt)	Groundfish landings (mt)	% Sablefish landings observed	% Groundfish landings observed
2002						358.5	433.0	0%	0%
2003	57	99	20	10.0	19.5	517.5	647.9	2%	3%
2004	136	235	30	24.3	33.2	419.7	562.1	6%	6%
2005	77	87	24	17.1	20.5	855.7	919.5	2%	2%
2006	48	50	22	10.6	12.4	736.9	825.4	1%	2%
2007	95	138	44	18.5	19.1	417.8	442.2	4%	4%
2008	111	141	51	23.0	26.6	517.1	570.3	4%	5%
2009	93	146	48	25.7	30.2	921.3	983.7	3%	3%
2010	105	173	60	30.0	33.7	990.3	1092.0	3%	3%

Shore-based Pacific Whiting Observation Program

The Shoreside Hake Observation Program (SHOP) was established in 1992 to provide information for evaluating bycatch in the directed Pacific whiting fishery and for evaluating conservation measures adopted to limit the catch of salmon, other groundfish, and prohibited species. Though instituted as an experimental monitoring program, it has been continued annually to account for all catch in targeted whiting trip landings, enumerate potential discards, and accommodate the landing and disposal of non-sorted catch from these trips. Initially, the SHOP included at-sea samplers aboard shore-based whiting vessels. However, when an Oregon Department of Fish and Wildlife (ODFW) analysis of bycatch determined no apparent difference between vessels with and without samplers, sampler coverage was reduced to shoreside processing plants. In 1995, the SHOP's emphasis changed from a high observation rate (50% of landings) to a lower rate (10% of landings), and the SHOP increased emphasis on collection of biological information (e.g., otoliths, length, weight, sex, and maturity) from Pacific whiting and selected bycatch species (yellowtail rockfish, widow rockfish, sablefish, chub [Pacific] mackerel [*Scomber japonicus*], and jack mackerel [*Trachurus symmetricus*]). The required observation rate was decreased as studies indicated that fishtickets were a good representation of what was actually landed. Focus shifted again due to 1997 changes in the allocation of yellowtail rockfish and increases in yellowtail bycatch rates. Since then, yellowtail and widow bycatch in the shoreside whiting fishery has been dramatically reduced because of increased awareness by fishermen of the bycatch and allocation issues involved in the SHOP program.

The SHOP is a cooperative effort between the fishing industry and state and Federal management agencies to sample and collect information on directed Pacific whiting landings at shoreside processing plants. Participating vessels apply for and carry an EFP issued by NMFS. Permit terms require vessels to retain all catch and land unsorted catch at designated shoreside processing plants. Permitted vessels are not penalized for landing prohibited species (e.g., Pacific salmon, Pacific halibut, and Dungeness crab), nor are they held liable for overages of groundfish trip limits. For additional information and complete reports go to: (www.dfw.state.or.us/MRP/hake/).

Since inception, an EFP has been adopted annually to allow suspension of at-sea sorting requirements in the shore-based whiting fishery, enabling full retention and subsequent port sampling of the entire catch. However, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based Pacific whiting fishery. In 2008, the PFMC and NMFS implemented a monitoring program to maximize retention opportunity without the use of the EFP process. Electronic monitoring of catches through the use of deck cameras and human at-sea observers were used, prior to catch share implementation to ensure maximized retention of catch at sea. Since the inception of the IFQ Program in January, 2011, 100% observer coverage has replaced electronic deck monitoring.

Data Collection Programs – Recreational sectors

Monitoring Recreational Catch

Recreational catch is monitored by the states as it is landed in port. These data are compiled by the PSMFC in the Recreational Fisheries Information Network (RecFIN) database. The types of data compiled in RecFIN include sampled biological data, estimates of landed catch plus discards, and economic data. Descriptions of the RecFIN program, state recreational fishery sampling programs in Oregon and Washington, and the most recent data available to managers, assessment scientists, and the general public, can be found on the PSMFC web site at: (http://www.psmfc.org/Recreational_Fisheries_Information_Network_RecFIN).

Central California Marine Sport Fish Project

The CDFG has been collecting angler catch data from the CPFV industry intermittently for several decades in order to assess the status of the nearshore California recreational fishery. The project has focused primarily on rockfish and lingcod angling and has not sampled salmon trips. Reports and analyses from these projects document trends by port area in species composition, angler effort, catch, and, for selected species, Catch Per Unit Effort (CPUE), mean length, and length frequency. In addition, total catch and effort estimates are based on adjustments of logbook data by sampling information. Before 1987, catch information was primarily obtained on a general port basis from dockside sampling of CPFVs, also called party boats. This did not allow for documentation of specific areas of importance to recreational anglers and was not sufficient to assess the status of rockfish populations at specific locations.

CPFV operators in California are required by law to record total catch and location for all fishing trips in logbooks provided by the CDFG. However, the required information is too general to use in assessing the status of the multispecies rockfish complex on a reef-by-reef basis. Rockfish catch data are not reported by species, and information on location is only requested by block number (a block is an area of 100 square miles). Many rockfish tend to be residential, underscoring the need for site-specific data. Thus, there is a strong need to collect catch information on board CPFVs at sea. However, locations of specific fishing sites are often not revealed for confidentiality reasons.

In May 1987, the Central California Marine Sport Fish Project began on board sampling of the CPFV fleet. Data collection continued until June 1990, when state budgetary constraints temporarily precluded further sampling, resumed in August 1991, and continued through 1994. The program depends on the voluntary cooperation of CPFV owners and operators. Angler catches on board central and northern California CPFVs were sampled from 14 ports, ranging from Crescent City in the north to Port San Luis (Avila Beach) in the south.

Oregon Marine Recreational Observation Program

In response to depleted species declarations and increasing concerns about fishery interactions with these species, ODFW started an observation program to improve understanding of recreational impacts. There were three objectives to this program: (1) document the magnitude of canary rockfish discard in the Oregon recreational fishery; (2) improve the biological database for several rockfish and groundfish species; and (3) gather reef location information for future habitat mapping. A seasonal sampler was stationed in each of the ports of Garibaldi, Newport, and Charleston to ride recreational groundfish charter vessels coastwide in Oregon from July through September, 2001. The Garibaldi sampler covered boats out of Garibaldi, the Newport sampler covered both Newport and Depoe Bay, and the Charleston sampler covered Charleston, Bandon, and Brookings charter vessels. During a typical day, the sampler would ride a five to eight hour recreational groundfish charter trip and spend the remainder of the day gathering biological and genetic data dockside from several rockfish and groundfish species for which little is known, mostly due to their infrequency in the catch. The sampler records locations of fishing sites by handheld GPS for future use by the Habitat Mapping Project of the ODFW Marine Resources Program. Results from this program have been incorporated into recreational fishery modeling by ODFW. This program has continued and expanded to document the magnitude of discard of all groundfish species, not just canary rockfish. For more information on this program as well as other fishery research and survey programs, see the ODFW Marine Resources Program website at: (www.dfw.state.or.us/MRP/).

WDFW Groundfish At-Sea Data Collection Program

The Washington Department of Fish and Wildlife (WDFW) At-Sea Data Collection Program was initiated in 2001 to allow fishery participants access to healthier groundfish stocks while meeting the rebuilding targets of depleted stocks and to collect bycatch data through an at-sea sampler program. The data collected in these programs could assist with future fishery management by producing valuable and accurate data on the amount, location, and species composition of the bycatch of rockfish associated with these fisheries, rather than using calculated bycatch assumptions. These data could also allow the PFMC to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

In recent years, WDFW has implemented its At-Sea Data Collection Program through the use of Federal EFPs. In 2001, 2002, 2003, and 2004, WDFW sponsored and administered a trawl EFP for arrowtooth flounder and petrale sole, and in 2002, WDFW also sponsored a mid-water trawl EFP for yellowtail rockfish. The primary objective for these experimental fisheries was to measure bycatch rates for depleted rockfish species associated with these trawl fisheries. Fishery participants were provided access to healthier groundfish stocks and were constrained by individual vessel bycatch caps. State-sponsored samplers were used to collect data on the amount of rockfish bycatch caught on a per tow basis and to ensure the vessel complied with the bycatch cap; therefore, vessels participating in the EFP were required to have 100% sampler coverage. In 2003 and 2004, WDFW sponsored a longline EFP for spiny dogfish that also required 100% sampler coverage to measure the bycatch rate of depleted rockfish species associated with directed dogfish fishing.

WDFW Ocean Sampling Program

In addition to the At-Sea Data Collection Program, WDFW collects at-sea data through the Ocean Sampling Program. The WDFW recreational observer program is designed to observe catch on salmon charter trips only. Groundfish are occasionally observed on these trips but biological data is not collected. The estimated discard weights are derived from landed retained catch. The at-sea portion is not intended to be an observer program for the purposes of enumerating the bycatch alone, but is coupled with shore-based sampling of anglers to calculate an estimated discard weight. At-sea samplers record biological information from discarded species. Shore-based creel surveys of anglers provide the estimate of total number of discards. Combining these two data sources yields estimates of the weight of total fishery discard by species.

Data Collection Programs – Tribal sectors

Tribal Observer Program

Tribal-directed groundfish fisheries are subject to full rockfish retention. For some rockfish species where the tribes do not have formal allocations, trip limits proposed by the tribes are adopted by the PFMC to accommodate incidental catch in directed fisheries (i.e., Pacific halibut, sablefish, and yellowtail rockfish). These trip limits are intended to constrain direct catches while allowing for small incidental catches. Incidental catch and discard of depleted species is minimized through the use of full rockfish retention, shore-based sampling, observer coverage, and shared information throughout the fleets regarding areas of known interactions with species of concern. Makah trawl vessels often participate in paired tows in close proximity where one vessel has observer coverage. If landings on the observed vessel indicate higher than anticipated catches of depleted species, the vessels relocate and inform the rest of the fleet of the results (Joner 2004). In order to avoid depleted species, fleet communication is practiced by all tribal fleets.

Additional Relevant Data Collection Programs

Stranding network

Under the Marine Mammal Protection Act (MMPA) of 1972, NMFS' regional marine mammal stranding networks were established in the early 1980's and are composed of cooperating scientific investigators, academic institutions, volunteer individuals and non-government organizations, wildlife and fisheries agencies, and Federal, state and local enforcement agencies. Network participants are trained in systematic data collection and are experienced in handling a variety of marine mammal stranding related tasks. The regional stranding networks are administered via authority delegated to the regional administrators in each of the six NMFS regions (Northeast, Southeast, Alaska, Northwest, Southwest, and Pacific Islands). The 1992 amendments to the MMPA established the Marine Mammal Health and Stranding Response Program (MMHSRP) and began the systematic compilation of regional stranding data and standardization of stranding response practices on a national level.

Two regional stranding networks operate on the Pacific coast of the continental U.S. The northwest network responds to marine mammal and sea turtle stranding events along the Washington and Oregon coasts, and the southwest network responds to events along the California coast. The stranding networks receive reports of stranding events from the public and respond to investigate and collect standardized data. Coordinators in each region verify and enter the data into a national database to establish baseline information on marine mammal populations and monitor their health. The reporting form containing prompts for standardized data collection is accessible online at: http://www.nmfs.noaa.gov/pr/pdfs/health/levela.pdf. These standardized data include evidence of human interaction, such as signs of fishery interaction or boat collision. Where there are findings of human interaction, an additional report is generated that includes more details about the observations that support the determination of the specific interaction type.

For data quality control, specific reporting protocols have been developed for use by the networks and regional coordinators. The collection of stranding data, in the field, is strongly influenced by the condition of the remains when examined as well as environmental factors such as severe weather or tidal fluctuation at the exam location. These factors can obscure the detection of human interaction evidence thus affecting the confidence in a human interaction determination. To assist with data interpretation, the MMHSRP protocols assign four confidence levels to the field data; 1) unconfirmed – low; 2) confirmed – minimum; 3) confirmed – medium; and 4) confirmed – high. Confirmed reports are used to inform the periodic updates to marine mammal stock assessment reports and annual modifications to the MMPA list of fisheries.

NMFS is completing policy development for analyzing and using marine mammal/human interaction data in stock assessment reports and list of fisheries decisions. Regional fisheries science centers compile information on marine mammal/human interactions from a variety of source including reports from regional stranding coordinators, fisher self reports, fisheries observer data and other reports from the field. Although the publication of stock assessment reports and list of fisheries decisions are periodic (annul or semi-annual) the compilation of data from the various sources, including regional stranding data, may lag behind the current reporting cycle by up to two years.

Fishery Enforcement Monitoring

Enforcement of fishery regulations has become increasingly complex with the addition of large closed areas, smaller cumulative trip limits and bag limits, and depth-based closures for commercial and recreational fisheries. At the same time, decreased catch limits and the need to rebuild depleted stocks has placed additional importance on controlling and monitoring fishery-related mortality. Enforcement agencies continue to use traditional methods to ensure compliance with groundfish fishery regulations, including dockside sampling, at-sea patrols, and air surveillance. Vessel Monitoring Systems (VMS) enhance, rather than replace, traditional enforcement techniques. Recent declines in enforcement agency budgets, combined with increased regulatory complexity, have stressed the ability to adequately monitor fisheries for regulatory compliance. In response, NMFS implemented a VMS monitoring program, which includes satellite tracking of vessel positions and a declaration system for those vessels legally fishing within a rockfish conservation area (RCA). VMS was initially implemented on 1 January 2004, and is currently required on all vessels participating in the groundfish fishery with a limited entry permit. In November 2005, the PFMC recommended expansion of VMS requirements to all commercial vessels that take and retain, possess, or land federally-managed groundfish species taken in Federal waters or in state waters prior to transiting Federal waters. Additionally, to enhance enforcement of closed areas for the protection of groundfish essential fish habitat, the PFMC recommends requiring VMS on all non-groundfish trawl vessels, including those targeting pink shrimp, California halibut, sea cucumber, and ridgeback prawn. Implementation of expanded VMS requirements is recommended to coincide with implementation of regulations for the protection of groundfish habitat but, no sooner than 1 January 2007.

Detailed descriptions of VMS and the analyses of VMS monitoring alternatives are contained in an Environmental Assessment under the National Environmental Policy Act (NEPA) prepared by NMFS and were presented to the PFMC in support of decisions to first implement and later expand the VMS monitoring program (NMFS 2003). Additional information on VMS, including links to the supporting NEPA documentation, can be found on the PFMC web site at: (www.pcouncil.org/groundfish/gfvms.html#info).

Anticipated Fishing Effort Changes

Most of our information on interactions between the WCGF and ESA-listed species has been obtained over the period from 2002–2010, corresponding to initiation of Federal observer programs (see above). However, we anticipate that fishing effort in 2012 cannot be predicted based on the historical information because fishing patterns change in response to a variety of factors including the population dynamics of fish species and behavioral drivers of fishing fleets through economic factors, such as fuel prices, market dynamics, and regulations. While the effects on the fishery of regulatory changes are the most foreseeable, even these effects are difficult to predict. As a consequence, our assessment of likely fishing effort in 2012 is based on an analysis of fishing effort from 2002-2010 and a qualitative assessment of how that effort might change in response to the regulatory changes contained in the proposed new management regime. NMFS and the PFMC will continue to monitor and report on fishing effort and we will use that information in future consultations on the continuation of the proposed management regime or any new proposed management regimes.

Regulatory Induced Effort Shifts

NMFS and the PFMC implemented a trawl rationalization program in January 2011 that represents a significant change to management of the groundfish fishery. Of importance to listed species are potential changes in fishing effort profiles by time, area, and gear type. Although this program was implemented in 2011 and the fishery monitored, we do not yet have an analysis of the monitoring data to inform the present consultation. The trawl rationalization program is a limited access privilege program designed to reduce capacity and improve the management, accountability, economic, and environmental stability of the groundfish fishery by vesting the conditional privilege of catch shares for a predetermined quantity of fish with permit holders. The program was implemented in 2011 by amendments 20 and 21 to the FMP and accompanying regulations. The PFMC's goal for the program is to:

> *Create and implement a capacity rationalization plan that increases net economic benefits, creates individual economic stability, provides for full utilization of the trawl sector allocation, considers environmental impacts, and achieves individual accountability of catch and bycatch.*

The objectives supporting this goal are to:

- Provide a mechanism for total catch accounting;
- Provide for a viable, profitable, and efficient groundfish fishery;
- Promote practices that reduce bycatch and discard mortality, and minimize ecological impacts;
- Increase operational flexibility; minimize adverse effects from the program on fishing communities and other fisheries to the extent practical;
- Promote measurable economic and employment benefits through the seafood catching, processing, distribution elements, and support sectors of the industry;
- Provide quality product for the consumer; and,
- Increase safety in the fishery.

The trawl rationalization program is in its earliest stages; however, it may influence the exposure of listed species to the fishery by incentivizing fishermen to change their historical fishing patterns relative to gear type and the time and location where it is deployed. The trawl rationalization program is also expected to reduce the overall amount of groundfish trawl effort by 50% to 66%; however, this reduction may be unevenly distributed (Lian et al. 2009). The program components that are most likely to influence effort patterns are allocation, gear switching, qualifying years, and quota transfer between fishermen. These components are discussed below.

Allocation

Amendment 21 allocates fixed percentages of allowable harvest by species to sectors. Because sectors are defined primarily by gear type, allocation may have the general effect of increasing or decreasing listed species exposure to a specific fishing gear and its associated impact potential. For the most part however, this is not expected to be the case. In general, the allocations are based on catch history from 2003–2005. This time period is recent enough that we do not expect significant changes to the exposure of listed species. There are three exceptions: starry flounder; "other flatfish;" and chilipepper rockfish south of 40º10'N latitude, for which amendment 21 allocates a higher percentage to the non-trawl sector than accounted for during the qualifying period. This may result in an increase in pot and bottom-longline gear fishing effort; however, it is impossible to predict the magnitude of such an increase given available data. As described above, NMFS is actively monitoring changes in the fishery that result from the trawl rationalization program and producing reports that will be incorporated into future ESA consultations on operation of the WCGF.

Gear Switching

Within the trawl rationalization program, vessels are no longer required to use a specific gear type. Vessels that have been limited to trawl gear may now opt to use non-trawl gear. As with other elements of the trawl rationalization program, it is unknown how this will influence fishing effort profiles. Market analysis suggests it may be economically beneficial for some fishermen to harvest sablefish by bottom-longline instead of trawl (PFMC and NMFS 2010); however, it is not yet known if this will occur or, if it does, the magnitude of change. As mentioned above, starry flounder, "other flatfish," and chilipepper rockfish south of 40º10'N latitude have been allocated to non-trawl fisheries in excess of historical amounts. Similar to sablefish, it is not possible to determine if this will result in a net increase in non-trawl effort. NMFS is actively monitoring changes in the fishery that result from the trawl rationalization program and producing reports that will be incorporated into future ESA consultations on the fishery.

Qualifying Years

Determination of "qualifying years" for trawl rationalization has the potential to create geographic shifts that may influence interactions with listed species. Qualifying years are the period of time that a permit must have been active to be eligible for participation in the trawl rationalization program. After considering several possible time periods to serve as the qualifying period, the PFMC recommended the years 1994–2003 for non-overfished species.

These years represent the period of time from the beginning of the license limitation period through the announcement of the trawl rationalization control date. Dates prior to 1994 would not have permit histories because the Limited Entry system under which the permits were issued was not implemented until 1994. Other potential start dates between 1994 and 2003 were considered, including 1997 (the first year of fixed allocations among the three whiting sectors), 1998 (to exclude older histories), 1999 (the year of the first major reductions in response to overfished determinations), and 2000 (the year disaster was declared and fishing opportunities were significantly constrained and modified). The PFMC also considered 2004 as a later end date to the qualifying period, but determined that using 2004 would reward speculative entrants who chose to ignore the control date, create perceptions of inequity, and undermine the ability of the PFMC to use control dates in the future. The recommended range of years from 1994–2003 would include fishing patterns under a variety of circumstances, would recognize long-time users of the fishery, and is intended to mitigate disruptive effects experienced by communities as a result of geographic effort shifts.

Quota Transfer

Permit holders with individual quotas may sell or transfer quota under the new program rather than harvest it themselves. Early research indicates this may reduce overall effort as quota is transferred to the most efficient and profitable operations, and may consolidate effort in areas with high relative catch rates (Toft et al. 2011). The monitoring and data collection programs described above will document any changes.

Summary of Potential Shifts in Fishing Effort

Fishing patterns are a function of multiple variables, the most significant of which is a recent implementation of the trawl rationalization program. The program may incentivize fishermen to increase fixed gear effort in patterns that deviate from the past. The magnitude of this deviation is not predictable; however, NMFS and the PFMC actively monitor fishing effort and produce periodic reports that will be available as the ESA consultation process unfolds.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the Pacific Coast groundfish fishery the action area is the EEZ of the Pacific Ocean, which is directly affected by the Federal action, and the coastal and inland marine waters of the states of Washington, Oregon and California, which may be indirectly affected by the Federal action. The EEZ (3-200 nautical miles offshore) of the states of Washington, Oregon, and California are managed under authority of the MSA. The area where direct effects to the above identified protected species are most likely to occur within the EEZ is depicted in Figure 2 above that maps the spatial extent of fishing effort in the recent past. Many of the protected species covered by this consultation have a smaller range than the spatial extent of fishing effort (distribution for each species is identified in the respective status sections), in which case, direct effects are anticipated in the area of overlap between the spatial extent of fishing effort and geographic range of the species. The area where indirect effects may occur is either the entire EEZ within which trophic effects to prey availability may occur, or is likewise the area of overlap between the EEZ and the geographic range of the affected species, where the geographic range of the species is smaller than the EEZ.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

2.1 Approach to the Analysis

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

"To jeopardize the continued existence of a listed species" means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

This biological opinion does not rely on the regulatory definition of 'destruction or adverse modification' of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[4]

We will use the following approach to determine whether the proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- *Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.*
- *Describe the effects of the environmental baseline in the action area.*
- *Analyze the effects of the proposed actions on both species and habitat.*
- *Describe any anticipated cumulative effects in the action area.*
- *Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.*
- *Reach jeopardy and adverse modification conclusions.*
- *If necessary, define a reasonable and prudent alternative to the proposed action.*

NMFS has determined that the proposed fishing is likely to adversely affect eulachon, green sturgeon, humpback whales, Steller sea lions, leatherback sea turtles, and critical habitat of green sturgeon and leatherback sea turtles. (As mentioned above, Pacific salmon and steelhead are the subject of separate consultations on the proposed fishery.) The jeopardy and adverse modification analyses for these species and critical habitats below include review of the status of the species and critical habitat, description of the environmental baseline in the action area, the effects of the action (direct, indirect and cumulative), integration and synthesis of the effects considering the baseline, and conclusions. NMFS provides not likely to adversely affect determinations for the following species and designated critical habitat in Section 2.11: blue whales, fin whales, Northern Pacific right whales, Southern Resident killer whales and their designated critical habitat, sperm whales, Sei whales, green sea turtles, olive ridley sea turtles, loggerhead sea turtles, and designated critical habitat of Steller sea lions.

2.2 Rangewide Status of the Species and Critical Habitat

This section describes the current status of each listed species and its critical habitat. One factor affecting the status of aquatic species and habitat is climate change. Physical changes associated with warming include increases in ocean temperature, increased stratification of the water column, and changes in the intensity and timing of coastal upwelling. These changes will alter primary and secondary productivity and the structure of marine communities (ISAB 2007).

[4] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

2.2.1 Status of Listed Species

In evaluating the status of a listed species, we consider information relevant to the criteria in our regulations at 50 CFR 402.02, defining "jeopardize the continued existence of." The regulation refers to actions that reduce "the reproduction, numbers, or distribution" of a species. We also consider information from status reviews and, where available, recovery plan documents. We describe the factors limiting recovery of the species to provide context for assessing the impacts of the proposed action.

2.2.1.1 Status of Eulachon

Description and Geographic Range

Eulachon are endemic to the northeastern Pacific Ocean and they range from northern California to southwest and south-central Alaska and into the southeastern Bering Sea. The southern DPS extends from the Skeena River in British Columbia south to the Mad River in Northern California (inclusive), and thus all eulachon found within the action area are considered to be part of the threatened southern DPS of eulachon.

Eulachon are anadromous, and generally spawn in glacial or snowpack driven rivers that experience spring freshets. Entry into the spawning rivers appears to be related to water temperature and the occurrence of high tides (Ricker et al. 1954; Smith and Saalfeld, 1955; Spangler, 2002). Water temperature at the time of spawning varies across the distribution of the species. Although spawning generally occurs at temperatures from 4 to 7°C (39 to 45º F) in the Cowlitz River (Smith and Saalfeld, 1955), and at a mean temperature of 3.1°C (37.6º F) in the Kemano and Wahoo Rivers (British Columbia), peak eulachon runs occur at noticeably colder temperatures (between 0 and 2°C [32 and 36º F]) in the Nass River (British Columbia). Cold temperatures have been shown to limit upstream movement of eulachon in the Columbia River (Smith and Saalfeld 1955). Incubation is also temperature dependent, with longer incubation periods observed in colder water (WDFW and ODFW 2001).

Juvenile and adult eulachon are an important link in the food chain between zooplankton and larger organisms. Eulachon are very high in lipids, and their historically large spawning runs made them an important part of the Pacific coastal food web. They have numerous avian predators, including sea birds such as harlequin ducks, pigeon guillemots, common murres, mergansers, cormorants, gulls, and eagles. Marine mammals such as baleen whales, orcas, dolphins, pinnipeds, and beluga whales are known to feed on eulachon. Fish that prey on eulachon include white sturgeon, spiny dogfish, sablefish, salmon sharks, arrowtooth flounder, Pacific hake, salmon, Dolly Varden, Pacific halibut, and Pacific cod (Gustafson et al. 2010). In particular, eulachon and their eggs seem to provide a significant food source for white sturgeon in the Columbia and Fraser rivers (Gustafson et al. 2010). Eulachon eggs and larvae have a very high natural mortality rate, which in some months exceeds 50% (Hay et al. 2002). The eulachon reproductive strategy of producing many offspring that suffer high mortality throughout their life cycle (leaving relatively few survivors that reproduce to sustain the population) is likely an adaptive response to high predation rates.

Although they spend 95–98% of their lives at sea (Hay and McCarter 2000), little is known about eulachon saltwater existence. They are reported to be present in the "food rich" and "echo scattering layer" of coastal waters (Barraclough 1964), and "in near-benthic habitats in open marine waters" of the continental shelf between 20 and 150 m depth (Hay and McCarter 2000). Hay and McCarter (2000) illustrated the offshore distribution of eulachon in British Columbia as determined in research trawl surveys, which indicate that most eulachon were taken at around 100 m depth, although some were taken as deep as 500 m and some at less than 10 m. Schweigert et al. (2007) stated that "the marine distribution of adults in British Columbia includes the deeper portions of the continental shelf around Dixon Entrance, Hecate Strait, Queen Charlotte Sound, and the west coast of Vancouver Island, generally at depths of 80–200 m."

Smith and Saalfeld (1955) reported the occasional capture of eulachon in the offshore "otter trawl fishery," particularly from November to January near the mouth of the Columbia River "as the mature smelt approach the Columbia River." Emmett et al. (2001) reported the capture of small numbers of eulachon by nighttime surface trawls targeting pelagic fishes off the Columbia River from April to July of 1998 and 1999. About 10% of the hauls in 1999 contained from one to eight eulachon (Emmett et al. 2001). Eulachon also occur as bycatch in some U.S.-based groundfish fisheries (Bellman et al. 2011) off the U.S. West Coast and more commonly in the California and Oregon ocean shrimp (*Pandalus jordani*) fisheries (NWFSC 2008). Al-Humaidhi et al. (2011) mapped the at-sea distribution of eulachon encounters in the ocean shrimp fishery. They showed that eulachon were most likely to be encountered as bycatch in tows from about 91–183 m in depth, although the greatest numbers of eulachon were caught between about 110 and 155 m depth.

Spatial Structure and Diversity

In the portion of the species' range that lies south of the U.S.–Canada border, most eulachon production originates in the Columbia River Basin. In the Columbia River Basin, the major and most consistent spawning runs return to the mainstem of the Columbia River and the Cowlitz River. Spawning also occurs in the Grays, Elochoman, Kalama, Lewis, and Sandy Rivers. Adult eulachon have been recorded at several locations on the Washington and Oregon coasts, and they were previously common in Oregon's Umpqua River and the Klamath River in northern California. Runs occasionally occur in many other rivers and streams, although these tend to be erratic, appearing in some years but not others, and appearing only rarely in some river systems (Hay and McCarter 2000, Willson et al. 2006, Gustafson et al. 2010).

The southern DPS of eulachon are distinguished from eulachon occurring north of the

DPS range by a number of factors including genetic characteristics. Significant microsatellite DNA variation in eulachon has been reported from the Columbia River to Cook Inlet, Alaska (Beacham et al. 2005). Within the range of the southern DPS, Beacham et al. (2005) found genetic affinities among the populations in the Fraser, Columbia, and Cowlitz rivers and also among the Kemano, Klinaklini, and Bella Coola rivers along the central British Columbia coast. In particular, there was evidence of a genetic discontinuity north of the Fraser River, with Fraser and Columbia/Cowlitz samples diverging three to six times more from samples further to the north than they did from each other. Similar to the study of McLean et al. (1999), Beacham et al. (2005) found that genetic differentiation among populations was correlated with geographic distances. The authors also suggested that the pattern of eulachon differentiation was similar to that typically found in studies of marine fish, but less than that observed in most salmon species.

Beacham et al. (2005) examined the stock composition of trawl and research surveys in marine areas off British Columbia. Using the genetic baseline data set of eulachon populations that they devised for rivers in Washington and British Columbia, they estimated the proportional composition of three marine-caught samples. A sample of eulachon collected during a shrimp research survey near Nootka Sound off the west coast of Vancouver Island yielded a large proportion of fish estimated to be from the Columbia River (56.6%) and Fraser River (37.5%). Populations from other rivers were estimated to contribute less than 6% to the sample. A second sample of eulachon was collected as bycatch in a shrimp trawl fishery near Chatham Sound (off British Columbia's north coast) in March 2001. These fish were estimated to be largely from the British Columbia central mainland (51.6%) and from the Nass River (37.4%), with a small number of Columbia (1.7%) and Fraser (2.1%) River fish. A third sample of fish was taken in research shrimp surveys in Queen Charlotte Sound in March 2001. This sample was composed of substantial proportions of Columbia, Fraser, British Columbia central mainland, and Skeena river fish, all contributing between 22.1% and 27.1%. Beacham et al. (2005) concluded from these sampling efforts that although eulachon marine migrations are largely unknown, there is spatial structure to the distributions of fish from different rivers.

The eulachon Biological Review Team (BRT) was concerned that eulachon do not have a buffer against year-class failures because they die after spawning once and the two largest spawning populations (Columbia and Fraser Rivers) may be limited to a single age class (Gustafson et al. 2010). The BRT was also concerned about the very low abundance of the Klamath River population, which is at the southernmost extent of the range and therefore may be expected to have unique adaptations.

Abundance and Productivity

There are few direct estimates of eulachon abundance. In most areas of the southern DPS escapement counts or estimates of spawning stock biomass are unavailable. When available, catch statistics from commercial or recreational eulachon fisheries have been used to estimate relative abundance. However, inferring population status or even trends from yearly changes in catch statistics requires assumptions that are seldom met including similar fishing effort and efficiency, assumptions about the relationship of the harvested portion to the total portion of the stock, and statistical assumptions, such as random sampling. There are few fishery-independent sources of abundance data available for eulachon, and there are few monitoring programs for them (in the United States). However, the combination of catch records and anecdotal information indicate that eulachon were present in large annual runs in the past and that significant declines in abundance have occurred over the last 20-30 years (Gustafson et al. 2010), enough so that eulachon numbers are at, or near, historically low levels throughout the range of the southern DPS.

The Columbia River and its tributaries support the largest known eulachon run. Although no direct estimates of adult spawning stock abundance are available, records of commercial fishery landings begin in 1888 and continue as a nearly uninterrupted data set through 2010 (Gustafson et al. 2010). Historic commercial catch levels were typically more than 500 metric tons[5], and occasionally exceeded 1,000 metric tons, from about 1915 to 1992. In 1993, the catch level began to decline; it averaged less than five metric tons from 2005 through 2008 (Gustafson et al. 2010). Some of this pattern is due to fishery restrictions, which were put in place in response to the sharp decline in abundance. Persistent low returns and landings of eulachon in the Columbia River from 1993 to 2000 prompted the States of Oregon and Washington to adopt a Joint State Eulachon Management Plan (WDFW and ODFW 2001). All eulachon fisheries (commercial and recreational) in Washington and Oregon were closed in 2011.

Similar declines in eulachon abundance have occurred in the Fraser and other coastal British Columbia rivers (Hay and McCarter 2000, Moody 2008). Over a three-generation time of 10 years (1999-2009), the overall biomass of the Fraser River eulachon population has declined by nearly 97% (Gustafson et al. 2010). The biomass was estimated to be 418 metric tons in 1999 and by 2009 it had dropped to just 14 metric tons. Abundance information is lacking for many of the coastal British Columbia subpopulations, but in general Gustafson et al. (2010) found that eulachon were present in larger annual runs in the past.

No long-term monitoring program for eulachon exists in Northern California, but large spawning aggregations of eulachon were regularly reported in the Klamath River (Fry 1979, Moyle et al. 1995, Larson and Belchik 1998, Moyle 2002, Hamilton et al. 2005). Although NMFS is reasonably confident that eulachon have declined substantially in the Klamath River, it is also clear that they have not been totally absent from this area in recent years. In particular, recent reports from Yurok tribal fisheries biologists note a few eulachon being caught incidentally in other fisheries on the Klamath in 2007 and 2011, thus demonstrating that eulachon still enter the Klamath River in low numbers.

There are no direct estimates of productivity for any eulachon populations within the

[5] The U.S. ton is equivalent to 2,000 pounds and the metric ton is equivalent to 2,204 pounds.

southern DPS. However, the ability of the Columbia River eulachon stock to respond rapidly to the good ocean conditions of the late 1999–early 2002 period illustrates the species' resiliency (Gustafson et al. 2010). This resiliency may provide the species with a buffer against future environmental perturbations. The productivity potential or intrinsic rate of increase among eulachon (Musick et al. 2000), as indicated by life history characteristics such as low age-at-maturity, small body size, and planktonic larvae, likely confer eulachon with some resilience to extinction as they retain the ability to rapidly respond to favorable ocean conditions (Gustafson et al. 2010). However, there are no empirical or theoretical grounds to conclude that high fecundity as a life history character confers resilience on a fish species in comparison to a species with lower fecundity (Sadovy 2001, Reynolds et al. 2005).

Limiting Factors

Climate Change

Scientific evidence strongly suggests that global climate change is already altering marine ecosystems from the tropics to polar seas. Physical changes associated with warming include increases in ocean temperature, increased stratification of the water column, and changes in the intensity and timing of coastal upwelling. These changes will alter primary and secondary productivity and the structure of marine communities (ISAB 2007).

Climate change impacts on ocean habitat are a serious threat to persistence of the southern DPS of eulachon (Gustafson et al. 2010). Changing ocean conditions caused by global climate change present an unclear, yet potentially severe, threat to eulachon survival and recovery. Increases in ocean temperatures have already occurred and will likely continue to impact eulachon and their habitats. In the marine environment, eulachon rely on cool or cold ocean regions and the pelagic invertebrate communities therein (Willson et al. 2006). As with El Niño and La Niña events, warming ocean temperatures will likely alter these communities, making it more difficult for eulachon and their larvae to locate or capture prey (Roemmich and McGowan 1995, Zamon and Welch 2005). Warmer waters could also allow for the northward expansion of eulachon predator and competitor ranges, increasing the already high predation pressure on the species (Rexstad and Pikitch 1986, McFarlane et al. 2000, Phillips et al. 2007).

Climate change along the entire Pacific Coast is expected to affect hydrologic patterns which may pose challenges to eulachon spawning because of decreased snowpack, increased peak flows, decreased base flow, and increased water temperatures (Morrison et al. 2002). The majority of eulachon spawning rivers are fed by extensive snowmelt or glacial runoff, and climate-related temperature increases, changes in snow pack, and changes in the timing and intensity of stream flows will likely have impacts on eulachon. In most rivers, eulachon typically spawn well before the spring freshet, near the seasonal flow minimum, and this strategy typically results in egg hatch coinciding with peak spring river discharge. The expected alteration in stream flow timing may cause eulachon to spawn earlier or be flushed out of spawning rivers at an earlier date. Early emigration may result in a mismatch between entry of juvenile eulachon into the ocean and coastal upwelling, which could have a negative impact on marine survival of eulachon during this critical transition period (Gustafson et al. 2010).

Other Factors

Eulachon occur as bycatch in shrimp trawl fisheries off the coast of Washington, Oregon, California, and British Columbia (Gustafson et al. 2010). Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation (Gustafson et al. 2010). Dredging activities during the eulachon spawning run may entrain and kill adult and larval fish, and eggs (Larson and Moehl 1990 and Tutty and Morrison 1976). Eulachon carry high levels of chemical pollutants (EPA 2002), and although it has not been demonstrated that high contaminant loads in eulachon have increased mortality or reduced reproductive success, such effects have been shown in other fish species (Kime 1995). The negative effects of these factors on the species and its habitat contributed to the determination to list the southern DPS of Pacific eulachon under the ESA.

2.2.1.2 Status of Green Sturgeon

The green sturgeon is an anadromous, long-lived, and bottom-oriented (demersal) fish species in the family Acipenseridae. Sturgeon have skeletons composed mostly of cartilage and lack scales, instead possessing five rows of characteristic bony plates on their body called "scutes." On the underside of their flattened snouts are sensory barbels and a siphon-shaped, protrusible, toothless mouth. The maximum age of adult green sturgeon is likely to range from 60–70 years, and adults may exceed 2 m in length and 90 kg in weight.

Based on genetic analyses and spawning site fidelity (Adams et al. 2002, Israel et al. 2004), NMFS determined that green sturgeon are comprised of at least two distinct population segments (DPSs): a northern DPS consisting of populations originating from coastal watersheds northward of and including the Eel River (“Northern DPS green sturgeon”), with spawning confirmed in the Klamath and Rogue river systems; and a southern DPS consisting of populations originating from coastal watersheds south of the Eel River (“Southern DPS green sturgeon”), with spawning confirmed in the Sacramento River system.

Southern DPS green sturgeon were listed as threatened under the ESA in 2006 (71 FR 17757, April 7, 2006). NMFS determined that ESA listing for Northern DPS green sturgeon was not warranted, but maintained the species on the NMFS Species of Concern list. In 2010, NMFS established ESA take prohibitions for Southern DPS green sturgeon under an ESA 4(d) Rule (75 FR 30714, June 2, 2010). Recovery planning for Southern DPS green sturgeon is underway, with a draft recovery plan expected in 2012. This section summarizes information taken from a draft NWFSC risk assessment of WCGF fishery to threatened and endangered marine species (NWFSC 2011), which includes review of information presented in the green sturgeon ESA 4(d) rule and supporting documents (75 FR 30714, June 2, 2010, NMFS 2010a), the final biological report prepared for the critical habitat designation (NMFS 2009), the most recent status review (Biological Review Team 2005), and the recovery plan outline (NMFS 2010b), as well as data that became available more recently. Because the Southern DPS green sturgeon is the listed entity, this section focuses on Southern DPS green sturgeon when DPS-specific information is available.

Spatial Structure and Diversity

Green sturgeon range from the Bering Sea, Alaska, to Ensenada, Mexico, and use a diversity of habitat types at different life stages. Adults spawn in the mainstem of large rivers during the spring (peaking May-June) every 2-4 years (Erickson and Webb 2007). Eggs are laid in turbulent areas of high velocity on the river bottom during the spring and settle into the interstitial spaces between cobble and gravel (Adams et al. 2007). Eggs hatch after 6–8 days, and larval feeding begins 10–15 days post-hatch; larval development is completed within 45 days at 60–80 mm TL (Beamesderfer et al. 2007). After rearing in freshwater or the estuary of their natal river for one to four years, young green sturgeon move into coastal waters.

Green sturgeon are one of the most marine-oriented and widely distributed of the sturgeons. Subadult green sturgeon (sexually immature fish that have entered coastal marine waters) spend at least approximately 6 to 10 years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (Nakamoto et al. 1995). After migrating out of their natal rivers, subadult green sturgeon move between coastal waters and various estuaries along the U.S. West Coast between San Francisco Bay, CA, and Grays Harbor, WA (Lindley et al. 2008, Lindley et al. 2011). Multiple rivers and estuaries are visited by dense aggregations of green sturgeon in summer months (Moser and Lindley 2007), and migration patterns differ among individuals within and among populations (Lindley et al. 2011). Mature adults enter their natal river in the spring and typically leave the river during the subsequent autumn when water temperatures drop below 10°C and flows increase (Erickson and Webb 2007). Thereafter, they migrate among the coastal ocean and non-natal estuarine habitats before returning again to spawn 2–4 years later (Erickson and Webb 2007). Winter months are generally spent in the coastal ocean, with many green sturgeon migrating to northern waters in the fall; areas north of Vancouver Island are favored overwintering areas, with Queen Charlotte Sound and Hecate Strait likely destinations based on observed depth and temperature preferences and detections of acoustically-tagged green sturgeon at the northern end of Vancouver Island (Lindley et al. 2008, Nelson et al. 2010). Peak migration rates exceeded 50 km per day during the spring southward migration (Lindley et al. 2008).

Relatively little is known about how green sturgeon use habitats in the coastal ocean and in estuaries, or the purpose of their episodic aggregations there at certain times (Lindley et al. 2008, Lindley et al. 2011). While in the ocean, archival tagging indicates that green sturgeon occur between 0 and 200 m depths, but spend most of their time between 20–80 m in water temperatures of 9.5–16.0°C (Nelson et al. 2010, Huff et al. 2011). They are generally demersal but make occasional forays to surface waters, perhaps to assist their migration (Kelly et al. 2007). Recent telemetry data in coastal ocean habitats suggest that green sturgeon spent a longer duration in areas with high seafloor complexity, especially where a greater proportion of the substrate consists of boulders (Huff et al. 2011). However, while in estuaries where green sturgeon feed over the bottom on benthic invertebrates (Dumbauld et al. 2008), they do not appear to use hard substrates. Preliminary data from mapping surveys conducted in Willapa Bay, WA, showed densities of “feeding pits” (depressions in the substrate believed to be formed when green sturgeon feed) were highest over shallow intertidal mud flats, while harder substrates (e.g., gravel) had no pits (M. Moser, unpublished data). In their natal rivers, telemetry data indicates mature green sturgeon prefer deep pools, presumably for the purposes of spawning and conserving/restoring energy (Erickson and Webb 2007; Heublein et al. 2009). Similar tracking studies involving juvenile green sturgeon have not been conducted, and their behavior and habitat preferences in rivers and estuaries are largely unknown.

As stated above, the green sturgeon is comprised of at least two DPSs, a Northern DPS and a Southern DPS. Genetic and acoustic tagging data indicate little migration between spawning areas of these DPSs, although they co-occur in non-natal marine and estuarine habitats to varying degrees (Israel et al. 2009, Lindley et al. 2011). Southern DPS green sturgeon have been confirmed to occur throughout the coast from Monterey Bay, CA, to as far north as Graves Harbor, AK (NMFS 2009). Green sturgeon observed northwest of Graves Harbor, AK, and south of Monterey Bay, CA, have not been identified as belonging to the Northern DPS or Southern DPS. Genetic analyses have found that green sturgeon aggregations in the Columbia River estuary and Willapa Bay have a larger proportion of Southern DPS green sturgeon (0.69 to 0.88) than Northern DPS green sturgeon, whereas Grays Harbor has a slightly larger proportion of Northern DPS green sturgeon (0.54 to 0.59) (Israel et al. 2009).

Abundance and Productivity

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either Northern DPS or Southern DPS green sturgeon in any of the natal rivers based on survey data (Israel et al. in prep). As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases, including monitoring designed for white sturgeon (*Acipenser transmontanus*) populations, harvest time series, or entrainment from water diversion and export facilities (Adams et al. 2007). Of these sources, only the water diversion data indicate a possible trend, suggesting green sturgeon abundance or recruitment has declined since 1986 in the Sacramento River (Adams et al. 2007). Long term population trends from fishery data (note: effort data is absent) indicate that the adult population in the Klamath River is fairly constant, with a few hundred spawning adults typically being harvested annually by tribal fisheries (Adams et al. 2007). Based on detections of tagged sturgeon in the marine environment during 2004, Lindley et al. (2008) estimated annual survival of tagged subadults and adults to be 0.83.

More recent genetic techniques and monitoring surveys are beginning to clarify questions about green sturgeon population size. Genetic data collected from outmigrating juvenile green sturgeon suggest that the number of adult green sturgeon in the upper Sacramento River (Southern DPS green sturgeon) remained roughly constant between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). Recently developed surveys using dual frequency identification sonar have estimated 175 to 250 sturgeon (±50) in the mainstem Sacramento River during the spawning season in 2010 and 2011 (pers. comm. with Ethan Mora, UC Davis, on January 10, 2012). However, there are many uncertainties regarding these estimates. Although most of the sturgeon observed in the surveys are likely to be green sturgeon, this must be verified by video data because some may be white sturgeon. Also, the movement of individual fish in and out of the area throughout the season remains to be characterized using telemetry data and could affect the estimated number of spawning adults present in the river during the spawning season each year (e.g., if sturgeon move into and out of the area throughout the season, then the observed numbers represent minimum estimates of adult sturgeon abundance in the river). Given these uncertainties, caution must be taken in using these estimates to infer the spawning run size for the Sacramento River, until further analyses are completed. Recently, Erickson et al. (unpublished) estimated spawning run sizes for Northern DPS rivers ranging from 426 to 734 adult green sturgeon (point estimates) using mark-recapture methods (Israel et al. in prep). These studies suggest each population may be represented by fewer than 1,000 adults, considering spawning periodicity is 2–4 years (Erickson and Webb 2007). These estimates appear to be inconsistent with harvest data indicating that 200 to 450 Northern DPS green sturgeon were harvested each year in the Klamath River tribal fishery from 1985 to 2003, with no evidence of declining catches (Adams et al. 2007; see Environmental Baseline section below). The inconsistencies may be due to error in the population estimates and/or because the recent population estimates were based on data collected from a different time period compared to the tribal harvest data. Adams (et al. 2007) concluded that the abundance of mature green sturgeon in the southern DPS is much smaller than in the northern one (Adams et al. 2007), but the absolute and relative abundance of the two DPS remain highly uncertain. Carefully designed studies remain needed to provide absolute estimates of abundance for the species.

Green sturgeon do not mature until they are at least 15–17 years of age at a size of 1.4–2.2 m in length (Beamesderfer et al. 2007). The length at first maturity is estimated to be 152 cm TL (14-16 years) for males and 162 cm TL (16-20 years) for females in the Klamath River (Van Eenennaam et al. 2006), and 145 cm TL for males and 166 cm TL for females in the Rogue River (Erickson and Webb 2007). Adult green sturgeon are believed to spawn every 2-4 years (Cech et al. 2000, Moyle 2002, Erickson and Webb 2007). Although males are capable of spawning annually, female sturgeon typically require two years to complete vitellogenesis. Green sturgeon fecundity (50,000–80,000 eggs; Van Eenennaam et al. 2001) is reportedly lower than other sturgeons, but the egg size is larger. Both fecundity and egg size increase with fish size (Van Eenennaam et al. 2006).

Recruitment data for Southern DPS green sturgeon are essentially nonexistent. Incidental catches of larval green sturgeon in the mainstem Sacramento River and of juvenile green sturgeon at the state and Federal pumping facilities in the South Delta suggest that green sturgeon are successful at spawning, but that annual year class strength may be highly variable (Beamesderfer et al. 2007, Adams et al. 2007). Successful recruitment into the population is unclear. Because green sturgeon are long-lived and spawn multiple times throughout their lifetime, spawning failure in one year can be made up for in another spawning year. In general, sturgeon year class strength appears to be episodic with overall abundance dependent on a few successful spawning events (NMFS 2010b).

Beamesderfer et al. (2007) generated a hypothetical population demographic model to evaluate life-stage specific mortality and determine impacts to spawning stock biomass and overall species status. Based on the study, an average green sturgeon population considered over a period of time would be comprised of primarily subadults (63%), with adults making up only 12% of the population. There is an additional population component of juvenile fish that rear in freshwater or their natal estuary for the first one to four years before they move into coastal waters. Spawning adults represented only a very small fraction (approximately 3%) of the total population, based on a spawning periodicity of four years at adulthood. The model indicated that sturgeon are sensitive to increasing mortality, showing abrupt declines in number and reproductive potential in hypothetical life table analyses. Even very low rates of mortality were shown to have a potentially significant impact on sturgeon population dynamics when results accrue across multiple life stages.

Limiting Factors

Green sturgeon face a variety of threats in the freshwater, estuarine, and marine environments within which they move throughout their life history. Threats to this species include: reduction/loss of spawning areas, insufficient freshwater flow rates in spawning areas, contaminants (e.g., pesticides), harvest bycatch, potential poaching, entrainment by water projects, influence of exotic species, small population size, impassable barriers, and elevated water temperatures (Adams et al. 2007). A principal factor in NMFS' conclusion that Southern DPS green sturgeon are likely to become endangered in the foreseeable future throughout all of its range was the reduction of potential spawning habitat to a single area in the Sacramento River due to migration barriers (e.g., dams). Presently, spawning has been confirmed to occur in the mainstem Sacramento River up to Keswick Dam and in the lower Feather River (downstream of Oroville Dam; pers. comm. with Alicia Seesholtz, California Department of Water Resources, on June 16, 2011). Historical spawning habitat may have extended up into the three major branches of the upper Sacramento above the current location of Shasta Dam; however, those habitats have been made inaccessible or altered by dams (Mora et al. 2009; Adams et al. 2007). The reduction of spawning habitat to a single system increases the vulnerability of the spawning population to catastrophic events and of early life stages to variable environmental conditions within the system. Severe threats to the single remaining spawning population, coupled with the inability to alleviate those threats using current conservation measures, led to the decision to list the species as threatened.

2.2.1.3 Status of Humpback whales

Humpback whales were listed as endangered under the ESA in 1970. A Recovery Plan was finalized for this species in 1991 (NMFS 1991). Under the MMPA, humpback whales are classified as a strategic stock and considered depleted. On August 12, 2009, NMFS initiated an ESA status review of humpback whales (74 FR 40568). The status review is currently in progress. This section summarizes information taken from a draft NWFSC risk assessment of WCGF fishery to threatened and endangered marine species (NWFSC 2011), which includes review of the recovery plan (NMFS 1991), stock assessment reports (reports for each stock are available online at: http://www.nmfs.noaa.gov/pr/sars/species.htm#largewhales), the draft status review (Fleming and Jackson 2011) as well as data that became available more recently.

Humpback whales are a long-lived species, with late onset of sexual maturity (NMFS 1991). In the Pacific Ocean, females bear their first calves at between 8–16 years of age, and the maximum life-span is at least 50 years, with an average generation time of 21.5 years. Calving intervals are from 2–3 years following an 11-month gestation period. Humpback whales feed on krill and small schooling fish, using solitary and group foraging strategies.

Spatial Structure and Diversity

Humpback whales are found in all oceans of the world with a broad geographical range from tropical to temperate waters in the northern hemisphere and tropical to arctic waters in the southern hemisphere. All populations migrate seasonally between their winter calving and breeding grounds and summer feeding grounds. Humpback whales typically occur on the feeding grounds during the summer and fall months.

In the North Pacific, the primary breeding grounds are located in coastal areas of Central America, Mexico, Hawaii, the Philippines, the islands of Ogasaware and Okinawa, and an unidentified additional Western Pacific breeding ground (Calambokidis et al. 2008, Fleming and Jackson in press). The breeding populations are genetically different (Baker et al. 1998, Baker and Steel 2010), and photo-id-based mark/recapture studies indicate a high, but not complete, degree of individual fidelity to one of the four general breeding areas (Mexico, Central America, Hawaii, Asia; Calambokidis et al. 2008).

Feeding areas include coastal waters across the Pacific Rim from California to Japan. Humpback whales are commonly observed off the California, Oregon and Washington coasts during the spring, summer and fall months (Figure 6), and they have also been detected off California (Forney and Barlow 1998) and Washington (Oleson et al. 2009, NWFSC unpubl. data) during the winter. The whales feeding off of California and Oregon are primarily from the Mexican breeding area, with smaller contributions from Central America. The whales feeding off of Washington and Southern British Columbia (BC) are also from the Mexican and Central American breeding areas, but include in addition a significant number of individuals from the Hawaiian breeding area (Calambokidis et al. 2008).

There is relatively high site fidelity of individuals to broad feeding grounds (Calambokidis et al. 2008), but movements likely occur between feeding areas. The migratory routes used by humpbacks from their West Coast feeding areas to breeding areas are not well known. Based on photo-id data, their movements in Oregon and California are probably primarily coastal as they move to Mexico and Central America. Limited information is available on the routes of whales tagged on their Mexican breeding ground, but the movements of one whale to the BC feeding ground was generally near or westward of the continental slope (Lagerquist et al. 2008). This coastal migration pattern may be similar for the portion of the northern Washington animals that also breed in these areas, but a substantial proportion of the animals observed in this area winter in Hawaii, and these animals obviously must have a less coastal migration pattern.

West Coast humpback whales migrate from breeding grounds in Mexico and Hawaii to the West Coast of the United States and British Columbia to feed in the summer. Thus, while whales do occur throughout the shelf waters of the U.S. West Coast, they aggregate off central California, Oregon, and the northwest coast of Washington State (Figure 6). In California, the whales use the Monterey Bay and Gulf of the Farallons (Barlow et al. 2009, Benson 2002, Benson et al. 2002, Forney 2007, Kieckhefer 1992). Off the northwest coast of Washington, whales are primarily observed east of the Barkley Canyon, between the La Perouse Bank and Nitnat Canyon, and on the shelf edge near the Juan de Fuca Canyon (Figure 6; Calambokidis et al. 2004, Dalla Rosa 2010). In particular, the whales occur primarily on the periphery of the Juan de Fuca Eddy (Dall Rosa 2010). In northern California and southern Oregon, humpbacks occurrence may be associated with the inside edge of the coastal upwelling front (Tynan et al. 2005).

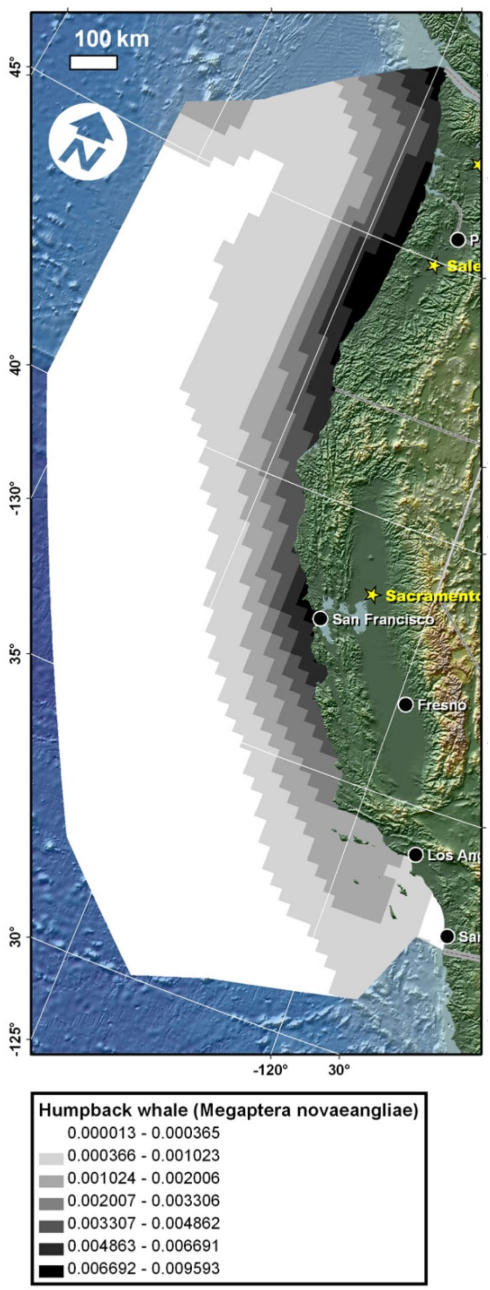


Figure 6. Mean predicted humpback whale density (number of animals/km^2), based on surveys conducted from June through November, from 1991 – 2005 (data from Barlow et al. 2009). Ship-based cetacean and ecosystem assessment surveys of humpback sighting locations were extrapolated to a regular grid (25 km resolution) for each year and were smoothed with geospatial methods to obtain a continuous grid of density estimates for the California Current Ecosystem (NWFSC 2011).

Abundance and Productivity

The most recent population estimate of humpback whales in the North Pacific Ocean is 21,808 (CV=0.04) (2004-2006 estimate; Barlow et al. 2011), which is higher than the estimated pre-exploitation abundance of ~15,000. There is, however, uncertainty about the latter estimate (Rice 1978). Estimates of the breeding population sizes are approximately 10,000 whales (Hawaii), 6,000-7,000 whales (Mexico, including Baja and the Revillagigedos Islands), 500 whales (Central America), and 1,000 whales (Western Pacific) (Calambokidis et al. 2008). For management under the MMPA, humpback whales stocks are defined based on feeding areas, with the whales feeding off of California, Oregon, and Washington currently considered one stock (Carretta et al. 2010). The estimated abundance of this feeding stock as of 2007/2008 was 2,043 whales (CV=0.10) (mark-recapture estimate; Carretta et al. 2010), with a minimum population estimate of 1,878 whales (lower 20th percentile of the mark-recapture estimate; Calambokidis 2009).

The maximum expected rate of annual increase for the species as a whole ranges from an estimated 7.3–8.6% (Zerbini et al. 2010), with a maximum plausible rate (upper 99% confidence interval of the expected maximum) of 11.8% annually. North Pacific populations as a whole grew by an estimated 6.8% annually over the period from 1966 to 2006 (based on an estimated post-exploitation abundance of 1,400 in 1966; Calambokidis et al. 2008). The Hawaiian breeding population grew by an estimated 5.5–6.0% annually over the period from 1991–1993 to 2006. The annual growth rate for the CA-OR-WA feeding stock is estimated at 7.5% (Carretta et al. 2010). Most Southern Hemisphere populations have been increasing at annual rates of 7–9% since the early- to mid-1990s (Fleming and Jackson 2011). The Gulf of Maine feeding population has been estimated to be increasing at a lower rate of ~3% annually from 1979 to 1993 (Stevick et al. 2003).

Limiting Factors

Humpback whales face a variety of threats, depending on the region in which they occur. Threats listed in the Recovery Plan include entrapment and entanglement in fishing gear, collisions with ships, acoustic disturbance, habitat degradation, and competition for resources with humans (NMFS 1991). Globally, entrapment and entanglement in fishing gear and collisions with ships represent most of the reported and observed serious injuries and mortalities for the species (review in Carretta et al. 2010).

<u>2.2.1.4 Status of Steller Sea Lions</u>

Steller sea lions were listed as threatened under the ESA on November 26, 1990 (55 FR 49204) across their entire range. Continued declines in the western portion of the population led to listing the western stock as endangered on May 5, 1997 (62 FR 24345), however the eastern stock remained listed as threatened (however, the proposed fishing only has potential to affect eastern DPS Steller sea lions, as described further below). Under the MMPA, all Steller sea lions are classified as strategic stocks and are considered depleted. NMFS issued the final revised recovery plan for Steller sea lions in March 2008 (NMFS 2008a). The final Steller sea lion recovery plan identified the need to initiate a status review for the eastern DPS of Steller sea lions and consider removing it from the Federal List of Endangered Wildlife and Plants (NMFS 2008a). On December 13, 2010, NMFS announced a decision to review the status of the eastern DPS in response to two petitions to delist the eastern DPS (75 FR 77602). This section summarizes information taken largely from a draft NWFSC risk assessment of the WCGF fishery to threatened and endangered marine species (NWFSC 2011), which includes review of the recovery plan (NMFS 2008a) and the most recent stock assessment report (Allen and Angliss 2011).

Steller sea lions are a long-lived species, and reproduction is somewhat delayed (by age 10 years; NMFS 2008a). Breeding occurs at rookeries where males compete for females by defending territories. Females bear at most a single pup each year between late May through early July, with peak numbers of births during the second or third week of June.

Steller sea lions are generalist predators, able to respond to changes in prey abundance. Their primary prey includes a variety of fishes and cephalopods. Some prey species are eaten seasonally when locally available or abundant, and other species are available and eaten year-round (NMFS 2008a). Pacific hake appears to be the primary prey item across the range of eastern Steller sea lion (NMFS 2008a). Other prey items include Pacific cod, walleye Pollock, salmon, and herring, among other species.

Spatial Structure and Diversity

The eastern DPS of Steller sea lions is a single population that ranges from southeast Alaska to southern California, including inland waters of Washington State and British Columbia. Occurrence in inland waters of Washington is limited to primarily male and sub-adult Steller sea lions in fall, winter, and spring months. They breed on rookeries in southeast Alaska, British Columbia, Oregon, and California. No rookeries occur in Washington. Haulouts are located throughout their range (NMFS 2008a).

Steller sea lions are not known to migrate. They disperse from rookeries outside of the breeding season (late May – early July), and adult males and juveniles are wider ranging than adult females (Allen and Angliss 2011). Exchange of breeding animals appears low between rookeries (Allen and Angliss 2011). The breeding distribution of the eastern DPS has shifted north, with range contraction in southern California and new rookeries established in southeast Alaska (Pitcher et al. 2007).

Abundance and Productivity

The total population estimate is a range between 58,334 and 72,223 animals based on extrapolation from pup counts, and the estimate of minimum abundance of non-pup and pup counts from all rookeries is 52,847 animals (Allen and Angliss 2011). The minimum estimate is not corrected for animals that were at sea. The population has increased at a rate of 3.1% per year from the 1970s until 2002 (Pitcher et al. 2007). The greatest increases have occurred in southeast Alaska and British Columbia (together accounting for 82% of pup production), but performance has remained poor in California at the southern extent of their range (Allen and Angliss 2011). In Southeast Alaska, British Columbia and Oregon, the number of Steller sea lions has more than doubled since the 1970s. Historical abundance is not well known, because prior to 1970 count data were intermittently available and therefore not comparable with more recent count data (NMFS 2008a).

Limiting Factors

Given the long-term positive population growth, no threats to the continued recovery of the eastern DPS were identified in the final revised recovery plan (NMFS 2008a). There are, however, factors that affect or have the potential to affect population dynamics of the eastern DPS. Those factors are predation (from killer whales and sharks), harvests, fishing bycatch and other human impacts, entanglement in debris, parasitism and disease, toxic substances, global climate change, reduced prey biomass and quality, and disturbance (NMFS 2008a). Because the entire species range occurs within the action area, we include greater detail related to bycatch and reduced prey, among other threats in the environmental baseline section.

2.2.1.5 Status of Leatherback Sea Turtles

Leatherback sea turtles were listed as endangered under the ESA throughout their range on June 2, 1970. NMFS and the USFWS issued a recovery plan for the U.S. Caribbean, Atlantic and Gulf of Mexico populations on October 29, 1991 (NMFS and USFWS 1991) and issued another recovery plan for the U.S. Pacific populations on May 22, 1998 (NMFS and USFWS 1998). This section summarizes information taken from a NWFSC risk assessment of the WCGF fishery to threatened and endangered marine species (NWFSC 2011), which includes review of the U.S. Pacific recovery plan (NMFS and USFWS 1998), the most recent status review (NMFS and USFWS 2007a), as well as information that became available more recently.

Leatherback sea turtles are a long-lived species, and likely have a late onset of sexual maturity (recent estimates suggest 13-14 years up to 29 years of age; review in NMFS and USFWS 2007a). Female leatherbacks lay clutches of approximately 80 eggs in the sand on tropical beaches, several times during a nesting season. Male leatherbacks are rarely seen near nesting aggregations, and it is speculated that breeding occurs on foraging grounds at sea. Leatherback hatchlings emerge from the nest after about two-months.

Survival and mortality estimates for different life history stages are not well known, but available information indicates that early life-stage survival is low (review in NMFS and USFWS 2007a). Leatherbacks primarily forage on cnidarians (jellyfish and siphonophores) and, to a lesser extent, tunicates (pyrosomas and salps) (NMFS and USFWS 1998).

Spatial Structure and Diversity

Leatherback sea turtles are widely distributed across the oceans of the world, and are primarily found in four major regions: the Pacific, Atlantic, and Indian Oceans and the Caribbean Sea. In the Pacific Ocean, nesting aggregations occur in the eastern Pacific (primarily in Mexico and Costa Rica) and in the western Pacific (primarily Indonesia, the Solomon Islands and Papua New Guinea). In the Atlantic Ocean, nesting aggregations occur in Gabon, Sao Tome and Principe, French Guiana, Suriname, and Florida. In the Caribbean, nesting occurs in the U.S. Virgin Islands and Puerto Rico and in the Indian Ocean nesting occurs in India and Sri Lanka. Females display site fidelity to nesting aggregations, but within these areas may nest at more than one beach in a single season (Lutz et al. 2003).

Adult and sub-adult females migrate long distances between foraging areas (pelagic and coastal waters) and nesting grounds (tropical beaches) typically every two to four years (Garcia and Sarti 2000, Benson et al. 2007a). Although the exact location and timing of migration is still being documented, eastern Pacific female leatherbacks generally migrate south of the nesting beaches and off central and south America, while western Pacific females may undergo transpacific migrations to waters off the Pacific Northwest and off central California (Benson et al. 2007a, Benson et al. 2011; Figure 7). The migratory pattern of males and juveniles are not as well known. Based on stranding records, it appears that juveniles primarily occur in waters warmer than 26° C (Eckert 1999b, Eckert 2002), and based on fisheries bycatch records and research capture efforts in the Pacific Ocean, subadults and males from the western Pacific population are also known to occur in the north Pacific and in waters off central California.

Foraging occurs in temperate waters where leatherbacks appear to use convergence zones and upwelling areas in the open ocean along continental margins and in archipelagic waters (Morreale *et al.* 1994; Eckert 1998, 1999). Foraging is also likely aggregated in productive coastal areas, where jellyfish prey is abundant (review in NWFSC 2011). There are few areas where the species is routinely encountered foraging, although NMFS recently identified two areas identified as critical habitat for leatherbacks due to aggregations of their preferred prey, including an area off the Pacific Northwest and an area off of central California. Also based on available information, use of the California Current by leatherbacks appears highly seasonal, arriving along the U.S. West Coast during summer and fall months, when large aggregations of jellyfish form (Bowlby 1994, Starbird et al. 1993, Benson et al. 2007b, Graham 2009).

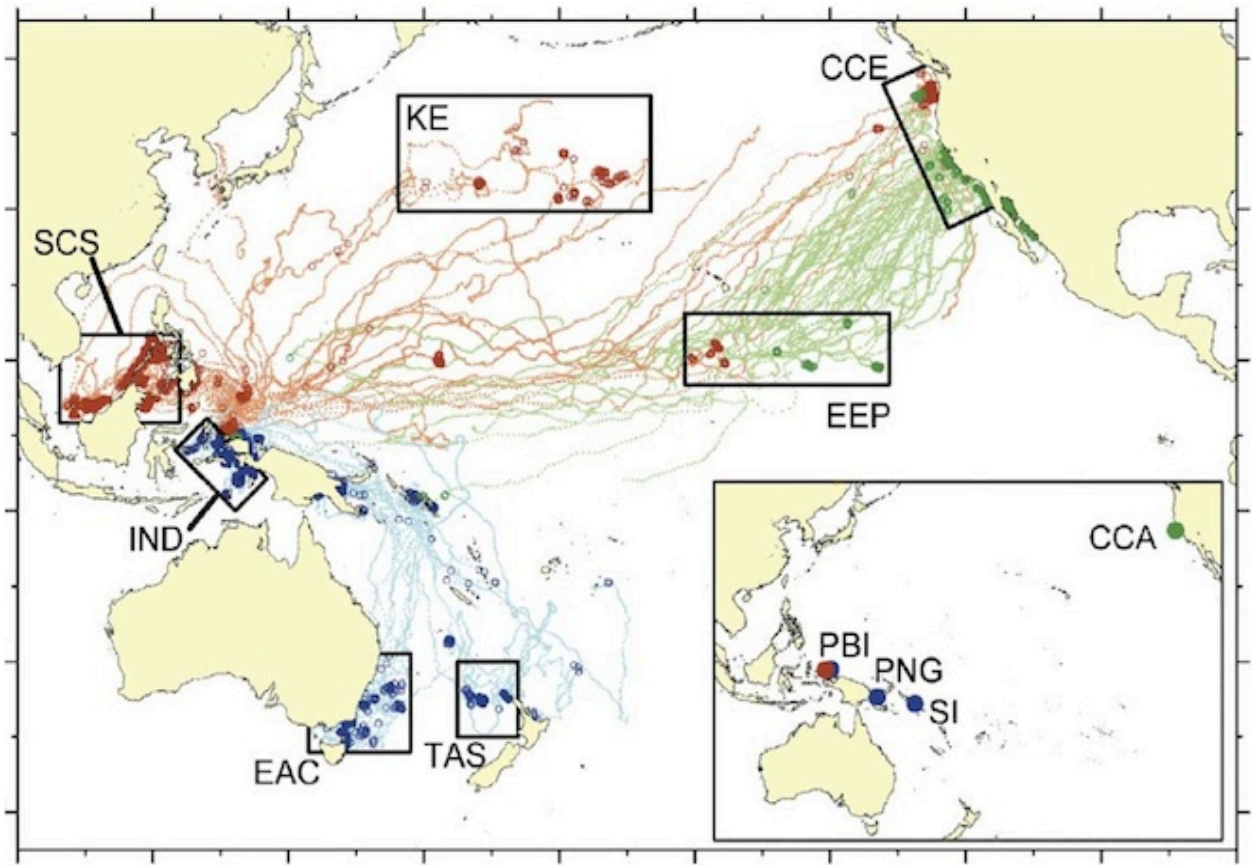


Figure 7. Between 2000 and 2007, Benson et al. (2011) attached GPS transmitters to 126 leatherbacks nesting in Indonesia, the Solomon Islands and Papua New Guinea. The colored lines indicate transpacific migration from their nesting grounds to the waters adjacent to the West Coast of North America. Source: NWFSC 2011 (Reproduced from Benson et al. [2011]).

Abundance and Productivity

The abundance of leatherback sea turtles worldwide is currently unknown. The most recent global estimate for nesting females is 34,500 turtles (CV: 26,200 to 42,900), based on monitoring at nesting beaches (Spotila et al. 1996). Population trends are estimated by monitoring the number of nesting females from year to year, over time. Based on this information, some nesting sites in the Atlantic appear to be increasing; however, trends in the Pacific have been declining for the past three decades. Based on declines at eastern Pacific nest sites, some researchers suggest that eastern Pacific leatherbacks may be on the verge of extinction (Spotila et al. 1996, Spotila et al. 2000). By contrast, despite evidence of a long-term decline since the 1980's and given that annual nesting estimates are not available on a continuing basis, western Pacific leatherbacks may be slightly increasing in recent years, as suggested by a 2007 estimate of breeding females (2,700 to 4,500 turtles; Dutton et al. 2007) compared to a 2000 estimate (1,775 to 1,900 turtles; Spotila 2000). Aside from coastal aerial surveys off central California and most recently off the Pacific Northwest (e.g., Benson et al. 2007b), there have been few attempts to assess abundance on foraging grounds.

To consider de-listing, each nesting stock of leatherbacks must average 5,000 females annually over six years (an estimated generation time) and nesting populations must be stable or increasing over a 25-year monitoring period (NMFS and USFWS 1998), among other criteria. In the recent status review, NMFS identified that efforts to attain these goals are ongoing, but have not been met (NMFS and USFWS 2007a).

Limiting Factors

Leatherback sea turtles face a variety of threats depending on the region in which they occur (22 threats are identified in the recovery plan for U.S. Pacific populations; NMFS and USFWS 1998). Many of the identified threats are specific to nesting beaches, and for the Pacific populations there are no leatherback nests in U.S. jurisdiction. Identified threats in the marine environment include direct harvest, natural disasters, disease and parasites, environmental contaminants, debris (entanglement and ingestion), fisheries bycatch, predation, boat collisions, marina and dock development, oil exploration and development and power plant entrapment.

On the U.S. West Coast, one of the known threats to leatherbacks is bycatch in fisheries (NMFS and USFWS 1998). Bycatch poses a threat in pelagic foraging and transit areas, the coastal feeding grounds and migratory routes along the U.S. West Coast and south into Mexico. While the level of leatherback bycatch in many fisheries is unknown, it has declined in U.S. fisheries such as the California drift gillnet fishery and the Hawaii long line fishery compared to historical levels, and fishing techniques that minimize bycatch (e.g., circle hooks) are now required in the Hawaii-based shallow set longline fishery. In addition, in 2001 NMFS implemented regulations to restrict the California/Oregon drift gillnet fishery off central, northern California and southern Oregon to reduce impacts to leatherbacks during times when they may likely be found off the coast (August 15 – November 15), which has significantly reduced interactions (to nearly zero). Entanglement and ingestion of marine debris, including old abandoned nets and plastic bags, and vessel strikes continue to pose a threat to leatherbacks. Appendix A summarizes the anticipated lethal and non-lethal take of leatherback sea turtles based on completed ESA consultations where authorized incidental take is still active.

2.2.2 Status of Critical Habitat

The NMFS reviews the status of designated CH that may be adversely affected by the proposed action by examining the essential physical and biological features identified throughout the designated area. These features are essential to the conservation of the listed species because they support habitat for one or more life stages of the species (e.g., sites with conditions that support reproduction, rearing, migration and foraging). This section will evaluate the effects of critical habitat designated for green sturgeon and leatherback sea turtles.

2.2.2.1 Status of Eulachon Critical Habitat

The action area for the proposed action does not overlap with designated eulachon critical habitat.

2.2.2.2 Status of Green Sturgeon Critical Habitat

Critical habitat has been designated for the Southern DPS of green sturgeon (Federal Register: 74 FR 52300, October 9, 2009). In the coastal ocean, this designation covers waters shallower than 60 fathoms (approximately 110 m) from Monterey Bay, CA to the Canadian border, including the Strait of Juan de Fuca. Natal rivers and numerous estuaries along the West Coast (e.g., San Francisco Bay, lower Columbia River estuary, Willapa Bay, and Grays Harbor) were also designated as critical habitat for the species. Separate sets of primary constituent elements (PCEs) were identified for freshwater rivers, coastal estuaries, and coastal marine waters. The three PCEs identified for coastal marine areas include:

Migratory corridor: A migratory pathway necessary for the safe and timely passage of Southern DPS green sturgeon within marine and between estuarine and marine habitats. Safe and timely passage was defined to mean that human-induced impediments, either physical, chemical, or biological, do not alter the migratory behavior of the fish such that its survival or the overall viability of the species is compromised (e.g., an impediment that compromises the ability of fish to reach abundant prey resources during the summer months in Northwest Pacific estuaries).

Water quality: Coastal marine waters with adequate dissolved oxygen levels and with acceptably low levels of contaminants (e.g., pesticides, heavy metals) that may disrupt the normal behavior, growth, and viability of subadult and adult green sturgeon.

Food resources: Data on prey species in coastal marine waters is lacking, but likely include benthic invertebrates and fish species similar to those fed upon by green sturgeon in bays and estuaries, including crangonid and callianasid shrimp, Dungeness crab, molluscs, and amphipods, and small fish, such as sand lances (*Ammodytes* spp.) and anchovies (Engraulidae) (Moyle 2002, Dumbauld et al. 2008).

A number of activities occur in and may affect the quality of green sturgeon critical habitat; however, relatively little information is available for the coastal marine areas compared to freshwater and estuarine areas. Green sturgeon primarily use coastal marine waters for migration between their natal waters and coastal estuaries. In recent years, large "dead zones" (areas of low dissolved oxygen) have been detected off the coasts of Oregon and Washington and may have an effect on green sturgeon migration. Point source (e.g., permitted discharges of pollutants from facilities) and non-point source (e.g., stormwater runoff) pollution along the coast may affect the quality of coastal marine waters used by green sturgeon. The specific impacts of these "dead zones" and discharges to the quality and function of the habitat for green sturgeon are yet to be studied. Finally, food resources appear to be widely distributed and abundant throughout the designated critical habitat areas, although studies are needed to identify specific food resources and feeding areas for green sturgeon in coastal marine waters.

2.2.2.3 Status of Leatherback Sea Turtle Critical Habitat

NMFS revised the current critical habitat for leatherback sea turtles by designating additional areas within the Pacific Ocean on January 26, 2012. This designation includes approximately 16,910 square miles along the California coast from Point Arena to Point Arguello east of the 3,000 meter depth contour; and 25,004 square miles from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter depth contour. The designated areas comprise approximately 41,914 square miles of marine habitat and include waters from the ocean surface down to a maximum depth of 262 feet. Based on the natural history of leatherback turtles and their habitat needs, NMFS identified the feature essential to conservation as: the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora*, and *Cyanea*), of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks.

Occurrence of Prey Species

Although jellyfish blooms are seasonally and regionally predictable, their fine-scale local distribution is patchy and dependent upon oceanographic conditions. Little information exists on their populations in open coastal systems, including the California Current upwelling system. Based on available research in coastal waters, jellyfish are most abundant in coastal waters of California, Oregon, and Washington during late summer-early fall months (Shenker 1984, Suchman and Brodeur 2005, Graham 2009), which overlaps with the time when turtles are most frequently sighted near central California (Starbird 1993, Benson *et al.* 2007b) and in coastal waters off Oregon and Washington waters (Bowlby 1994). Any activities that adversely affect these prey species (e.g., through reduction in diversity, abundance, density and condition) may affect the conservation value of critical habitat for leatherback sea turtles. Available scientific information does not indicate that jellyfish abundance or availability is currently limiting leatherback turtle recovery.

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for the species affected by the proposed action includes the effects of many activities that occur across the broad expanse of the action area considered in this opinion. The status of the species described in the previous section of the biological opinion is a consequence of those effects.

NMFS recognizes the unique status of treaty Indian fisheries and their relation to the environmental baseline. The treaty fishing right itself exists and must be accounted for in the environmental baseline, although the precise quantification of treaty Indian fishing rights cannot be established. If, after completing this ESA consultation, circumstances change or unexpected consequences arise that necessitate additional Federal action to avoid jeopardy determinations for ESA listed species, such action will be taken in accordance with standards, principles and guidelines established under *United States v. Washington*, Secretarial Order 3206, and other applicable laws and policies.

2.3.1 Eulachon

Research Fisheries

Although not identified as a factor for decline or a threat preventing recovery, scientific research and monitoring activities have the potential to affect the species' survival and recovery by killing eulachon. For the year 2011, NMFS issued numerous section 10(a)(1)(A) scientific research permits allowing lethal and non-lethal take of listed species. Although eulachon take is not prohibited, the permit applicants are required to consult with NMFS on their take of the species. NMFS estimates lethal and non-lethal take from the research being permitted will be 884 fish and 922 fish respectively. NMFS also authorized state scientific research programs under ESA section 4(d) for 2011. The estimated lethal and non-lethal take of eulacon by these programs is 195 fish and 790 fish respectively. NMFS is expected to issue further section 10(a)(1)(A) scientific research permits that will incur eulachon take for 2012. NMFS also has completed the review and expects to re-authorize the state scientific research programs under ESA section 4(d) for 2012.

Commercial and Recreational Harvest

In the past, eulachon were harvested in both commercial and recreational fisheries. The best available information for catches comes from the Columbia River, where catches have been as high as 5.7 million pounds per year (approximately 70 million fish), but averaged nearly two million pounds (approximately 24.6 million fish) from 1938 to 1993 (Gustafson et al. 2010). Between 1994 and 2010, no catch exceeded one million pounds (approximately 12.3 million fish) annually and the median catch was approximately 43,000 pounds (approximately 529,000 fish), which amounts to a 97.7% reduction in catch (JCRMS 2011). Catch from recreational eulachon fisheries was also high and, at its height in popularity, the fishery would draw thousands of participants annually. Currently, commercial and recreational harvest of eulachon is prohibited in both Washington and Oregon.

The Fraser River supports the only commercial eulachon fishery in British Columbia that is within the range of the southern DPS. This fishery has been essentially closed since 1997, only opening briefly in 2002 and 2004 when only minor catches were landed (DFO 2006).

Shrimp Fisheries Bycatch

Eulachon are taken as bycatch in shrimp trawl fisheries off the coasts of Washington, Oregon, and California, (NWFSC 2008, 2009a, 2010b). Offshore trawl fisheries for ocean shrimp (*Pandalus jordani*) extend from the west coast of Vancouver Island to the U.S. West Coast off Cape Mendocino, California (Hannah and Jones 2003). *Pandalus jordani* is known as the ocean pink shrimp or smooth pink shrimp in Washington, simply pink shrimp in Oregon, and Pacific ocean shrimp in California. We use the common name "ocean shrimp" in reference to *P. jordani,* as suggested by the American Fisheries Society (see Gustafson et al. 2010).

Historically, bycatch of eulachon in the ocean shrimp fishery along the U.S. and Canadian coasts has been very high (composing up to 28% of the total catch by weight; Hay and McCarter 2000, DFO 2008). Prior to the mandated use of bycatch-reduction devices (BRDs) in the ocean shrimp fishery, 32–61% of the total catch in this fishery consisted of non-shrimp biomass, made up mostly of Pacific hake, various species of smelt including eulachon, yellowtail rockfish, sablefish, and lingcod (Hannah and Jones 2007). Beginning in 2003, Washington, Oregon, and California mandated that BRDs be used in offshore shrimp trawl fisheries, and their use has substantially reduced fin fish bycatch in these fisheries (Hannah and Jones 2007, Frimodig 2008). However, it is impossible to determine the effect that mandatory BRD use has had on eulachon bycatch because observer data is not available to compare pre- and post-BRD implementation bycatch rates.

Al- Humaidhi et al. (2012) provide estimates of the number of individual eulachon caught in the Oregon and California ocean shrimp trawl fishery as bycatch from 2004 to 2010 (except for in 2006 when these fisheries were not observed). These estimates were derived from WCGOP data (Table 9). The WCGOP began coverage of Washington ocean shrimp licenses in 2010, with the same criteria used for Oregon and California State ocean shrimp coverage (Al-Humaidhi et al. 2012). The total estimated bycatch of eulachon in the Oregon and California ocean shrimp fisheries ranged from 217,841 fish in 2004 to a high of 1,008,259 fish in 2010 (Al-Humaidhi et al. 2012). For all years observed, fleet-wide eulachon bycatch estimates in the Oregon ocean shrimp fishery were much higher than in the California fishery. In 2010 Estimated eulachon bycatch in the Washington ocean shrimp fishery was 66,820 fish and the total 2010 estimated eulachon bycatch for all three states combined was 1,075,081 (Al-Humaidhi et al. 2012). Eulachon encountered as bycatch in these fisheries come from a wide range of age classes but are all assumed to be part of the southern DPS.

The estimated bycatch of eulachon in the ocean shrimp fisheries increased considerably between 2007 (218,476 fish) and 2010 (1,075,081 fish). There are three reasons for this increase: 1) increased reporting for the fisheries (i.e. the inclusion of bycatch data for Washington); 2) increased effort in the fisheries; 3) increased bycatch rate in the fisheries. It is unknown whether the increasing bycatch rate of eulachon is a result of increasing eulachon abundance.

Table 9. Estimated bycatch of eulachon (number of individual fish) in all U.S. west coast fisheries observed by the WCGOP and the At-Sea Hake Observer Program (A-SHOP) from 2002-2010. Ocean shrimp fisheries were not observed in 2002, 2003, or 2006. Italicized bycatch estimates result from bootstrapping due to fewer than three observed vessels in those strata. Dashes (--) signify years when the sector was not observed.

		Eulachon Bycatch Estimates (number of fish)									Total Eulachon	
		WCGOP						A-SHOP				
		LE Trawl			Pink Shrimp			At-Sea Hake				
Year	Season	WA	OR	CA	WA	OR	CA	Tribal Mothership	Non-Tribal Mothership	Catcher-Processor	Bycatch Estimate	95% Confidence interval
2002	winter	0	553	0	--	--	--	0	0	0	821	147
	summer	0	268	0				0	0	0		1,830
2003	winter	0	52	0	--	--	--	0	0	0	52	10
	summer	0	0	0				0	0	0		136
2004	winter	0	0	0	--	146,560	71,281	0	0	0	217,846	115,359
	summer	0	0	5				0	0	0		335,714
2005	winter	0	0	0	--	207,362	61,542	0	0	0	268,903	140,249
	summer	0	0	0				0	0	0		410,833
2006	winter	0	0	0	--	--	--	0	0	0	145	NA
	summer	0	0	0				0	0	145		NA
2007	winter	0	0	0	--	197,807	20,669	0	0	0	218,559	77,204
	summer	0	72	0				0	4	6		364,387
2008	winter	*0*	0	0	--	389,604	67,610	0	2	37	457,256	294,773
	summer	0	0	0				0	4	0		634,237
2009	winter	0	0	0	--	845,081	84,631	30	0	30	929,848	421,270
	summer	0	67	0				2	6	0		1,456,610
2010	winter	0	0	0	66,820	741,203	267,057	0	0	0	1,075,102	742,598
	summer	0	0	21				0	0	0		1,407,618

Groundfish Fishery Bycatch

Several recent reports (NWFSC 2008, 2009a, 2009b, 2010a, 2010b; Bellman et al. 2008, 2009, 2010, 2011; Al-Humaidhi et al. 2012) provide data on estimated bycatch of eulachon in U.S. West Coast commercial fisheries, which were derived from the WCGOP and the A-SHOP. Eulachon were observed as bycatch in the: (1) limited entry bottom trawl fishery; (2) at-sea Pacific hake/whiting mothership fishery; (3) at-sea Pacific hake/whiting tribal mothership fishery; (4) at-sea Pacific hake/whiting catcher-processor fishery; and (5) Washington, Oregon and California commercial shrimp trawl fishery (Al-Humaidhi et al. 2012). Al-Humaidhi et al. (2012) provided estimated bycatch of eulachon from 2002–2010 as number of individual fish in the limited entry groundfish trawl and at-sea Pacific hake fisheries (Table 9).

Observer data indicate that eulachon were not encountered in the Washington portion of the limited entry bottom trawl fishery from 2002 to 2010. The majority of eulachon encounters in the limited entry bottom trawl fishery from 2002 to 2010 occurred in the Oregon portion of the fishery, although eulachon were encountered (in very low numbers) in the California portion of the fishery in 2004 and 2010 (Table 9). Total eulachon bycatch for the limited entry bottom trawl fishery from 2002 to 2010 was estimated at 1,030 total individual fish (Al-Humaidhi et al. 2012). Bycatch in this fishery was recorded in six of the nine observed years, with no bycatch reported in 2005, 2006, or 2008 (Al-Humaidhi et al. 2012). The highest observed yearly bycatch in the limited entry bottom trawl fishery (for all areas combined) was recorded in 2002 (819 eulachon).

The offshore fishery for Pacific hake occurs along the coasts of northern California, Oregon, and Washington from April through November. The total eulachon bycatch for the offshore Pacific hake fishery from 2002 to 2010 was estimated to be 256 individual fish (Table 9). Bycatch in this fishery was recorded in four of the nine observed years, and no bycatch was reported in 2002, 2003, 2004, 2005, or 2010 Al-Humaidhi et al. 2012). The highest observed yearly bycatch in the offshore Pacific hake fishery (for all sectors combined) was recorded in 2006 (145 eulachon). Although bycatch of eulachon was observed in the tribal mothership, non-tribal mothership, and catcher-processor sectors of this fishery, Al-Humaidhi et al. (2012, p. 10) noted that eulachon appear "… to be encountered as bycatch in the catcher processor sector of the fishery more than other sectors."

Not all observed smelt (family Osmeridae) bycatch in the limited entry bottom trawl and at-sea Pacific hake fisheries have always been identified to the species level. Due to sampling conditions and time constraints, it is likely that some portion of observed eulachon bycatch may have been recorded as "other non-groundfish," in the early years of the two observer programs. The proportion of eulachon bycatch recorded as "other non-groundfish" is unquantifiable, but likely was not very large given the current level of estimated bycatch.

2.3.2 Green Sturgeon

The environmental baseline for Southern DPS green sturgeon within the action area includes the past impacts of the Federal groundfish fishery as well as the past and present impacts of other Federal, state or tribal fisheries conducted along the U.S. West Coast. Because Southern DPS green sturgeon are not morphologically distinguishable from Northern DPS green sturgeon, the effects of the environmental baseline described below are not specific to Southern DPS green sturgeon. However, information from genetic and tagging studies can be used to infer the stock composition of green sturgeon along certain parts of the coast. We summarize this information where available and apply it to estimate the proportion of the impacts specific to Southern DPS green sturgeon.

Overview of Fisheries Impacts

Historically, large numbers of green sturgeon were harvested in white sturgeon commercial and sport fisheries, which often considered them as bycatch due to their inferior meat quality and lower relative market value (Emmett et al. 1991, Adams et al. 2007). A relatively smaller part of the harvest occurred as bycatch from tribal gillnet salmon fisheries in the Columbia and Klamath Rivers. From 1985–2003, harvest came predominately from the Columbia River (51%), coastal trawl fisheries (28%), the Oregon fishery (8%), and the California tribal fishery (8%) (Adams et al. 2007). Overall, the total average annual harvest of green sturgeon declined substantially from 6,494 fish in 1985–1989 to 1,072 fish in 2000–2003. Much of the reduction in total average annual harvest of green sturgeon was due to increasingly restrictive Columbia River fishing regulations. Note, however, that harvest of green sturgeon in the Klamath tribal fisheries did not show evidence of declining catches from the period between 1985 and 2003, with harvest remaining at about 200 to 450 green sturgeon annually (Adams et al. 2007)).

Recently enacted fishing regulations and conservation measures have further reduced current fishery impacts to green sturgeon throughout its range (http://www.nmfs.noaa.gov/pr/species/fish/greensturgeon.htm). Various commercial and sport fisheries in California, Oregon, Washington (United States), and British Columbia (Canada) now ban retention of green sturgeon. Implementation of sturgeon fishing restrictions in Oregon and Washington and protective efforts put in place on the Klamath, Trinity, and Eel Rivers may offer protection to the Southern DPS.

West Coast Groundfish Fisheries

Recently published summaries of bycatch estimates from U.S. West Coast groundfish fisheries provide information on the scale of impacts from 2002 -2010 (Adams et al. 2007, Bellman et al. 2011, Al-Humaidhi et al. 2011, NWFSC 2011). On average, 331 green sturgeon are estimated to have been caught per year from 2002 through 2010. The largest estimated green sturgeon bycatch occurred in 2006, when 793 individuals were estimated to have been caught by the limited entry sector of the California halibut fishery. Overall, estimated green sturgeon bycatch from 2003 through 2006 was higher than estimated bycatch in 2007 through 2010, with the exception of 2009. In 2009, the estimated bycatch of green sturgeon was 333 individuals, similar to the estimated bycatch in 2003 and 2004. The reduction in estimated bycatch of green sturgeon, as well as in total California halibut landings, in the limited entry sector of the fishery since 2007 was likely the result of recent changes in state fishing regulations (California Fish and Game Code Section 8494) which have reduced access to the California halibut fishery. It is likely that many of the green sturgeon encountered as bycatch in the California halibut fishery are Southern DPS green sturgeon, based on the estuarine distribution of green sturgeon populations (Lindley et al. 2011) and the fishery's primary trawl grounds just offshore of San Francisco Bay (Bellman et al. 2011). Bycatch of green sturgeon also occurred in the At-Sea Hake/whiting trawl fishery, with only 3 green sturgeon observed in the period from 2002 through 2010.

Alaska Groundfish Trawl Fisheries

The North Pacific Groundfish Observer Program, which observes Federal groundfish fisheries off Alaska, has recorded rare encounters of green sturgeon as bycatch in trawl fisheries in the Bering Sea. Two green sturgeon were encountered in 2006 (Colway and Stevenson 2007) and one in 2009 (pers. comm. with B. Mason, June 4, 2009). All of the green sturgeon encountered were found dead. It is unknown whether the green sturgeon encountered belonged to the Northern DPS or the Southern DPS.

California, Oregon, and Washington coastal fisheries

The largest existing fisheries impact to green sturgeon is bycatch-related mortality from three coastal and estuarine fisheries: the coastal groundfish trawl fishery, white sturgeon commercial and sport fisheries, and Klamath tribal salmon gillnet fisheries (Adams et al. 2007). The only fishery where green sturgeon are still legally retained in the U.S. is in tribal gillnet fisheries in the Klamath River. Historical annual catches in the fishery appear to be of the same order of magnitude as spawning escapement, suggesting possibly unsustainable harvest rates. On the Klamath, tribal harvest has accounted for 200–450 fish annually between 1985 and 2003, with no evidence of declining catches (Adams et al. 2007). As noted earlier, these catch estimates are inconsistent with estimates of spawning run size that range from 426 to 734. The Yurok Tribe has recently adopted new regulations for their subsistence harvest that reduce impacts to green sturgeon (Israel et al. in prep). Because the Klamath River is a natal river of the Northern DPS, the harvest is believed to impact only Northern DPS green sturgeon.

Fisheries in Mexico and British Columbia

Green sturgeon are rarely encountered in coastal waters of Baja California, Mexico, and fishery impacts in Mexican waters are likely negligible.

Canada currently bars retention of green sturgeon in all fisheries, although they are frequently encountered in coastal bottom trawl fisheries off the west coast of Vancouver Island and may have been specifically targeted in past decades (COSEWIC 2004).

Green Sturgeon Critical Habitat

Bottom trawl fisheries are likely to have some impact on both the habitat and prey of green sturgeon. The diet of green sturgeon in the ocean is poorly known, but they may prey upon demersal fish (sand lance are a known diet item) captured in these fisheries. While green sturgeon seem to prefer high-relief, complex, benthic habitats at certain times and places, it is not clear what features of these habitats they are responding to and how dependent they are upon them (i.e., the boulders themselves or biota associated with the boulders) (Huff et al. 2011). Recent gear restrictions (i.e., footrope limits) and landing limits have been effective in protecting rocky habitats along the Pacific Coast from trawl fishing impacts by shifting fishing effort away from these areas (Bellman et al. 2005). Therefore, management efforts directed at protecting the rocky habitat of depleted rockfish (*Sebastes* spp.) may have accrued some additional benefits to green sturgeon in the ocean. These habitat and trophic effects are difficult to quantify more accurately, however, until more definitive information is known about the marine habitat preferences and diets of green sturgeon.

2.3.3 Humpback Whales

Humpback whales that occur within the action area are part of the California/Oregon/Washington stock (Carretta et al. 2010). Therefore, all effects of the environmental baseline described below are specific to this stock.

Entrapment and Entanglement in Fishing Gear

Entrapment and entanglement in fishing gear can result in serious injury and mortality to humpback whales. Carretta et al. (2010) reported that 18 humpback whales were observed entangled in fishing gear during 2004-2008 off the West Coast. In most of these cases, the final status of the entangled animal was unknown. Of the 18 humpbacks entangled in fishing gear from 2004-2008, 11 were reported entangled at sea in trap/pot fishery gear off California and Oregon, including two animals later found dead in Oregon (stranding data reported in Carretta et al. 2010). Seven humpbacks were reported entangled in unknown gillnet or other gear. Two of the 11 pot/trap gear entanglements could be attributed to specific fisheries. One whale was entangled in sablefish trap gear (a fishery of the proposed action) and another in spot prawn trap gear.

Two of the whales entangled in trap/pot gear were successfully disentangled from gear. One of the sightings involving pot gear included a cow/calf pair where the cow was entangled. Caretta et al. (2010) considered 14 of the humpbacks seriously injured, and did not consider the two successfully disentangled animals as seriously injured. In addition, there were 12 unidentified whales observed entangled in pot/trap gear or unknown gillnet gear during this time period (2004-2008). Caretta et al. (2010) indicate it is likely most of the unidentified pot/trap fishery entanglements involved humpback whales.

The proportion of fishing activity observed by observer programs that quantify bycatch is variable across fisheries in the action area. In addition, some fixed gear fisheries leave gear unattended. Large whales can swim considerable distances after becoming entangled in such gear, so mortality or injuries may be unobserved in these fisheries even if observers are on board. All of the above identified reports of entangled humpback and unidentified whales came from opportunistic sightings reported to stranding networks, not from observer programs. The potential for unobserved injury or mortality due to entanglement, particularly in pot/trap gear, introduces uncertainty about the impacts of these fisheries on humpback whales.

An additional method for evaluating fishery impacts to humpback whales is used on the east coast of the U.S. Observations of scarring are used to estimate the mortality rate of humpback whales associated with gear entanglement (e.g., as described in Robbins et al. 2009). This type of data is not currently available to estimate the mortality rate for the CA/OR/WA stock.

Collisions with Ships

From 2004-2008 two humpback whale deaths were attributed to ship strikes (stranding data reported in Carretta et al. 2010). One additional humpback whale was struck in Washington waters in 2008 and the collision reportedly broke the vessel's stabilizer, but the condition of the whale remains unknown. There were also reports of eight injuries of unidentified large whales attributed to ship strikes during the same time period (2004-2008). Some of these may have been humpback whales. Other ship strikes likely happened but went unreported because the whales did not strand or, did not have obvious signs of trauma. Several humpback whales were photographed in California with large gashes in their dorsal surface that may be from ship strikes (J. Calambokidis, pers. comm., in Carretta et al. 2010). Carretta et al. (2010) estimated that the average number of documented humpback whale deaths by ship strikes for 2004-2008 was 0.4 per year.

Acoustic Disturbance

Anthropogenic (human-generated) sound in the action area is generated by construction activities, vessels and military operations. Natural sounds in the marine environment include wind, waves, surf noise, precipitation, thunder, and biological noise from other marine species. The intensity and persistence of certain sounds (both natural and anthropogenic) in the vicinity of humpback whales is expected to vary by time and location and have the potential to interfere with important biological functions (e.g., hearing and communication).

In-water construction activities are permitted by the Army Corps of Engineers under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899 and by the State of Washington under its Hydraulic Project Approval program. NMFS conducts consultations on these permits and helps project applicants incorporate conservation measures to minimize or eliminate potential effects of in-water activities, such as pile driving, to marine mammals.

NMFS completed consultation on major rehabilitation of the jetty system at the mouth of the Columbia River, and concluded that the proposed action was likely to adversely affect but not likely to jeopardize the continued existence of humpback whales (March 18, 2011, NMFS 2011a). NMFS anticipated that humpback whales exposed to sound from the proposed pile driving would respond by either a deviation in their course to deflect around the sound (in the case of whales otherwise passing through the area) or by avoiding the area (in the case of whales otherwise feeding in the area). The proposed action includes maintenance pile driving that is expected to occur over a 20-year period from the time of project initiation; a time as yet to be determined. NMFS has not issued an incidental take statement for this anticipated behavioral disruption, because the incidental take has not been authorized under section 101(a)(5) of the MMPA and/or its 1994 Amendments. Following issuance of such regulations or authorizations, NMFS may amend its opinion to include an incidental take statement for humpback whales, as appropriate.

Sound generated by large vessels is a source of low frequency (5 to 500 Hz) human-generated sound in the world's oceans (NRC 2003). Humpback whales have specialized hearing in the low-frequency range (estimated auditory bandwidth: 7 Hz to 22 kHz; Southall et al. 2007), and therefore, sound from vessels is likely to disturb them. Sonar generated by military vessels also has the potential to disturb humpback whales. NMFS recently completed consultation on the Navy training at the Northwest Training Range Complex and found that the proposed training activities were likely to adversely affect but not likely to jeopardize the continued existence of humpback whales. NMFS issued an incidental take statement and MMPA permit for these activities that included some harassment of humpback whales (need to get citations).

Prey Availability

Many fisheries in the action area target relatively large, commercially valuable fish species, such as salmon, a variety of groundfish (some of which are targeted by the proposed action), and highly migratory species, which are not consumed by humpback whales. The Coastal Pelagic Species FMP does harvest anchovy, market squid, Pacific sardine, Pacific mackerel, and jack mackerel, some of which are also consumed by humpback whales. This FMP was recently amended to include all krill species and to prohibit their harvest (Amendment 12 – Measures to Prohibit Fishing for Krill; 74 FR 33372). This proactive PFMC recommendation was intended to protect krill's vital role in the marine ecosystem, and effectively limits the potential for competition over prey resources consumed by humpback whales.

2.3.4 Steller Sea Lions

Steller sea lions that occur within the action area are part of the eastern DPS. Therefore, all effects of the environmental baseline described below are specific to the eastern DPS.

Subsistence Harvest

On average, an estimated 12 Steller sea lions per year were harvested or struck but lost during subsistence hunting by Alaska Natives (from 2004-2008, Allen and Angliss 2011). An unknown number of Steller sea lions are harvested by subsistence hunters in Canada; however, the magnitude of Canadian harvest is probably small (Allen and Angliss 2011).

Fisheries Bycatch

Bycatch in fishing gear can result in serious injury and mortality to Steller sea lions. Allen and Angliss (2011) reported a minimum estimated mortality of 25.6 Steller sea lions per year (2004-2008 average) incidental to commercial and recreational fisheries (both U.S. and Canadian), based on fisheries observer data (0.8), opportunistic observations (24.2), and stranding data (0.6).

Other Human-Caused Mortality

Other sources of human-caused mortality are minimal, but have been documented by stranding reports in recent years, including shooting (an average of 0.8 reports per year in Oregon and Washington; 2004-2008), blunt trauma of unknown origin (potentially human-caused), and entanglement in marine debris that is not fishery-related (an average of 0.6 reports per year in Oregon and Washington; 2001-2005) (Allen and Angliss 2011). In addition, mortality can occur incidental to marine mammal research activities authorized under MMPA permits, which based on recent reporting results in an average of 1.8 mortalities per year (2003-2007; Allen and Angliss 2011). Based on available reports, other human-caused mortality is estimated at 2.2 Steller sea lions per year (0.8+0.6+1.8).

Prey Availability

Many fisheries in the action area target commercially valuable fish species, such as salmon and a variety of groundfish (some of which are targeted by the proposed action), some of which are also consumed by Steller sea lions. As mentioned in the Status section, Steller sea lions are generalist predators, able to respond to changes in prey abundance, and based on long-term population growth of the eastern DPS, prey availability does not appear to be limiting the population.

Disturbance

Anthropogenic (human-generated) sound in the action area is generated by construction activities, vessels and military operations. Natural sounds in the marine environment include wind, waves, surf noise, precipitation, thunder, and biological noise from other marine species. The intensity and persistence of certain sounds (both natural and anthropogenic) in the vicinity of Steller sea lions is expected to vary by time and location and have the potential to interfere with important biological functions (e.g., hearing and communication).

In-water construction activities are permitted by the Army Corps of Engineers under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899 and by the State of Washington under its Hydraulic Project Approval program. NMFS conducts consultations on these permits and helps project applicants incorporate conservation measures to minimize or eliminate potential effects of in-water activities, such as pile driving, to marine mammals.

NMFS completed consultations on Steller sea lions that make use of the action area, specifically for two upcoming construction projects: (1) major rehabilitation of the jetty system at the mouth of the Columbia River and (2) the Columbia River Crossing transportation project (a freeway bridge). In both cases, NMFS concluded that the proposed actions were likely to adversely affect but not likely to jeopardize the continued existence of Steller sea lions (NMFS 2011a, NMFS 2011b). NMFS anticipated that Steller sea lions exposed to sound from proposed pile driving for these projects would respond by spending less time at a proximate haulout or foraging in the immediate vicinity or travel more quickly through the affected area. The jetty action includes maintenance pile driving that is expected to occur over a 20-year period from the time of project initiation; a time as yet to be determined. The Columbia River Crossing project includes pile driving with construction anticipated to begin September 2012 and end in December 2020. NMFS has not issued an incidental take statement for the anticipated behavioral disruption from either project, because the incidental take has not been authorized under section 101(a)(5) of the MMPA and/or its 1994 Amendments. Following issuance of such regulations or authorizations, NMFS may amend its opinions to include an incidental take statement for Steller sea lions, as appropriate.

A few Steller sea lions that make use of the action area were also affected by a deterrence program from 2008-2010 to reduce pinniped impacts on ESA-listed Pacific salmon and steelhead below Bonneville Dam on the lower Columbia River. NMFS previously consulted on the effects of this program, and concluded that the non-lethal deterrence activities that target Steller sea lions are likely to adversely affect, but not likely to jeopardize Steller sea lions. Steller sea lions that are likely to be affected by this deterrence program have shown increasing habituation in recent years to the various hazing techniques used to deter the animals from foraging on sturgeon and salmon in the Bonneville tailrace area, including acoustic deterrent devices, boat chasing, and above-water pyrotechnics (Stansell *et al.* 2010, Brown *et al.* 2010). Additionally, many of the individuals that travel to the tailrace area return in subsequent years.

2.3.5 Leatherback Sea Turtles and their Critical Habitat

Leatherback sea turtles that occur within the action area are most likely turtles originating from nesting aggregations of the western Pacific (Benson et al. 2011, NWFSC 2011). Therefore, effects of the environmental baseline described below are specific to western Pacific leatherbacks.

Fisheries Bycatch

Only one interaction between a leatherback sea turtle and drift gillnet fishing gear in the action area has been observed or reported to NMFS since the leatherback conservation zone for the drift gillnet fishery was implemented in 2001, and the turtle was released alive in good condition (in 2009; NMFS 2011c and Appendix A). There have been a few stranding reports of leatherbacks entangled in pot-gear in the recent past (3 entanglements in CA reported from 2001-2008; SWR stranding network database).

NMFS has completed a few consultations in the action area that authorized take of leatherback sea turtles incidental to fisheries and in all cases found that the fishing proposed was not likely to jeopardize the continued existence of leatherback sea turtles. These include consultations on shallow-set longline exempted fishing permits under the West Coast Highly Migratory Species FMP (e.g., NMFS 2008b). In these opinions, NMFS issued an incidental take statement for a maximum of 5 captured turtles and 1 turtle mortality incidental to fishing effort in the year of authorization (2007 and 2008); however, these fishing activities never occurred. NMFS also completed consultation on the CA/OR drift gillnet fishery managed under the West Coast Highly Migratory Species FMP (NMFS 2004). In this opinion, NMFS authorized the annual capture of 3 leatherbacks in live condition and 2 leatherback mortalities. This opinion and ITS are currently active. To date, only one live interaction has occurred, and the turtle was released in good condition (in 2009, as referenced above). NMFS also recently completed consultation on the deep-set tuna longline fishery also managed under the West Coast Highly Migratory Species FMP (NMFS 2011c). In this opinion, NMFS issued an incidental take statement for a maximum of one leatherback mortality over three years. This fishery has been observed with 100% coverage since 2005, and in that time there has only been one observed turtle interaction, which was not a leatherback (mortality of an olive ridley sea turtle).

The proportion of fishing activity observed by programs that quantify bycatch is variable across fisheries in the action area. There remains uncertainty about the impacts of potential bycatch for fisheries with low observer coverage. We can, however, be confident that impacts on leatherback turtles are low for fisheries with relatively high observer coverage and no observed bycatch. Unlike large whales, sea turtles are not large enough to swim away with gear after becoming entangled. Therefore, there is little chance of a turtle entanglement going unobserved where observers are on board, with the exception of potential entanglement in ghost-gear (e.g., fixed gear that keeps fishing after being carried off its deployed location, such as can happen in storms).

Collisions with Ships

Between 2000 and 2005, there were three reported boat collisions with leatherbacks in the action area, and fate of these turtles is unknown (SWR stranding data base). Two of the reports documented damage to the carapace, head, or flippers. In 2008, there was another boat collision reported off Cayucos Point, California and the turtle was observed dead (SWR stranding data base). Ship strikes likely go largely unreported, and may pose a threat to leatherbacks in foraging areas like the Gulf of the Farallones (Benson et al. 2007b).

Entanglement and Ingestion of Marine Debris

Marine debris may be a threat to leatherback sea turtles in the action area, and can cause mortality or illness (ingesting objects, e.g., plastic bags). There are no documented cases of leatherbacks entangled in debris that is not fishing-related, however, these types of events would be difficult to document and thus are likely to go unobserved or unreported.

Other Human Activities

NMFS has completed two consultations in the action area that authorize take of leatherback sea turtles incidental to the operation of nuclear generating systems, and in both cases found the activities were not likely to jeopardize the continued existence of leatherback sea turtles (Diablo Canyon, NMFS 2006b and San Onofre, NMFS 2006c; Appendix A). In these opinions, NMFS issued incidental take statements both of which authorize a maximum of 3 turtle interactions that result in live release (with one serious injury) and 1 turtle mortality. These opinions and ITSs are currently active.

Prey Availability

Many fisheries in the action area target commercially valuable fish species, but can also bycatch jellyfish that are consumed by leatherbacks. A reduction in prey availability could affect leatherbacks and the conservation value of their critical habitat. The amount and distribution of jellyfish bycatch in various fisheries is not quantified, and the standing stock biomass of jellyfish consumed by leatherbacks is also unknown. Thus, it is difficult to gauge potential impacts on leatherbacks or their critical habitat. Lack of prey, however, is not a presently identified threat to the species recovery.

2.4 Effects of the Action on Species and Designated Critical Habitat

"Effects of the action" means the direct and indirect effects of an action on the species and/or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

2.4.1 Effects of the Action on Listed Species

2.4.1.1 Eulachon

The proposed action's main effect is that the proposed fisheries would capture and kill juvenile and adult eulachon. . An unknown number of eulachon may enter groundfish trawl nets during fishing operations. However we have no way of determining what percentage of these fish are retained, nor how the survival of fish that are not retained would be affected. We expect that all of the eulachon retained as bycatch in these fisheries would be killed.

We do not anticipate fishing effort to increase in any of the proposed fisheries. Therefore, and to err on the side of caution, we analyzed the effects of the highest annual bycatch for which we have estimates (2002-2010) and projected that take into the future for each individual fishery (Table 10).

Table 10. Anticipated annual bycatch of eulachon (number of individual fish) in all U.S. west coast groundfish fisheries covered by this biological opinion. These estimates are based on the highest estimated level of bycatch observed in these fisheries from 2002-2010.

	Limited Entry Trawl	At-sea hake			Total Annual Estimate
		Tribal Mothership	Non-tribal Mothership	Catcher-Processor	
Eulachon Bycatch Estimate (fish)	821	32	6	145	1004

Any eulachon that may be captured during the proposed fisheries would probably come from a mix of various freshwater production areas. Beacham et al. (2005) reported that marine sampling by trawl showed that eulachon from different rivers mix during their two to three years of pre-spawning life in offshore marine waters, but not thoroughly. Their samples from southern British Columbia were comprised of a mix of fish from multiple rivers, but were dominated by fish from the Columbia and Fraser River populations. Their results suggest that the eulachon that may be captured off the coasts of Oregon and Washington during the proposed fisheries may have originated from the Columbia and Fraser Rivers (the major production areas for the DPS) as well as from several smaller streams along the Washington and Oregon coasts. This means that the decrease in abundance caused by removing fish would be spread over several populations representing a number of discrete freshwater production areas. Additionally, the proposed action would take place in multiple marine locations, further decreasing the chance that the eulachon bycatch would disproportionately affect any particular population. The captured fish would also be members of several year classes, as eulachon spend 3-5 years at sea before returning to their natal spawning areas.

Marine mortality is likely very high for eulachon. Thus the death of 1004 individuals of different age classes in the ocean would be equivalent to a very small number of spawning adults. Although it is not possible to quantify exactly how small (due to the mix of age classes that are likely to be encountered), based on our knowledge of survival of fishes with similar life histories, it could potentially be substantial. For example, the annual mortality rate of adult Pacific herring has been estimated at 50% (Hourston and Haegele 1980) and the annual mortality rate of 4 to 5 year old capelin has been estimated as high as 93% (Dommansnes and Røttingen 1985). At a minimum, if we assume that all eulachon caught in the proposed action would have spawned in the following year (a conservative estimate given that multiple age classes will likely be caught) and we assume an annual mortality rate of 50%, then the 1004 eulachon killed by the proposed action would represent approximately 502 adult spawners.

Although there are no reliable abundance estimates for the southern DPS of eulachon, 1004 fish would likely represent an extremely small proportion of eulachon abundance in this area. Furthermore, those 1004 fish would most likely come from several populations and year classes so the reduction in spawner abundance would likely be small for any given population or year class.

2.4.1.2 Green Sturgeon

For Southern DPS green sturgeon, the proposed action's main effect would be the capture and release of subadult and adult green sturgeon in the fisheries. Although the majority of the green sturgeon captured would likely be released alive, some portion of the green sturgeon may die during capture or after being released. This analysis considers the extent to which the sublethal effects and mortalities associated with the proposed action may reduce the reproduction, numbers, or distribution of Southern DPS green sturgeon, pursuant to the regulatory definition of jeopardy. We evaluated the potential effects of the proposed action on Southern DPS green sturgeon based on the best scientific information about past human interactions with green sturgeon, including past bycatch in the fisheries.

We analyzed effects in two steps. First, we estimated the number of Southern DPS green sturgeon likely to be encountered as bycatch in the fisheries and considered both the sublethal and lethal effects on individuals. Second, we considered the consequences of those sublethal and lethal effects at the population level. This analysis highlights our level of confidence in the available data, identifies where there is uncertainty in light of data gaps, and identifies how we based assumptions in our analysis on the best available science.

Effects from Bycatch in Fishing Gear

In this analysis, we tried to identify the degree to which Southern DPS green sturgeon are likely to be exposed to the action's effects and the nature of that exposure. The best available bycatch data provide information on the fishery sectors that encounter green sturgeon and the observed and estimated number of green sturgeon encountered from 2002 through 2010. From these data, we identified the fishery sectors likely to encounter green sturgeon and the number and life stage of Southern DPS green sturgeon likely to have been encountered from 2002 through 2010, based on the following general calculation:

$$N_{LY} = B_Y * S * P_L$$

where N_{LY} = the estimated number of Southern DPS green sturgeon of life stage L encountered in year Y

B_Y = the estimated bycatch of green sturgeon in year Y

S = the estimated proportion of Southern DPS green sturgeon in the bycatch

P_L = the proportion of life stage L in the bycatch from 2002 through 2010 (life stages include adult and subadult).

The resulting estimates of Southern DPS green sturgeon encountered in the fisheries from 2002 through 2010 were then used to estimate the number and life stage of Southern DPS green sturgeon likely to be encountered under the proposed action. In the following paragraphs, we describe the analysis and the assumptions and uncertainties involved in more detail.

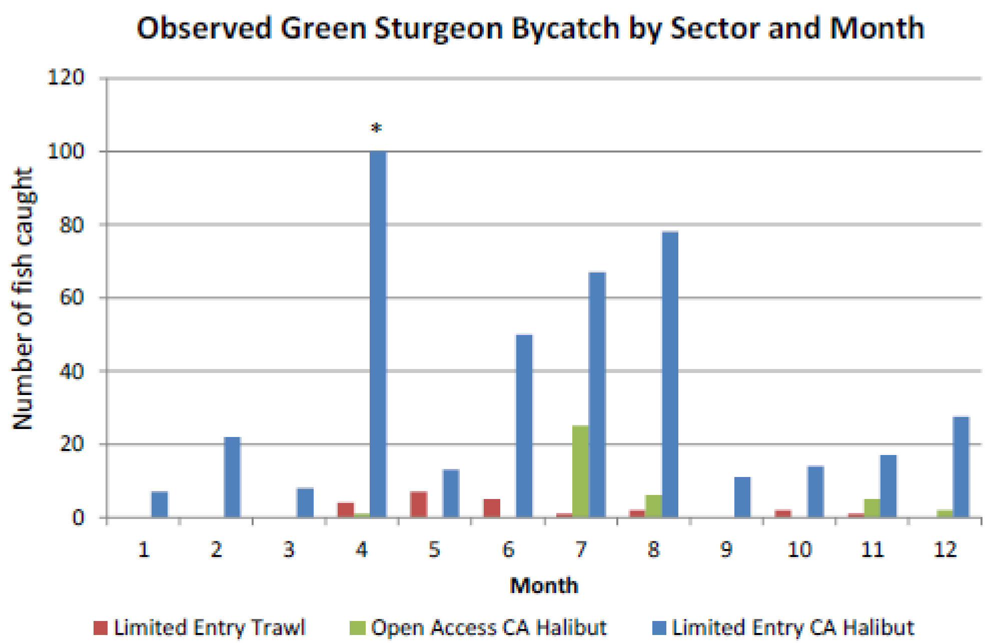
Based on the best available bycatch data (summarized in the NWFSC 2011 and the NWR's biological assessment), the proposed operation of the Pacific Coast Groundfish Fishery for 2012 as described in the 2012 harvest specifications and management measures (76 FR 77415) is likely to encounter green sturgeon as bycatch in the following sectors:

- LE groundfish bottom trawl
- LE bottom trawl – targeting California halibut
- OA bottom trawl – targeting California halibut
- At-sea Pacific hake/whiting mothership
- At-sea Pacific hake/whiting tribal mothership.

Most of the bycatch occurred in the LE sector of the California halibut fishery, which primarily takes place at depths of less than 60 m in fishing grounds adjacent to San Francisco Bay, CA (Bellman et al. 2011). The depth distribution of tows encountering green sturgeon bycatch from 2002 to 2010 (all fisheries combined) indicates most green sturgeon were encountered within the depth range of 5-9 fathoms (60%) (Al-Humaidhi et al. 2011). The deepest observed tow that encountered green sturgeon was at 65 fathoms; all other observed tows that encountered green sturgeon were at less than 60 fm (Al-Humaidhi et al. 2011). Bycatch primarily occurred during summer months from April through August (Figure 8, from Al-Humaidhi 2011).

The majority of the green sturgeon encountered as bycatch in these fisheries is expected to be Southern DPS green sturgeon. The following sections describe the expected bycatch of Southern DPS green sturgeon in the fisheries listed above. We recognize that uncertainties exist that may influence the green sturgeon bycatch estimates reported in this opinion, including uncertainty in sampling of landings for species composition, logbook spatial information, observed retained catch weight, and green sturgeon recapture rates (Bellman et al. 2011, Al-Humaidhi et al. 2011). Given these uncertainties, the bycatch estimates should be considered with caution. However, these estimates represent the best data available at this time to assess the effects of the proposed action on Southern DPS green sturgeon.

Figure 8. Observed green sturgeon bycatch by sector and month from 2002 through 2010 (Figure from Al-Humaidhi 2011). * Note: 97 of the 100 observed green sturgeon caught by the limited entry California halibut sector in April were caught in 2006 on 35 hauls throughout the month.



Limited entry groundfish bottom trawl and LE and OA bottom trawl California halibut sectors

Although the California halibut fishery is managed by the State of California, some of the vessels hold Federal groundfish permits as well as state permits. At this time, we are not able to separate impacts of the state managed portion of the fishery from impacts of the Federal portion of the fishery. Therefore, this opinion analyzes the impacts of the Limited entry groundfish bottom trawl sector and LE and OA bottom trawl California halibut sectors together as part of the action.

Data on the observed and estimated bycatch of green sturgeon in the LE groundfish bottom trawl and the California halibut fisheries (both the LE and OA sectors) from 2002 through 2010 indicate that the estimated bycatch of green sturgeon varied widely between years and seasons (Table 11, from Al-Humaidhi et al. 2011). In most years, the majority of the observed and estimated bycatch of green sturgeon occurred within the California halibut fishery. Estimated bycatch of green sturgeon within the LE groundfish bottom trawl fishery ranged from 0 to 37 green sturgeon annually, whereas estimated bycatch of green sturgeon within the California halibut fishery (LE and OA sectors combined) ranged from 0 to 786 green sturgeon annually. Estimated bycatch levels were higher in the period from 2003 through 2006 compared to estimated bycatch levels in the period from 2007 through 2010. This decrease may be due to CDFG's revised 2006 regulations (California Fish and Game Code Section 8494) which have restricted access to the California Halibut fishery. Because the revised CDFG regulations will still be in place at the time of the proposed action, the fishery effort and green sturgeon bycatch levels from 2007 and 2010 are likely to be more representative of what would be expected under the proposed action, compared to the fishery effort and green sturgeon bycatch levels observed in the years prior to implementation of the revised 2006 regulations. Therefore, the bycatch of green sturgeon in the LE groundfish bottom trawl and California halibut fishery under the action is likely to be on the lower end of the range, from 100 to 333 green sturgeon annually (based on the highest estimate of 333 green sturgeon caught in the period from 2007 through 2010).

Table 11. Estimated bycatch of green sturgeon (number of individual fish) in all U.S. west coast fisheries observed by the WCGOP and the A-SHOP from 2002 through 2010. The open access California halibut sector was not observed in 2002 and 2006. Italicized estimates result from bootstrapping due to fewer than three observed vessels in those strata. Dashes (--) signify years when the fishery/sector was not observed. Winter season is January – April and November – December; summer season is May – October. (Table 5 from Al-Humaidhi et al. 2011)

		Green sturgeon bycatch estimates (number of fish)[1]						**Total Green Sturgeon**	
		WCGOP					**A-SHOP**	Bycatch estimate	95% confidence interval
		LE Trawl			**CA Halibut**		**At-Sea Hake**		
Year	**Season**	WA	OR	CA	LE	OA	All		
2002	Winter	0	7	0	19	--	0	217	140
	Summer	20	7	0	*164*	--	0		351
2003	Winter	0	0	0	10	*27*	0	389	158
	Summer	0	0	0	336	16	0		633
2004	Winter	0	0	0	0	65	0	349	165
	Summer	0	11	5	195	*74*	0		575
2005	Winter	0	0	0	220	71	0	658	283
	Summer	5	5	0	285	*72*	1		1,079
2006	Winter	0	5	0	786	--	0	793	508
	Summer	0	0	0	0	--	2		1,080
2007	Winter	0	0	0	55	0	0	109	16
	Summer	0	6	0	49	0	0		221
2008	Winter	*0*	0	0	164	0	0	189	99
	Summer	0	0	0	26	0	0		305
2009	Winter	0	12	0	*103*	*57*	0	333	167
	Summer	0	25	6	47	*82*	0		539
2010	Winter	0	0	0	*84*	0	0	190	146
	Summer	0	8	0	*98*	0	0		241

[1] We note that these estimates were based on the number of green sturgeon encountered in the observed portion of each fishery in a given year and season. If no green sturgeon were encountered in the observed portion of the fishery, the estimated bycatch was zero. Because only a portion of each fishery was

observed in each year and season (observer coverage ranged from 1% to 25% in the California halibut fishery and from 12% to 26% in the LE groundfish bottom trawl fishery), it is possible that green sturgeon were encountered in the fisheries but not in the observed portion. Data are not available at this time to assess the likelihood of this scenario or to estimate the number of green sturgeon encountered fleet-wide when none we encountered in the observed portion.

Because Southern DPS green sturgeon and Northern DPS green sturgeon co-mingle in coastal marine waters, we expect that a portion of the total estimated bycatch of green sturgeon belongs to the Northern DPS. Since 2007, the WCGOP and A-SHOP have collected tissue samples from observed green sturgeon encountered in the fisheries for genetic analysis, to determine the DPS composition of the green sturgeon encountered as bycatch. Samples from 2007 and 2008 have been analyzed to date. Eighteen of the 19 samples were collected from green sturgeon encountered in coastal waters adjacent to San Francisco Bay and one sample was collected from a green sturgeon encountered in coastal waters adjacent to the Columbia River estuary. Based on genetic analysis of those samples, 15 out of the 18 green sturgeon encountered off the coast of San Francisco Bay were assigned to the Southern DPS, as well as the one green sturgeon encountered offshore of the Columbia River estuary (Israel 2010).

In all areas except for the waters adjacent to San Francisco Bay, the available data were limited to stock composition data within coastal estuaries. Tagging and genetic studies both confirm wide distribution and use of coastal estuaries throughout the West Coast by Southern DPS green sturgeon. Genetic studies examining the stock composition of estuarine aggregations (Israel et al. 2009) indicate that almost all green sturgeon in the San Francisco Bay system belong to the Southern DPS. This is corroborated by tagging and tracking studies which found that no green sturgeon tagged in the Klamath or Rogue rivers (i.e., Northern DPS spawning rivers) were detected in San Francisco Bay (Lindley et al. 2011). However, green sturgeon in coastal waters adjacent to San Francisco Bay may include Northern DPS green sturgeon. As discussed above, genetic analysis of tissue samples collected from observed green sturgeon bycatch in coastal waters adjacent to San Francisco Bay indicated that approximately 17% (i.e., 3 out of 18) of the green sturgeon encountered and sampled belonged to the Northern DPS and approximately 83% (i.e., 15 out of 18) belonged to the Southern DPS (Israel 2010). The proportion of Southern DPS green sturgeon in Winchester Bay, Oregon, varied widely between years (0.16 to 0.55). Aggregations in the Columbia River estuary and Willapa Bay were primarily Southern DPS green sturgeon (proportions ranging from 0.69 to 0.88), whereas Grays Harbor had slightly greater proportions of Northern DPS green sturgeon (0.54 to 0.59). We applied these proportions to the estimated bycatch data to estimate the bycatch of Southern DPS green sturgeon from 2002 to 2010 and the expected bycatch of Southern DPS green sturgeon under the proposed action. In doing so, we made several assumptions. First, we assumed that the green sturgeon stock composition in coastal estuaries is representative of the stock composition in adjacent coastal marine waters. Second, we assumed that the 18 green sturgeon encountered, sampled, and genetically analyzed in 2007 and 2008 were a representative sample of the green sturgeon stock composition in waters adjacent to San Francisco Bay. Finally, where we did not have data on estuarine or marine stock composition (i.e., in coastal marine waters off Neah Bay, WA, and Humboldt Bay, CA), we assumed that 50% of the estimated bycatch belonged to the Southern DPS. This assumption was based on evidence from telemetry studies showing that both Southern DPS and Northern DPS green sturgeon occur in these areas (Lindley et al. 2008, 2011). Humboldt Bay is close in proximity to Northern DPS green sturgeon spawning rivers (Klamath River, CA, and Rogue River, OR), which may imply a greater likelihood that green sturgeon in this area are Northern DPS green sturgeon. However, Southern DPS green sturgeon migrating out of their natal waters migrate north the majority of the time and thus green sturgeon in waters off Humboldt Bay are just as likely to be Southern DPS green sturgeon. Similarly, both Southern DPS and Northern DPS green sturgeon are known to make northward migrations along the coast to Vancouver Island and further north. Thus, green sturgeon in waters off Neah Bay are just as likely to be Southern DPS green sturgeon as they are to be Northern DPS green sturgeon. Table 12 provides a summary of the coastal areas where green sturgeon have been encountered and the estimated proportion of Southern DPS green sturgeon.

Table 12. Estimated proportion of Southern DPS green sturgeon within areas along the U.S. West Coast where green sturgeon have been encountered.

Coastal area	**Estimated Proportion of Southern DPS green sturgeon**	**Reference**
Offshore of San Francisco Bay	0.83 to 1.0	Israel 2010; Israel et al. 2009
Offshore of Humboldt Bay	0.50	Best professional judgment
Oregon Coast (excluding area off Columbia River estuary)	0.16 to 0.55	Israel et al. 2009
Offshore of Columbia River estuary	0.69 to 0.88	Israel et al. 2009
Offshore of Willapa Bay	0.69 to 0.88	Israel et al. 2009
Offshore of Grays Harbor	0.41 to 0.46	Israel et al. 2009
Offshore of Neah Bay	0.50	Best professional judgment

Applying the proportions listed in Table 12, the total estimated bycatch of Southern DPS green sturgeon in the LE groundfish bottom trawl and California halibut fishery from 2002 to 2010 ranged from 90 fish (the lowest of the low estimates) to 789 fish (the highest of the high estimates) (See Tables 13 and 14 below). Based on these estimates, most of the bycatch is expected to be of Southern DPS green sturgeon because most encounters occurred in coastal marine waters adjacent to San Francisco Bay. This is expected given that these waters are the primary trawl grounds for the California halibut fishery (Bellman et al. 2011). As discussed above, the total estimated bycatch of green sturgeon was greater in the period from 2002 through 2006 and decreased after 2007, likely due to revised CDFG regulations, which reduced access to the California halibut trawl fishery and consequently reduced the total estimated bycatch of green sturgeon in waters adjacent to San Francisco Bay. As stated above, the revised CDFG regulations will still be in place throughout the duration of the proposed action. Because of this, the fishery effort and green sturgeon bycatch levels from 2007 through 2010 are likely to be more representative of what would be expected under the proposed action, compared to the fishery effort and green sturgeon bycatch levels observed in the years prior to implementation of the revised CDFG regulations. Although bycatch of as many as 789 Southern DPS green sturgeon could occur under the proposed action, the available bycatch data from 2002 through 2010 indicate that such a high level of bycatch is not likely. In 7 out of the 9 years over this time period, the estimated bycatch of Southern DPS green sturgeon was below 400 fish per year, and in 4 out of the 9 years, the estimated bycatch of Southern DPS green sturgeon was at or below 200 fish per year (three of those years occur in the period from 2007 to 2010). Therefore, the expected bycatch of Southern DPS green sturgeon in the LE groundfish bottom trawl and California halibut fisheries under the proposed action is likely to be on the lower end of the range, from 90 to 328 green sturgeon annually (based on the estimated bycatch of Southern DPS green sturgeon in the period from 2007 through 2010).

The length frequency distribution of observed green sturgeon bycatch from 2007 through December 2010 in the LE groundfish bottom trawl and California halibut fisheries indicates that the majority of the green sturgeon encountered consists of subadults (WCGOP 2011, unpublished data). Using a minimum fork length of 140 cm for adults (corresponding to approximately 150 cm TL; pers. comm. with David Woodbury, NMFS, on January 10, 2012), 8 out of the 88 green sturgeon observed and measured as bycatch in the fisheries were adults (range in fork length = 61 to 213 cm). Based on the assumption that the composition of the observed green sturgeon bycatch from 2007 to 2010 is representative of the expected bycatch in the proposed fisheries for 2012, we expect that the majority of the Southern DPS green sturgeon encountered under the proposed action would be subadults, with 8 to 30 adult Southern DPS green sturgeon expected to be encountered per year (Tables 13 and 14).

Table 13. Low estimated bycatch of Southern DPS (SDPS) green sturgeon from 2002 through 2010, and associated bycatch mortality using the low estimated proportion of Southern DPS green sturgeon. The estimated total green sturgeon bycatch represents the expanded green sturgeon bycatch estimates across the whole fleet regardless of whether the green sturgeon belong to the Northern DPS or the Southern DPS, as reported in Al-Humaidhi et al. 2011. Note: Estimated Southern DPS green sturgeon bycatch mortalities are discussed in the following section.

YEAR	Estimated total green sturgeon bycatch	Estimated SDPS green sturgeon bycatch			Estimated SDPS green sturgeon bycatch mortalities		
		Subadult bycatch	Adult bycatch	Total Bycatch	Subadult mortalities	Adult mortalities	Total mortalities
2002	217	157.5	15.7	173	8.2	0.8	9.0
2003	389	293.5	29.4	323	15.3	1.5	16.8
2004	350	255.7	25.6	281	13.3	1.3	14.6

2005	658	493.9	49.4	543	25.7	2.6	28.3
2006	791	593.8	59.4	653	30.9	3.1	34.0
2007	110	82.2	8.2	90	4.3	0.4	4.7
2008	190	143.4	14.3	158	7.5	0.7	8.2
2009	332	245.8	24.6	270	12.8	1.3	14.1
2010	190	142.3	14.2	157	7.4	0.7	8.1
TOTAL	3227	2408.2	240.8	2649	125.2	12.5	137.7

Table 14. High estimated bycatch of Southern DPS green sturgeon from 2002 through 2010, and associated bycatch mortality, using the high estimated proportion of Southern DPS green sturgeon. The estimated total green sturgeon bycatch represents the expanded green sturgeon bycatch estimates across the whole fleet regardless of whether the green sturgeon belong to the Northern DPS or the Southern DPS, as reported in Al-Humaidhi et al. 2011. Note: Estimated Southern DPS green sturgeon bycatch mortalities are discussed in the following section.

YEAR	Estimated total green sturgeon bycatch	Estimated SDPS green sturgeon bycatch			Estimated SDPS green sturgeon bycatch mortalities		
		Subadult bycatch	Adult bycatch	Total Bycatch	Subadult mortalities	Adult mortalities	Total mortalities
2002	217	189.6	19.0	209	9.9	1.0	10.8
2003	389	353.6	35.4	389	18.4	1.8	20.2
2004	350	311.2	31.1	342	16.2	1.6	17.8
2005	658	595.2	59.5	655	30.9	3.1	34.0
2006	791	717.0	71.7	789	37.3	3.7	41.0
2007	110	99.3	9.9	109	5.2	0.5	5.7
2008	190	172.7	17.3	190	9.0	0.9	9.9
2009	332	297.8	29.8	328	15.5	1.5	17.0
2010	190	171.9	17.2	189	8.9	0.9	9.8
TOTAL	3227	2908.4	290.8	3199	151.2	15.1	166.4

At-sea Pacific Hake/Whiting fishery

Based on observed bycatch data from 2002 through 2010, bycatch of green sturgeon in the At-sea Pacific hake/whiting fishery is rare. Only three green sturgeon have been observed as bycatch in this fishery, one in the summer of 2005 and two in the summer of 2006 (see Table 11). We have biological data and information regarding the tow location of the vessel for one of the two green sturgeon encountered in the summer of 2006. The green sturgeon (a subadult at 134 cm total length) was caught in June 2006, in waters off the coast of Grays Harbor, Washington, during an observed tow at a depth of 45 fm (Duane Stevenson and Vanessa Tuttle, NMFS, unpublished data, September 2006). Biological and tow data were not available for the other two green sturgeon encountered in this fishery. Given the lack of data, we must make assumptions regarding the DPS and life stage of the green sturgeon that have been encountered and those that are likely to be encountered under the proposed action. Assuming that all of the green sturgeon caught in this fishery were Southern DPS green sturgeon, bycatch of Southern DPS green sturgeon as a result of the operation of this fishery under the proposed action would be expected to range from zero to two subadults or adults.

Summary of expected bycatch of Southern DPS green sturgeon

Based on available estimated bycatch data for the fisheries from 2002 through 2010, we expect that between approximately 90 to 330 Southern DPS green sturgeon may be encountered in the WCGF fishery under the proposed action. The majority of the encounters are likely to occur in the coastal waters adjacent to San Francisco Bay and in depths ranging from 5-9 fathoms. We expect the majority of the encounters to be subadult Southern DPS green sturgeon.

Sublethal Effects and Mortality

After estimating the expected bycatch, we then identified how Southern DPS green sturgeon adults and subadults are likely to respond given their exposure to the action's effects. Based on the available data, Southern DPS green sturgeon are likely to experience sublethal and lethal effects as a result of bycatch in the fisheries. To estimate the proportion of fish likely to die as a result of the action's effects, we first estimated the bycatch mortality rate of green sturgeon incidentally caught in the fisheries, by fishery sector, making several assumptions about the immediate and delayed mortality rates imposed on green sturgeon. We then applied these mortality rates to estimate the number of Southern DPS green sturgeon adults and subadults likely to die. We assumed that the remaining Southern DPS green sturgeon encountered and released alive would be subject to sublethal effects only and are likely to survive. In the following paragraphs, we describe this analysis and the assumptions and uncertainties involved in more detail.

A-SHOP data indicate that all three green sturgeon encountered in the At-sea Pacific hake/whiting fishery died as a result of the encounter. Therefore, we can expect that green sturgeon encountered in this fishery (estimated to range from 0 to 2 Southern DPS green sturgeon) under the proposed action will die.

An estimate of the mortality of green sturgeon incidentally captured in the LE groundfish bottom trawl fishery and California halibut fishery has not been generated. Limited acipenserid bycatch mortality data is available from commercial trawl fisheries. From 1989 to 2000, no Atlantic sturgeon bycatch mortalities were observed in Northeastern U.S. commercial otter trawl fisheries (Stein et al. 2004). There was no information on condition of acipenserids upon capture or estimates of delayed mortality associated with this fishery. Fisheries observers collected bycatch data on a percentage of the LE groundfish bottom trawl and California halibut fisheries conducted on the U.S. West Coast. The WCGOP (2011, unpublished data) reported biological data on 88 green sturgeon incidentally captured and observed from 2007-2010. Additional notes were included on the condition of 32 of these individuals; one of these 32 individuals was reported as dead (3.1%). Therefore, immediate bycatch mortality of green sturgeon in this fishery is potentially low. In addition, three of the 32 individuals were reported in poor condition. Overall, four of the 32 individuals were reported as dead or in poor condition (12.5%), but these data are not representative of the entire fishery due to inconsistencies in data collection and condition reporting. Ocean surface temperatures where the majority of green sturgeon bycatch occurred rarely exceed 16 degrees Celsius, even during summer or El Nino years; therefore, water temperature is not considered to have a significant effect on bycatch mortality. The data set is too small to accurately correlate other tow parameters (e.g. duration, depth, overall catch weight, etc.) with green sturgeon mortality. Assuming only one mortality occurred, and parameters when biological data were collected for these 32 green sturgeon were somewhat representative of the entire fishery, we can generate a qualitative immediate mortality rate estimate of 3.1%. We considered this a qualitative estimate of immediate mortality, recognizing that a sample size of 32 green sturgeon is small and an estimate based on this dataset may be associated with a large error rate. However, these are the best data available at this time upon which we can base an estimate of immediate mortality. The assumptions and justification for a qualitative estimation of the rate of overall mortality (immediate and delayed mortality) are further discussed below.

In addition to immediate mortality, mortality following capture and release, or "delayed mortality," is anticipated in commercial fishing. Immediate mortality is the only available measure of overall mortality in many assessments of acipenserid bycatch. Robichaud et al. (2006) assessed immediate and delayed bycatch mortality rates in white sturgeon with three methods and found the set gillnet had both the highest immediate and delayed mortality rate of the three methods. This study, however, is not analogous to mortality in the groundfish bottom trawl fisheries because gillnet set times were considerably longer (i.e., overnight) than tows, and post-capture holding had significant effects on delayed mortality (Robichaud et al. 2006). Nonetheless, this shows that immediate bycatch mortality could have some relation to delayed mortality in acipenserids.

With limited available information involving acipenserid mortality in trawl fisheries, information from the following gillnet studies was necessary to generate a qualitative estimate of overall mortality in this fishery: (1) observed mortality in the Columbia River test gillnet fishery; and (2) qualitative mortality from capture and tagging of green sturgeon in the San Pablo Bay. The primary direct effects of capture of green sturgeon with shallow gillnets are entanglement and associated abrasion, laceration, constriction, and restriction of ventilation and/or respiration. In addition to some entanglement, the primary direct effects of capture of green sturgeon with trawl nets involve rapid decompression (associated with hauling the trawl from depth), impingement, and crushing of green sturgeon by other fish or materials in the trawl. Both methods typically involve removal of green sturgeon from the water for varying duration prior to release. These gillnet studies are used to generate a qualitative green sturgeon mortality estimate for trawl bycatch under the assumption that gillnetting and trawling have similar attributable green sturgeon mortality rates in the respective fisheries.

In the LE groundfish bottom trawl and California halibut fisheries, most observed green sturgeon bycatch occurred in less than 60 fm depth; tows ranged from 0.5 to 8 hours in duration, with a mean tow time of approximately 3.5 hours (WCGOP 2011, unpublished data). Green sturgeon gillnetting data included in this opinion were associated with scientific collection[6] and typically involved similar set times (<2 hours) to average tow times in the groundfish bottom trawl fishery. Gear set or tow time with these methods appear to have some direct relationship to bycatch mortality of acipenserids; longer set times involve higher immediate and, in some cases, delayed mortality (Stein et al. 2004; Robichaud et al. 2006). In the Northeastern US, Stein et al. (2004) estimated Atlantic sturgeon bycatch in otter trawl, drift gillnet, and sink gillnet commercial fishing. Sink gillnetting involved the longest set times and also the highest observations of immediate Atlantic sturgeon bycatch mortality (22%) (Stein et al. 2004). On the Fraser River, Robichaud et al. (2006) estimated immediate and delayed white sturgeon bycatch mortality in set gillnet, drift gillnet, and hook and line fishing. Set gillnetting involved the longest set times (overnight) and also the highest observations of immediate and delayed (following a 3-day post-capture holding period) white sturgeon bycatch mortality (6.2% and 46.9% respectively; Robichaud et al. 2006).

Condition upon capture observation rates have only a qualitative value in estimating overall bycatch mortality. Delayed mortality could occur in sturgeon with no visible signs of poor condition, while sturgeon with obvious signs of poor condition could later recover to their pre-capture condition. Robichaud et al. (2006) found no statistical difference in condition upon capture of white sturgeon that survived a 3-day post-capture holding period vs. those that died. Condition upon capture, however, can qualitatively represent delayed mortality in the following way: delayed mortality in sturgeon observed to be in good condition are qualitatively represented by sturgeon observed in poor condition that recover. Therefore, observed immediate green sturgeon mortality and condition upon capture can be used as a proxy to estimate overall mortality.

ODFW (2006) used condition upon capture and release of green sturgeon in the Columbia River test gillnet fishery during the month of July, 1992, to establish an estimated 5.2% green sturgeon bycatch mortality for the fall, 2006, Columbia River commercial gillnet fishery. Additional data from July 2004 increased the total number of green sturgeon capture in July to 258 with no additional observed mortalities, thus reducing the mortality estimate to 3.1% from 5.2% (ODFW unpublished data from pers. comm. with Olaf Langness December 29, 2011). “Mortality” was presumably defined as sturgeon floating upon capture or displaying a loss in

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[6] More care is taken when handling fish in scientific collection than in commercial fisheries but it is difficult to quantify an effect of handling care on mortality.

equilibrium (pers. comm. with Olaf Langness, WDFW, on December 29, 2011). This estimate is potentially conservative or high. Gillnetting during summer has resulted in direct green sturgeon mortality (pers. comm. with Dan Erickson, ODFW, on January 3, 2012); this is likely due to increases in physiological stress, such as hypoxia, associated with warmer water temperatures. Subsequent records from the Columbia River test gillnet fishery indicated lower mortality (ODFW unpublished data from pers. comm. with Olaf Langness December 29, 2011). During the month of June from years 1986 to 1993, gillnet capture of green sturgeon totaled 295 individuals with eight observed mortalities, or 2.7% mortality (ODFW unpublished data from pers. comm. with Olaf Langness December 29, 2011).

Between April 2004 and March 2006, Heublein et al. (2009) captured and released 212 green sturgeon with gillnets in waters of less than 10 meters depth in San Pablo Bay, California. No mortality was observed in green sturgeon caught and released immediately from gillnets (unpublished data from Heublein et al. 2009, pers. comm. with Joe Heublein, NMFS, January 2012). Short term (~24-hour) delayed mortality could be measured in 96 green sturgeon surgically implanted with acoustic tags and released following recovery; these sturgeon were held in onboard holding tanks for approximately 24 hours following gillnet capture (Heublein et al. 2009). No short-term delayed mortality was observed, and all but two fish vigorously swam following release; the post-release lethargy observed in two fish was attributed to a new anesthetic technique and not the capture or tag implantation methodologies (unpublished data from Heublein et al. 2009, pers. comm. with Joe Heublein, NMFS, January 2012). Furthermore, no long-term (>24-hour) delayed mortality has been attributed to tagged green sturgeon initially captured by either gillnet or hook and line in San Pablo Bay or the Sacramento River (i.e., lack of detections was attributed to poor tag performance or lack of receiver coverage) (unpublished data from Heublein et al. 2009, pers. comm. with Joe Heublein, NMFS, January 2012, pers. comm. with Matt Manuel on December 22, 2011). Based on the mortality estimate for gillnetting of green sturgeon in the lower Columbia River and data from tracking of green sturgeon captured with gillnets in San Pablo Bay, it is unlikely mortality associated with gillnetting of green sturgeon under similar conditions would exceed 5.2%.

As described above, some delayed mortality is expected in commercial bycatch; a green sturgeon bycatch mortality estimate based only on immediate mortality is likely to be low. Bycatch in gillnet and trawl gear have different effects on green sturgeon. Similar fishing parameters (tow and set duration, depth, etc.) and low numbers of immediate green sturgeon mortality in these two methods could result in similar overall bycatch mortality. Even with these similarities, there is likely to be some disparity in bycatch mortality between two different fishing methods. Therefore, NMFS used the higher green sturgeon gillnet mortality estimate of 5.2% from ODFW (2006) as a qualitative measure of overall green sturgeon mortality in this trawl fishery.

Applying this qualitative mortality rate estimate of 5.2% to the expected estimated bycatch, the total estimated mortality of Southern DPS green sturgeon in the LE groundfish bottom trawl and California halibut fisheries from 2002 through 2010 ranged from 4.7 to 41 fish (Tables 13 and 14). It is notable to add that the size data suggest the majority of the observed green sturgeon bycatch consists of subadult fish (WCGOP 2011, unpublished data). Assuming that the composition of the observed green sturgeon bycatch in 2007 through 2010 is representative of the bycatch throughout the fisheries from 2002 through 2010, the bycatch of Southern DPS green sturgeon in the fisheries is estimated to have resulted in the mortality of 4.3 to 37.3 subadults and 0.4 to 3.7 adults per year (Tables 13 and 14). The range in estimated Southern DPS green sturgeon mortalities was greater in 2002 through 2006 (9 to 41 fish) compared to the estimated mortalities in 2007 through 2010 (4.7 to 17 fish), presumably due to the decrease in green sturgeon bycatch following implementation of CDFG's revised 2006 regulations restricting access to the California halibut fishery. As stated above, because CDFG's revised regulations will be in place during the duration of the proposed action, the green sturgeon bycatch levels from 2007 through 2010 are likely to be more representative of the bycatch levels expected under the proposed action than the bycatch levels from 2002 through 2006. Based on this assumption, the mortality of Southern DPS green sturgeon as a result of bycatch in the LE groundfish bottom trawl and California halibut fishery under the proposed action would be expected to range from 4.7 to 17 fish (including 4.3 to 15.5 subadults and 0.4 to 1.5 adults).

Because of expected natural mortality, the loss of 4.7 to 17 Southern DPS green sturgeon in ocean fisheries would not translate to the loss of 4.7 to 17 spawning adults. The annual survival rate of green sturgeon was previously estimated to be 0.83. Of the fish killed in the bycatch some would die from natural mortality or other causes prior to spawning. Since the age structure and number of years prior to spawning of the fish killed in the fishery is unknown we can only qualitatively indicate that the effect on future spawning is less than indicated by the estimated mortality, particularly for subadult fish.

Sublethal impacts on subadult Southern DPS green sturgeon caught and released in these fisheries could include stress, changes in migratory behavior, and injury (which may affect migration, growth, development, future reproductive success, etc.). Sublethal impacts on adult Southern DPS green sturgeon would be the same, but may also include changes in spawning behavior and physiology, and the loss of spawning potential (e.g., disruption of spawning migration and atresia).

Summary of sublethal effects and mortalities of individual Southern DPS green sturgeon

The bycatch of Southern DPS green sturgeon under the proposed operation of the Pacific Coast Groundfish fisheries in 2012, is expected to result in the mortality of 4.3 to 17.5 subadults and 0.4 to 3.5 adults, as well as sublethal impacts to as many as 300 subadults and 32 adults. These estimates of expected take include the expected take in all relevant sectors of the Pacific Coast Groundfish fisheries that encounter green sturgeon (i.e., the LE groundfish bottom trawl, California halibut bottom trawl, and At-sea hake/whiting fisheries). Thus, NMFS concludes that the take of Southern DPS green sturgeon in the course of the proposed action is likely to reduce the survival, growth, and/or reproductive success of individual Southern DPS green sturgeon.

We note that the estimated take of Southern DPS green sturgeon under the proposed operation of the fisheries in 2012 is based on available data on observed and estimated green sturgeon bycatch in the fisheries from 2002 through 2010 and that there are many uncertainties regarding these historical data. First, the total bycatch of green sturgeon across the whole fishery was estimated from the observed bycatch of green sturgeon, because only a portion of each fishery was observed in each year (ranging from 12 to 26% in the LE groundfish bottom trawl fishery, 3 to 25% in the California halibut fishery, and 100% in the At-Sea hake/whiting fishery). There is estimation error in the expansion of the observed bycatch to an estimated total bycatch across the whole fishery. Second, information on the recapture rate of green sturgeon is lacking. It is unknown whether the same individuals are encountered as bycatch more than once in a year. If they are, then the total observed and estimated expanded green sturgeon bycatch, as well as the assessment of impacts to those individuals, could be affected. Third, estimates of bycatch mortality (immediate and delayed) are uncertain. The estimates reported in this opinion are based on observations of the condition of 32 green sturgeon encountered and observed in the fisheries in the period from 2007 through 2010, as well as post-release mortality estimates from coastal estuarine gillnet fisheries. The large range in estimated bycatch and bycatch mortality reflect the high degree of uncertainty in the data. However, these data are the best available at this time for our analysis. In the future, additional information should be collected to address these uncertainties, to support a more thorough and accurate analysis of the action and its effects on Southern DPS green sturgeon.

Species-Level Analysis

As stated above in the “Status of the Species” section, population abundance estimates are not available for Southern DPS green sturgeon, nor are they available for Northern DPS green sturgeon. Recent surveys estimated 175 to 250 sturgeon (+/- 50) were present in the mainstem Sacramento River during the spawning season in 2010 and 2011 (pers. comm. with Ethan Mora, UC Davis, on January 10, 2012). As noted previously, there are a number of uncertainties regarding these estimates. Among the analyses that have yet to be completed are verification that the sturgeon observed are green sturgeon and what proportion might be white sturgeon, and characterization of the movements of individual green sturgeon to estimate the emigration and immigration of sturgeon from the surveyed portion of the river throughout the spawning season. Given these uncertainties, caution must be taken in applying these survey results to estimate the spawning run size for the Sacramento River until further analyses have been conducted. However, at this time, this is the best available information upon which to base an estimate of the adult and subadult population abundance in order to evaluate the potential effects of the proposed action on the Southern DPS green sturgeon population. To generate a rough population estimate, this analysis assumed that the observations of 175 to 250 sturgeon in the mainstem Sacramento River during the spawning seasons of 2010 and 2011 are observations of Southern DPS green sturgeon adults and are representative of the spawning run size for those survey years, recognizing that there is great uncertainty associated with using these estimates. Applying a spawning periodicity of 2 to 4 years (Erickson and Webb 2007) and making the assumption that the proportion of juveniles, subadults, and adults in the population is similar to that expected in an equilibrium population (25% juveniles, 63% subadults, and 12% adults; Beamesderfer et al. 2007), we estimate that the Southern DPS green sturgeon population is comprised of 350 to 1000 adults and 1838 to 5250 subadults. The total population of juveniles, subadults, and adults combined is estimated to range from 2917 to 8333 individuals. The broad range reflects the high degree of uncertainty in these estimates. These adult and subadult abundance estimates were used as the best available information to evaluate the potential effects of the proposed action on Southern DPS green sturgeon.

Lethal and sublethal take of adult Southern DPS green sturgeon can have the greatest effect on the overall population due to immediate loss of spawning potential and changes in spawning behavior and physiology. An estimated 0.8 to 9.1% (i.e., 8 to 32 adults) of the adult population is expected to be encountered as bycatch during the operation of the fisheries in 2012, with 0.04 to 1% (i.e., 0.4 to 3.5 adults) of the adult population expected to die. The high estimated proportion of the adult population that may be affected was calculated using the lowest estimated adult population size (350 adults) and the highest estimated number of adults expected to be encountered (32) and expected to die (3.5). The low estimated proportion of the adult population that may be affected was calculated using the highest estimated adult population size (1000 adults) and the lowest estimated number of adults expected to be encountered (8) and expected to die (0.4). The wide range in the estimated bycatch and bycatch mortality reflects the high degree of uncertainty in the bycatch and population estimates. However, observations of the annual abundance of adult green sturgeon in the Sacramento River over recent years indicate that the size of the adult population is likely to be at the higher end of the estimated range (around 800 to 1000 adults; pers. comm. with David Woodbury, NMFS, on January 10, 2012). If that is the case, then the estimated proportion of the adult population expected to be encountered as bycatch is likely to be closer to 0.8 to 3% and the estimated proportion of the adult population expected to die as a result of the proposed action is likely to be closer to 0.04 to 0.3%. Thus, the expected lethal take is a small number (0.4 to 3.5 adults) and a small proportion (0.04 to 0.3%) of the adult population. The high estimates may be inflated, because they include the assumption that 2 adult Southern DPS green sturgeon will be encountered and killed in the At-Sea hake fishery during the proposed action, whereas the A-SHOP data from 2002 through 2010 indicate that in most years no green sturgeon were encountered.

The potential effects of the estimated lethal take of adults on Southern DPS green sturgeon population viability may be evaluated using information from a simple life table model developed by Beamesderfer et al. (2007). Although the Beamesderfer et al. (2007) model makes several assumptions that are rarely met (i.e., constant recruitment, population equilibrium, stable size and age structure, and lack of density dependence), it provides a tool for evaluating the sensitivity of the population to changes in demographic rates, including how fish numbers and reproductive potential may be affected by varying rates of mortality operating over different size ranges of green sturgeon. Results from the model indicate that fishing mortality rates of 7% to 25% on adult green sturgeon (>165 cm in total length) may reduce reproductive potential to 20% to 50% of the values expected with no fishing mortality (Beamesderfer et al. 2007). Comparing the estimated proportion of the adult population subject to bycatch mortality under the proposed action to these fishing mortality rates, the proportion of the adult population subject to bycatch mortality under the proposed action is much lower than the mortality rates that are estimated by the model to substantially reduce reproductive potential. This suggests that the expected lethal take of adult Southern DPS green sturgeon under the proposed action is not likely to result in substantial impacts to the overall viability of the population. We note, however, that estimates of the mortality imposed on adult Southern DPS green sturgeon from sources external to the proposed action are lacking. Such estimates would inform a more comprehensive analysis of how the estimated lethal take of adults under the proposed action may affect Southern DPS green sturgeon at the population and species level.

The sublethal impacts of the proposed action on adult Southern DPS green sturgeon may have an immediate effect on the reproductive potential of the population. Handling and/or injuries as a result of encounters in the fisheries may result in changes in spawning behavior and physiology. For example, if an adult green sturgeon is encountered prior to its upstream spawning run, the fish may abort its spawning run and delay spawning until the next year. Little information is available on the effects of bycatch in bottom trawl fisheries on adult green sturgeon spawning behavior and physiology. Green sturgeon captured and tagged for research purposes during their upstream spawning migrations have been shown to continue on their upstream migrations, presumably to spawn. Although the gear and handling conditions involved in the capture and tagging of green sturgeon for research differ from the gear and conditions involved in the bottom trawl fisheries, these observations suggest that adult green sturgeon encountered in the fisheries and released alive may continue on their spawning migrations. This suggests that the sublethal take of 8 to 32 adult green sturgeon may not have substantial impacts on the overall viability of Southern DPS green sturgeon. However, we note that further studies are needed to better characterize the sublethal impacts of bycatch in the fisheries on adult Southern DPS green sturgeon.

Lethal and sublethal take of subadult Southern DPS green sturgeon is expected to be much greater than the take of adults. Because subadult green sturgeon are not yet reproductively mature, the sublethal impacts of take do not have an immediate effect on spawning potential and are likely to be less severe. However, population models have shown that the loss of a portion of the subadult population can have a substantial effect on the future adult population size and reproductive potential (Beamesderfer et al. 2007). An estimated 1.6 to 16.3% of the subadult population is expected to be encountered in the operation of the fisheries in 2012, with 0.08 to 1% of the subadult population subject to lethal take. The high estimated proportion of the subadult population that may be affected was calculated using the lowest estimated subadult population size (1838 subadults) and the highest estimated number of subadults expected to be encountered (300) and expected to die (17.5). The low estimated proportion of the subadult population that may be affected was calculated using the highest estimated subadult population size (5250 adults) and the lowest estimated number of subadults expected to be encountered (82) and expected to die (4.3). The wide range in the estimated bycatch and bycatch mortality reflects the high degree of uncertainty in the bycatch and population estimates.

The potential effects of the estimated lethal take of subadults on Southern DPS green sturgeon population viability may also be evaluated using information from the Beamesderfer et al. (2007) life table model. Results from the model indicate that fishing mortality rates of 5% to 10% on subadult green sturgeon (from 117 to 183 cm in total length) may reduce reproductive potential to 20% to 50% of the values expected with no fishing mortality (Beamesderfer et al. 2007). The estimated lethal take of 0.08 to 1% of the subadult population is lower than these fishing mortality rates, suggesting that the estimated lethal take of subadults is not likely to substantially reduce the reproductive potential and viability of Southern DPS green sturgeon. In addition, if the adult population size is actually 800 to 1000 fish, the size of the subadult population is likely to be at the higher end of the estimated range as well (approximately 3000 to 5000 subadults). If this were the case, the proportion of the subadult population subject to lethal take would likely be closer to the lower end of the estimated range (0.08 to 0.3%). However, as stated above, information is lacking regarding the mortality rates imposed on subadult Southern DPS green sturgeon from other sources. This information is needed to more comprehensively evaluate how the estimated lethal take of subadults under the proposed action may affect Southern DPS green sturgeon at the population and species level.

The sublethal impacts of the proposed action on subadult Southern DPS green sturgeon may not have an immediate effect on the reproductive potential of the population, but could affect the growth and reproductive development of subadults. A potentially high proportion (16.3%) of the subadult population may be subject to bycatch based on the estimated range of subadult green sturgeon that may be encountered. However, as stated above, if the adult population size is actually 800 to 1000 fish, the size of the subadult population is likely to be at the higher end of the estimated range as well (approximately 3000 to 5000 subadults). If this were the case, the proportion of the subadult population subject to sublethal take would likely be closer to the lower end of the estimated range (1.6 to 5.7%). Bycatch data from 2002 through 2010 indicate that the majority of green sturgeon encountered will be released alive. The hardy nature of green sturgeon suggests that the individuals caught and released alive and in good condition are likely to recover from any sublethal impacts. This suggests that the sublethal take of subadults under the proposed action is not likely to have a substantial effect on the viability of Southern DPS green sturgeon. However, additional information is needed to better inform our understanding of the sublethal impacts on green sturgeon from being caught, handled, and released in these fisheries.

2.4.1.3 Humpback Whales

The proposed fishing may affect listed humpback whales through direct effects from entrapment and entanglement in fishing gear as well as indirect effects on prey availability. Even though the proposed fishing targets species at higher trophic levels than are consumed by humpback whales, removal of this biomass could still indirectly affect prey availability at lower trophic levels that are consumed by humpback whales (e.g., by disrupting food-web dynamics of the ecosystem). Humpback whales that occur within the action area are part of the California/Oregon/Washington stock (Carretta et al. 2010). Therefore, effects of the proposed action are specific to this stock. We then put effects specific to this stock in the context of effects to the globally-listed species.

Effects from Entrapment and Entanglement in Fishing Gear

We compared the human-caused serious injuries and mortalities of humpback whales with and without entanglements from proposed fishing and found that the proposed fishing will increase the average number of human-caused serious injuries and mortalities, annually. This analysis considers whether effects of increased human-caused serious injuries and mortalities may reduce the reproduction, numbers, or distribution of humpback whales, pursuant to the regulatory definition of jeopardy. We evaluated the potential effects of proposed fishing on humpback whales based on the best scientific information about past human interactions with humpback whales including past entanglements in fishing gear.

We analyzed effects in three steps. First, we examined the overlap between the fishery and whale occurrence. Next, we estimated the number of serious injuries and mortalities expected to be caused by the proposed fishing in 2012. Finally, we considered the consequences of that level of injury and mortality at the population level. This analysis highlights our level of confidence in the available data, identifies where there is uncertainty in light of data gaps, and identifies how we based assumptions in our analysis on the best available science.

The pertinent information that helped us consider consequences at the population level:

- We compared the estimated number of human-caused serious injuries and mortalities of CA/OR/WA humpback whales likely to occur in 2012 (from baseline, cumulative effects and proposed fishing) to the estimated potential biological removal (PBR) metric for this stock (as estimated in Carretta et al. 2010).

- We evaluated the recent rate of increase of the species and compared this to the rate expected in the absence of human-caused mortality on the CA/OR/WA stock, including potential mortality from entanglements.

Degree of Spatial Overlap

Humpback whales occur at highest densities near the coast, and therefore generally have a relatively high degree of spatial overlap with the WCGF fishery (Figure 9). Among the three fisheries categories, the highest overlap index was with the fixed-gear fishery, followed by the mid-water trawl hake fishery and the bottom trawl fishery (NWFSC 2011, Appendix B). For the fixed-gear portion of the fishery, peak areas of overlap (>17 animal hours/km^2) occur north of Cape Mendocino, off the central Oregon coast, and off the Columbia River mouth (Figure 9). For the trawl fishery, the highest overlap indices occur along the north portion of the coast from Cape Mendocino to Cape Flattery, and areas of overlap are > 3 animals hours/km^2 (Figure 9). The highest overlap indices for the hake fishery occur near Cape Flattery, and are < 2 animal hours/km^2 (Figure 9). The degree of overlap indicates there are substantial opportunities for humpback whales to interact with proposed fishing.

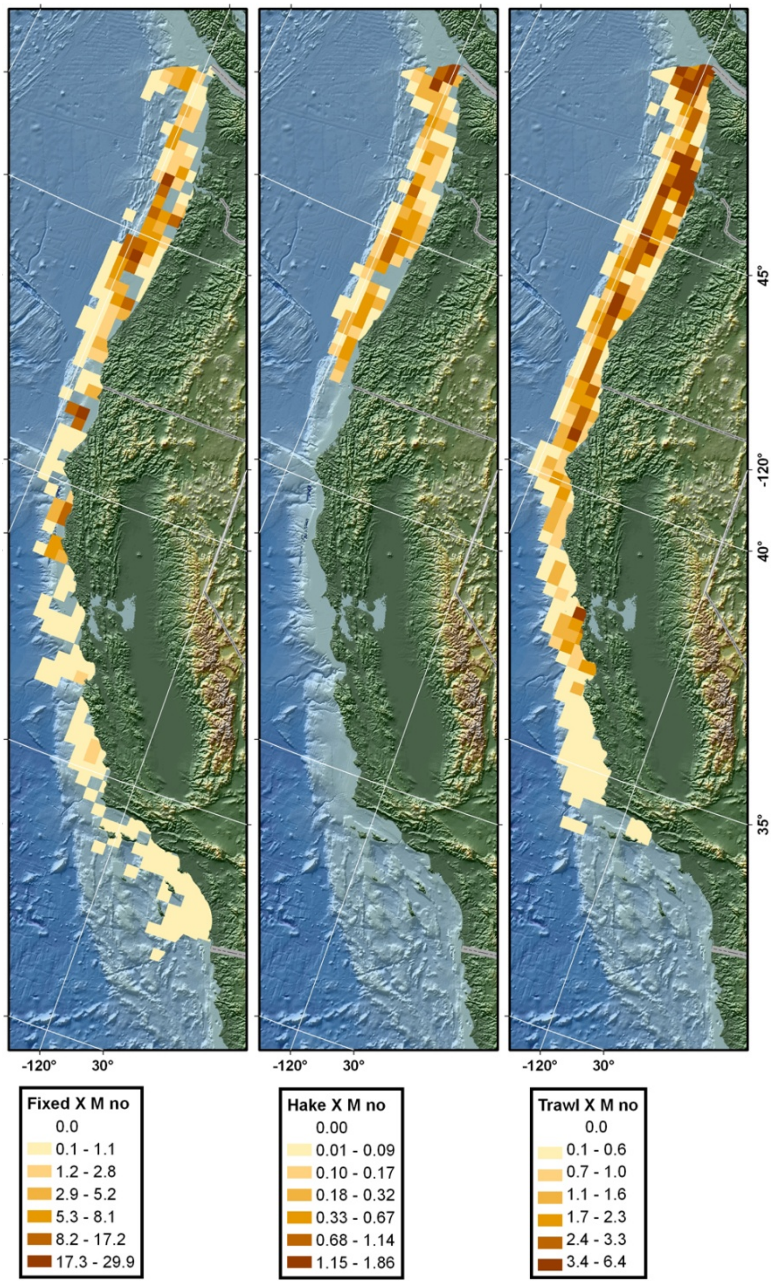

Figure 9. Overlap indices of humpback whales with three fishery sectors: fixed gear, hake trawl (mid-water trawl), and bottom trawl. Indices are in units of animal hours/km^2. (NWFSC 2011; in Appendix B for details).

Serious Injury and Mortality

We used the number of past entanglements and ship collisions of CA/OR/WA humpback whales from 2004-2008 to estimate the number of entanglements and ship collisions anticipated to occur over the same timeframe into the future. The number of ship collision and entanglements were then added together to estimate the number of potential serious injuries and mortalities that could occur over a 5-year period in the future. Because the opinion term is 1 year, we divided the total by five to represent an average annual estimate. All CA/OR/WA humpback and unidentified whales that were reported entangled in fishing gear within the action area were used to inform these estimates (from 2004-2008, as summarized in the environmental baseline for humpback whales; Section 2.3.3 and reported in Carretta et al. 2010). We consider it appropriate to include all past entanglements to estimate the number of potential serious injuries and mortalities that could occur in the future for three reasons, described below.

(1) Successful disentanglement cannot be relied upon with certainty in the future. An attempt to disentangle a large whale from fishing gear is a highly opportunistic event and the success of a disentanglement attempt is also variable. Therefore, although two entangled whales were successfully disentangled from 2004-2008, we still included these whales in our estimates.

(2) Carretta et al. (2010) indicated that most of the unidentified whale entanglements from 2004-2008 were likely to be humpback whales. Therefore, we included all 12 unidentified whales in our estimates.

(3) Observed injuries and mortalities from entanglement in fixed-gear fisheries represent minimum estimates. The number of observations is a minimum estimate because of the difficulty of observing entanglement events (as previously described in the environmental baseline for humpback whales; Section 2.3.3). In light of this uncertainty, including both successfully disentangled whales and unidentified whales in our estimates is more conservative.

For the purposes of this biological opinion, we evaluated the average annual number of serious injuries and mortalities of CA/OR/WA humpback whales under two scenarios: (1) with the proposed fishing (potential serious injuries and mortalities from all human-caused sources) and without the proposed fishing (potential serious injuries and mortalities from all human-caused sources except the proposed fishing) to isolate effects of the action.

When added together, the number of ship collision (3 WA/CA/OR humpbacks; Carretta et al. 2010) and entanglements (18 WA/CA/OR humpbacks + 12 unidentified whales; Carretta et al. 2010) is 33 whales from 2004-2008. There is uncertainty about the number of past entanglements attributed to the proposed fishing, because in most instances the entangling gear could not be identified to a specific fishery. The gear from one entanglement is known to be from the WA/OR/CA sablefish pot fishery of the proposed action (Carretta et al. 2010); however, most of the entanglements were characterized as pot/trap gear from unidentified fisheries. Some of these may therefore have involved pot/trap gear associated with the WCGF fishery. The ability to identify gear to specific fisheries should improve in the future[7]; however, given the

[7] NMFS recently developed fixed-gear guide (http://swr.nmfs.noaa.gov/psd/fixed_gear.htm). This guide characterizes fixed gear of various commercial fisheries operating off the coast of

present uncertainties, we made precautionary assumptions in our analysis to ensure the proposed fishing is not likely to jeopardize the continued existence of humpback whales, as described below.

Any entangling trap/pot gear that could be positively identified to a fishery of the proposed action in addition to any entangling gear that could not be identified to a specific fishery were included in our analysis as entanglements potentially caused by fisheries of the proposed action. We do not consider fishing gear of the proposed action other than trap/pot gear to be an entanglement risk for humpback whales, because other gear types of the proposed action are not left unattended. Thus, observer programs are able to document entanglement or entrapment from direct observation and estimate fleet-wide mortality based on those observations (Jannot et al. 2011). Since the WCGF fishery observer programs have not observed any interactions of humpback whales with these observed fisheries, we do not anticipate other gear types of the proposed fishery (e.g., bottom and mid-water trawl) to constitute an entanglement risk for humpbacks (Jannot et al. 2011). Similarly, collisions with ships are observable by fishers and observer programs, and there are no reported collisions of humpback whales with boats of the proposed fishery. Thus, we do not consider fishing boats of the proposed action to be a collision risk for humpbacks.

Of the 18 humpback whales entangled in fishing gear, 11 were reported entangled in trap/pot fishing gear and two of the 11 could be positively identified to specific fisheries- one from a fishery of the proposed action (sablefish pot gear) and the other in spot prawn gear (likely the CA spot prawn fishery) (Caretta et al. 2010). Additionally, one of the 11 was most likely from the OR Dungeness crab fishery (as described in the 2009 List of Fisheries, when this fishery was re-categorized to Category II; NMFS 2009). Spot prawn and Dungeness crab fisheries are state-managed, and not part of the proposed action. Entangling gear of the remaining 8 humpbacks were not identified with enough certainty to ascribe them to a specific fishery, and therefore these incidents were included in our analysis as entanglements potentially caused by fisheries of the proposed action along with the one entanglement that was positively identified to a fishery of the proposed action. In addition, all 12 unidentified whale entanglements were included as entanglements potentially caused by fisheries of the proposed action, for a total of 21 entanglements (8+1+12=21).

The scenario with the proposed fishing is 6.6 humpback whales seriously injured or killed, annually (33/5) and the scenario without the proposed fishing is 2.4 humpback whales,

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CA, OR and WA, and ongoing outreach to west coast stranding networks, state fisheries organizations and agencies, whale watch vessels, and other groups about the guide should help stranding reporters identify gear to specific fisheries. The SOS Whale campaign initiated by NMFS is also anticipated to improve stranding reporting (Large whale entanglement hotline: 1-877-SOS-WHALE).

annually (12/5). Therefore, the serious injury and mortality of CA/OR/WA humpback whales potentially caused by the proposed fishing in 2012 is anticipated to be 4.2 whales.

Species-Level Analysis

PBR Comparison

We use the PBR concept in assessing effects of incidental mortality under the MMPA. PBR represents the maximum level of anthropogenic mortality consistent with achievement of the stock's optimum sustainable population level. PBR is calculated as N_{min}* 0.5 R_{max} * F, where N_{min} is the minimum current population size, R_{max} is the maximum annual rate of increase for the species or stock, and F is a recovery factor that ranges from 0.1 to 1 depending on the conservation status of the stock (Barlow et al. 1995). The most recent estimate of PBR can be found in Carretta et al. (2010). We compare the most recent estimate of PBR with the estimated number of human-caused serious injuries and mortalities of CA/OR/WA humpback whales likely to occur in the following year (from baseline, cumulative effects and proposed fishing activities).

For the CA/OR/WA stock of humpback whales, PBR is estimated by computing the minimum population size (1,878 whales) times one half the estimated population growth rate for the stock (1/2 of 8%) times a recovery factor of 0.3 (for an endangered species, with N_{min} > 1,500 and CV (N_{min}) < 0.50), resulting in a PBR of 22.5 whales (Carretta et al. 2010). This stock only spends about half of its time inside the U.S. EEZ, and therefore the PBR allocation for U.S. waters is 11.3 whales (1/2 of 22.5 whales). The estimated number of human-caused serious injuries and mortalities of CA/OR/WA humpback whales likely to occur in the following year with the proposed fishing is 6.6 humpback whales (from baseline, cumulative effects and proposed fishing, as described above). This total is less than the U.S. allocation of PBR (at 58% of the U.S. allocation). Therefore, the population should continue to grow toward its optimum sustainable population level.

Species Growth Rate Comparison

At the current estimated growth rate (7.5%) and abundance (2,043) of CA/OR/WA stock humpback whales, the population is growing at ~153 whales, annually. By assuming that growth would increase by 6.6 whales in the absence of human-caused mortality (including potential mortality from entanglements), this increase translates into a reduction of the population growth rate of ~0.32 percent. By the same assumptions, the increase of 4.2 whales absent anticipated mortality from the proposed fishing would translate into a reduction of the population growth rate of ~0.2 percent.

As described above, estimated serious injury and mortality of CA/OR/WA humpback whales from all fisheries including the proposed fishing may be underestimates, because of the difficulty of observing entanglement events and identifying entangling gear to specific fisheries.

Therefore, these estimated reductions in population growth rate may also be underestimates. For these reasons, the NWFSC developed two different approaches for estimating the maximum mortality rate potentially imposed by all west coast fisheries, including the WCGF fisheries (NWFSC 2011). Those approaches are summarized below.

The first approach evaluated the difference between the estimated 7.5% growth rate of the stock and maximum plausible growth rate of 11.8% (described further below), for a difference of 4.3%. Under the highly improbable assumption that fishing is the only source of non-natural mortality on the stock and that the stock is sufficiently below carrying capacity that it is increasing at its maximum rate, this value would be an upper bound on the maximum possible impact from fishing and would imply that in recent years ~88 whales/year are killed due to fishing activities. The second approach was to assume that the estimated 3% mortality from entanglement for the Gulf of Maine stock (Robbins et al., 2009) is also representative of the CA/OR/WA stock. This would imply that in recent years ~ 61 whales are killed annually due to fishing. Although there are currently no estimates of the annual rate of new scarring from entanglement for the CA/OR/WA stock, the proportion of all whales with scars is similar between the two stocks (Robbins and Matilla 2004, Robbins et al. 2009), which might imply that the rate of scarring from entanglement is similar between the two areas. Both of the upper bound estimates are well above PBR and, if true, would suggest that total mortality from fishing is having a substantial impact on the population's growth rate.

The true level of impact is almost certainly well below these upper estimates for the following reasons. The maximum plausible growth rate of 11.8% is based on the 99th percentile of a distribution around a mean estimate (Zerbini et al. 2010). The authors of that estimate emphasize that "…such a high figure can be observed only with extreme and very optimistic life-history parameters" (Zerbini et al. 2010 p. 1233). The point estimates of the maximum plausible growth rate (7.3–8.6%) are in fact very close to the observed growth rate of the CA/OR/WA stock (7.5%), suggesting that this population is likely to be growing at close to its maximum rate and that mortality from fishing is therefore not substantially impacting its growth rate. The Gulf of Maine estimate of 3% mortality/year is also considered to be a "…crude, preliminary…" estimate by its authors (Robbins et al. 2009 p. 3), and becomes even more so when applied to an entirely different population.

Effects on Prey Availability

The WCGF fishery targets relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish (see Chapter 2 Description of the Fisheries). Humpback whales feed on krill and small schooling fishes, such as anchovies and sardines, which are not impacted by the WCGF fishery to any significant extent (NWFSC 2010a). Indirect trophic effects of the WCGF fishery on humpback whale prey are expected to be minor and in fact may positively affect the abundance of krill through removal of predators NWFSC 2011; Appendix A).

2.4.1.4 Steller Sea Lions

The proposed fishing may affect Steller sea lions through direct effects from bycatch in fishing gear as well as indirect effects on prey availability. Steller sea lions that occur within the action area are part of the eastern DPS. Therefore, effects of the proposed fishing are specific to this listed entity.

Effects from Bycatch in Fishing Gear

We compared the human-caused serious injuries and mortalities of Steller sea lions with and without proposed fishing and found that the proposed fishing would increase the average annual number of human-caused serious injuries and mortalities. This analysis considers the extent to which serious injuries and mortalities associated with the proposed fishing may reduce the reproduction, numbers, or distribution of Steller sea lions, pursuant to the regulatory definition of jeopardy. We evaluated the potential effects of proposed fishing on Steller sea lions based on the best scientific information about past human interactions with Steller sea lions including past bycatch in fishing gear.

We analyzed effects in two steps. First, we estimated the number of Steller sea lion serious injuries and mortalities caused by the proposed fishing, annually. Second, we considered information to help put the number in context. This analysis highlights our level of confidence in the available data, identifies where there is uncertainty in light of data gaps, and identifies how we based assumptions in our analysis on the best available science.

The pertinent information that helped us put this number in context includes the following:

- We compared the estimated number of human-caused serious injuries and mortalities of Steller sea lions likely to occur in 2012 (from all sources including the proposed action) to the estimated potential biological removal (PBR) metric for this stock (Allen and Angliss 2011).
- We evaluated the recent rate of increase of the Eastern DPS of Steller sea lions and compared this to the rate expected in the absence of human-caused mortality (including potential mortality from bycatch in fishing gear).

Serious Injury and Mortality

We used the number of past Steller sea lions caught in fishing gear and other sources of human-caused mortality from the recent past (averages of 2004-2008, 2001-2005 and 2003-2007, as compiled in Allen and Angliss 2011, and 2002-2009 from Jannot et al. 2011). The annual average serious injuries and mortalities from these sources were added together to represent an overall average for the recent past. We evaluated the annual average number of serious injuries and mortalities of Steller sea lions under two scenarios: (1) with the proposed fishing and (2) without the proposed fishing to isolate effects of the action.

When added together, the minimum number of serious injuries and mortalities from all sources is an average of 39.8 Steller sea lions, annually, based on documented observations and stranding reports summarized in Allen and Angliss (2011). Allen and Angliss (2011) also report 25.6 sea lion mortalities annually were attributed to fisheries. However, more information about bycatch specific to proposed fishing is summarized in Jannot et al. (2011) and more information about stranding reports are summarized in NWFSC (2011).

Jannot et al. (2011) reported observed bycatch from two WCGF observer programs and estimated total bycatch by extrapolation from the proportions of each observed fishery in which bycatch is documented (the West Coast Groundfish Observer Program and At-Sea Hake Observer Program). Based on these methods, the estimated total was 44 Steller sea lions, with upper and lower 90% confidence intervals of 18 and 111 serious injuries or mortalities for the 2002-2009 period. This translates to an average annual estimate of 5.5 sea lions, with a lower bound of 2.3 and upper bound of 13.9 sea lions, annually. The number of serious injuries and mortalities has varied across years and has been increasing the last five years (Jannot et al. 2011, NWFSC 2011). Given this increasing trend, the upper-bound estimate is a more conservative estimate of potential future effects than the average- or lower-bound estimates. Fisheries included in the proposed action comprised 3% of the Allen and Angliss (2011) estimated minimum mortality attributed to fisheries bycatch generally (0.8 of 25.6 sea lions, annually). In this biological opinion, we rely on the upper-bound estimate of 13.9 sea lions based on Jannot (2011), rather than the 0.8 estimate from Allen and Angliss (2011).

NWFSC (2011) used data from entanglement surveys, stranding networks, and an entanglement study by Raum-Suryan et al. (2009) to estimate a minimum mortality attributable to entanglement in or ingestion of fishing gear of 5-40 Steller sea lions, annually. Opportunistic observations comprised 94% of the Allen and Angliss (2011) minimum mortality attributed to fisheries bycatch (24.2 of 25.6 sea lions, annually). For purposes of this biological opinion, we rely on the upper-bound estimate of 40 Steller sea lions based on NWFSC (2011), rather than the 24.2 estimate. We therefore estimate a total of 68.7 sea lions seriously injured or killed, annually, from all sources including the proposed fishing, and 54.8 sea lions seriously injured or killed, annually, from all sources except for proposed fishing, where 13.9 sea lions is the amount of serious injury and mortality that is anticipated from proposed fishing in 2012, as identified above.

Species-Level Analysis

PBR Comparison

We reviewed the most recent estimate of PBR (Allen and Angliss 2011) for comparison with the estimated number of human-caused serious injuries and mortalities of Steller sea lions likely to occur in 2012 (from baseline, cumulative effects and proposed fishing). For eastern stock Steller sea lions, PBR is estimated by computing the minimum population size (52,847 sea lions) times one half the estimated population growth rate for the stock (1/2 of 12%) times a recovery factor of 0.75 (as recommended by the Alaska Scientific Review Group, Allen and Angliss 2011), resulting in a PBR of 2,378 sea lions. By comparison, the estimated number of all human-caused serious injuries and mortalities anticipated to occur in the following year, including the proposed fishing, is 68.7 sea lions, which is approximately 3% of the PBR.

The NMFS Alaska Region (AKR) recently completed a similar analysis comparing the total human-caused serious injury and mortality for eastern Steller sea lions to the stock's PBR. Their analysis was conducted for the purpose of making a negligible impact determination under the MMPA. Their analysis resulted in the same conclusion, that the anticipated total human-caused serious injury and mortality for eastern Steller sea lions is less than 10% of the stock's PBR. Based on this result, the AKR found that Alaska groundfish fisheries have a negligible impact on eastern Steller sea lions (NMFS 2010c).

Species Growth Rate Comparison

At the current estimated growth rate (3.1%) and abundance (52,847) of eastern stock Steller sea lions, the population is growing at ~1,638 individuals, annually. By assuming that growth would increase by 68.7 sea lions in the absence of human-caused mortality (including potential mortality from fisheries bycatch), this increase translates into a reduction of the population growth rate of ~0.23 percent. By the same assumptions, the increase of 13.9 sea lions absent anticipated mortality from the proposed fishing would translate into a reduction of the population growth rate of ~0.03 percent.

Estimated serious injuries or mortalities from all fisheries including proposed fishing may be underestimates. For this reason, we have incorporated upper-bound estimates from Jannot et al. (2011) and NWFSC (2011) into our predictions. These predictions are still based in part on opportunistic stranding reports, and there remains uncertainty about the number of strandings that may go unobserved or unreported. Our predictions are, however, more conservative than predictions based solely on minimum estimates.

Effects on Prey Availability

The WCGF fishery targets a variety of groundfish, some of which are also consumed by Steller sea lions. Food web modeling conducted by the NFWSC (2011) indicates that marine mammals, including pinnipeds, which frequently prey upon fish species affected either directly or indirectly by proposed fishing, are unlikely to be strongly impacted by food web interactions caused by proposed fishing. The forage species evaluated were found to be resilient to direct fishing mortality (i.e., high productivity of the stocks compensated for the range of fishing harvest evaluated, such that only small prey reductions were anticipated), as would be expected from the life history of small pelagic fishes. Because of their resiliency, the forage species were likewise not impacted through indirect effects of predation or competition (NWFSC 2011).

Food-web modeling conducted by NWFSC was based on species assemblages, where pinnipeds are represented by a number of seal and sea lion species, of which Steller sea lions is one of the largest and their dominant prey is skewed toward relatively larger fish than represented for the assemblage as a whole. Therefore, the food-web modeling results may underestimate potential for effects on Steller sea lions. Nonetheless, eastern Steller sea lions have been increasing by 3% per year for approximately 20 years (Allen and Angliss 2011). This suggests that any effects of fishing on their prey availability, at least over the last 20 years, has not prevented steady population increases.

2.4.1.5 Leatherback Sea Turtles

The proposed fishing may affect leatherback sea turtles through direct effects of entanglement in fishing gear and could potentially cause indirect effects on leatherbacks by reducing the availability of their jellyfish prey. Leatherback sea turtles that occur within the action area are most likely to originate from nesting aggregations of the western Pacific. Therefore, we analyze effects of the proposed action on leatherbacks from the western Pacific.

Effects from Entanglement in Fishing Gear

We compared human interactions with leatherback sea turtles with and without entanglement in gear from proposed fishing and found that the proposed fishing may increase the number of injuries and mortalities of leatherbacks. This analysis considers whether effects of increased injuries and mortalities may reduce the reproduction, numbers, or distribution of leatherback sea turtles, pursuant to the regulatory definition of jeopardy. We evaluated the potential effects of proposed fishing on leatherback sea turtles based on the best scientific information about past human interactions with leatherbacks including past entanglement in fishing gear. We estimated the number of leatherback sea turtle injuries and mortalities caused by the proposed fishing, annually. This analysis highlights our level of confidence in the available data, identifies where there is uncertainty in light of data gaps, and identifies how we based assumptions in our analysis on the best available science.

We used the number of past entanglements and ship strikes of leatherback turtles in the recent past (2001-2008 for entanglements and 2000-2008 for ship strikes), as well as incidental mortalities we have authorized in the action area for the following year, to estimate the number of entanglements, ship strikes, and other human-sources of mortality anticipated to occur in the following year. Because the opinion term is one year, we computed the average annual estimates from these sources and added the estimates together to compute a total annual estimate. All reports from stranding networks and observer programs were used to inform these estimates. We consider it appropriate to include all past human-interactions from these sources to estimate the number of potential serious injuries and mortalities that could occur in the future because observer coverage is low for some fisheries where interactions have occurred, and successful disentanglement cannot be relied upon with certainty in the future. Additionally, some of the observed injuries and mortalities are based on opportunistic stranding reports, and there is potential for entanglement or strike events to go unobserved or unreported.

The minimum number of potential injuries and mortalities from entanglements is 3 turtles over 8 years (including entanglement with proposed fishing) and from ship strikes is 4 turtles over 9 years (data are summarized in the environmental baseline section). Additionally, the number of leatherback mortalities already authorized in the action area that could occur in the following year is 5 turtles (also summarized in the environmental baseline section).

There is uncertainty about the number of past entanglements attributed to fisheries of the proposed action, because most of the fishing effort identified as an entanglement risk was not observed. Additionally, entanglements reported through stranding networks could not be attributed to specific fisheries. The entanglements were characterized as pot/trap gear from unidentified fisheries. Some of these may therefore have involved pot/trap gear from proposed fishing. The ability to identify gear to specific fisheries should improve in the future following NMFS recently developed fixed-gear guide, as described for humpback whales above. Additionally, NMFS NWR will engage the groundfish observer program in a planning and budgeting discussion and will consider increasing observer coverage for non-nearshore open access fixed-gear fisheries, such that it would be possible to estimate the fleet-wide mortality rate for leatherbacks incidental to this fishing in the future.

Given the present uncertainties, we made precautionary assumptions in our analysis to ensure the proposed fishing is not likely to jeopardize the continued existence of leatherbacks. Any entangling gear that could be positively identified to a fishery of the proposed action in addition to any entangling gear that could not be identified to a specific fishery were included in our analysis as leatherback entanglements potentially caused by fisheries of the proposed action.

Three leatherbacks reported entangled in fishing gear were all entangled in trap/pot fishing gear, one of which could be positively identified to a specific fishery of the proposed action (sablefish pot gear documented by the groundfish observer program; Jannot et al. 2011). The remaining two could not be identified to a specific fishery. The very low observer coverage of the sablefish pot/trap fishery does not allow for accurate estimation of the fleet-wide mortality rate (non-nearshore open access fixed gear had 1-9% coverage from 2002-2009; Jannot et al. 2011). All three incidents were included in our analysis as entanglements potentially caused by fisheries of the proposed action.

The scenario with the proposed fishing is ~5.8 turtles per year (5 mortalities already authorized/year plus 3 turtles/8 years = 0.38 turtles/year from entanglements and 4 turtles / 9 year =0.44 turtles/year from ship strikes) and the scenario without the proposed fishing is ~5.4 turtles per year (5 mortalities already authorized/year plus 4 turtles / 9 years=0.44 turtles/year from ship strikes). The serious injuries and mortalities of leatherback sea turtles potentially caused by the proposed fishing in 2012 are anticipated to be 0.4 turtles, less than one individual.

Effects on Prey Availability

The WCGF fishery targets a variety of groundfish, but also bycatch jellyfish that are consumed by leatherback sea turtles. Food web modeling conducted by the NFWSC (2011) indicates that the protected species evaluated are unlikely to be strongly impacted by food web interactions caused by proposed fishing (i.e., because of the resiliency of the forage species evaluated, as described in the Steller sea lion section above). The effort did not specifically model interactions between the fisheries and leatherback prey, but based on the general predicted pattern of resiliency, it is unlikely that leatherback prey would be strongly affected by the proposed fishing, and therefore unlikely that leatherback turtles would be impacted by food web interactions caused by proposed fishing.

2.4.2 Effects of the Action on Critical Habitat

2.4.2.1 Green Sturgeon Designated Critical Habitat

Designated critical habitat for the Southern DPS green sturgeon includes coastal marine waters within 60 fm depth from Monterey Bay, CA, to the U.S./Canada border, including the Strait of Juan de Fuca. The operation of bottom trawl fisheries under the proposed action overlaps with and may impact designated critical habitat for Southern DPS green sturgeon. The use of bottom trawl gear may alter or disturb benthic habitats as well as prey resources for green sturgeon in coastal marine waters.

Bottom trawl fisheries conducted under the proposed action may affect the prey resources PCE in designated green sturgeon critical habitat. Little is known about green sturgeon feeding and prey resources in marine waters, but it is likely that they prey on demersal fish (e.g., sand lance) and benthic invertebrates similar to those that green sturgeon are known to prey upon in coastal estuaries (Dumbauld et al. 2008). Bottom trawl fisheries may disturb benthic habitats where these prey species are found or may remove prey resources (e.g., captured as targeted or non-targeted species in the fisheries). The bycatch data indicate that the coastal waters adjacent to San Francisco Bay are an important area for green sturgeon, although how green sturgeon use the area (e.g., primarily for migration or also feeding, aggregation, etc.) is not known. This is also a primary area for the California halibut fishery. The effects on benthic habitats and prey resources are unclear, however, due to several factors. First, green sturgeon are known to be generalist feeders and may feed opportunistically on a variety of benthic species encountered. Thus, the removal of certain prey species in the fisheries may not affect the prey resources for green sturgeon. Second, although green sturgeon are believed to feed in marine habitats, marine feeding has not been confirmed. In addition, very little is known about the marine habitat preferences of green sturgeon. As a result of these factors, the potential effects of bottom trawl fisheries on green sturgeon critical habitat are difficult to evaluate until more definitive information is known about marine habitat use and feeding habitats of the species. Based on the best available information, we conclude that fisheries conducted in the course of the proposed action are not likely to reduce the quality of the PCEs for green sturgeon critical habitat within the action area. However, additional studies are needed to further evaluate these effects.

2.4.2.2 Leatherback Sea Turtle Critical Habitat

In addition to the direct and indirect effects to the species discussed above, the proposed fishing may affect critical habitat for leatherback sea turtles. Based on the natural history of the species and their habitat needs, NMFS designated critical habitat based on the following physical or biological feature essential to conservation: Occurrence of prey species of sufficient condition, distribution, diversity, and abundance to support individual as well as population growth, reproduction, and development.

The proposed fishing is likely to result in some bycatch of jellyfish, which will reduce prey availability in critical habitat. As described previously, food web modeling conducted by the NFWSC (2011) indicated that the protected species evaluated are unlikely to be strongly impacted by food web interactions caused by proposed fishing (i.e., because of the resiliency of the forage species evaluated, as previously described). The effort did not specifically model interactions between fisheries and jellyfish, but based on the general predicted pattern it is unlikely that the conservation value of critical habitat will be substantially impacted by food web interactions caused by proposed fishing.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. For purposes of this analysis, the action area includes all marine waters of the U.S. west coast EEZ.

Although state, tribal and local governments have developed plans and initiatives to benefit marine fish and mammal species, including those under consultation, we cannot consider them reasonably certain to occur in our analysis of cumulative effects until concrete steps are taken to implement them. Government actions are subject to political, legislative and fiscal uncertainties. These realities, added to the geographic scope of the action area, which encompasses several government entities exercising various authorities, and the changing economies of the region, make analysis of beneficial cumulative effects difficult. There are some impacts that we predict are reasonably certain to occur into the future, such as private activities associated with other commercial and sport fisheries, construction and other habitat altering activities, vessel traffic and sound, and marine pollution, discussed in more detail below.

We find it likely that the past and present impacts of state and private actions identified above in the environmental baseline will continue into the future. We find it reasonably certain that the impacts of entanglement and bycatch in fishing gear and other sources of human-caused injury and mortality to the species under consultation identified in the environmental baseline are likely to continue into the future at comparable levels to those seen in the present and recent past (unless changes result from implementation of the conservation measures in this biological opinion). We also find it reasonably certain that state and private actions associated with marine pollution will continue into the future (e.g., state permits for effluent discharges and the status of currently contaminated sites).

Some types of human activities that contribute to cumulative effects are expected to have adverse impacts on the listed populations and their designated critical habitat. Many of these are activities that have occurred in the recent past and had an effect on the environmental baseline. These can be considered reasonably certain to occur in the future because they occurred frequently in the recent past, especially if authorizations or permits have not yet expired. Although it is not possible to quantify these effects, we find it likely that the cumulative effects of these activities will have adverse effects commensurate to those of similar past activities.

For eulachon, the most likely non-Federal action affecting their viability is bycatch in offshore trawl fisheries for ocean shrimp (Gustafson et al. 2010). These fisheries are operated by the states of Washington, Oregon, and California and are not subject to section 7 consultation under the ESA. Estimated bycatch of eulachon in these fisheries (Table 9) has ranged from 217,841 fish in 2004 (Oregon and California only) to 1,075,081 fish in 2010 (all three states). Green sturgeon, humpback whales, and leatherback turtles are also likely to be incidentally caught in state-managed fisheries. The past impacts of these fisheries are described in the Environmental Baseline section. In our analysis for these three species, we have assumed that levels of bycatch will continue into the future similar to what they have been in the past, at levels described in the Effects of the Action section.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step of our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2). The term of this consultation is one year. We are currently working to complete a final risk assessment that will inform a longer-term consultation on the ongoing management of the WCGF fishery beyond the 2012 season.

2.6.1 Eulachon

Because the proposed action is unlikely to differentially affect eulachon from different spawning populations and year classes, we do not expect it to have a measureable effect on structure or diversity of the southern DPS. Our analysis of effects therefore focuses primarily on abundance. Productivity may also be affected by the actions, but those effects would be the result of effects on abundance. As noted previously, there are no reliable abundance estimates for the southern DPS of eulachon. However, we do know that eulachon taken as bycatch in the proposed action would likely be from multiple freshwater production areas and represent multiple age classes.

As described in the *Status of the Species* section marine mortality is likely very high for eulachon. Thus the death of 1004 individuals of different age classes in the ocean would be equivalent to a much smaller number of spawning adults. We conservatively estimated that the 1004 individuals that may be killed by the proposed action would represent at most 502 spawning adults.

Eulachon spawner abundance has declined greatly in the last 20 years, and the species has been extirpated (or nearly so) from several historic spawning areas (Gustafson et al. 2010). Eulachon face a number of threats throughout their range including climate change induced impacts to marine and freshwater habitat, bycatch in commercial fisheries, and freshwater habitat alteration. The impacts to eulachon from climate change and habitat alteration are difficult to quantify, but the impact of bycatch in commercial fisheries has been documented (Al-Humaidhi et al. 2012). The state-managed ocean shrimp trawl fishery incurs the overwhelming majority of eulachon fisheries bycatch (estimated at 1,075,081 fish in 2010). Pacific coast ocean shrimp trawl fisheries are managed by the states of California, Oregon, and Washington, and are not included in the proposed action of this biological opinion.

The anticipated effects from the ocean shrimp fisheries in the action area during 2012 could be bycatch levels as high as 2011, when slightly more than one million eulachon were incidentally taken. Without a reliable estimate of eulachon abundance, or information on the geographic and year-class composition of this catch, it is not possible to quantify the impact of the ocean shrimp fishery on the southern DPS. By comparison, the expected take from the proposed action would be less than 0.1% of the 2010 take of eulachon in the ocean shrimp fisheries. This demonstrates that the impact of the proposed action on eulachon abundance would be substantially less than 0.1%. The level of take expected for the proposed action is so small that we do not anticipate it would add measurably to the cumulative effects already occurring in the action area.

Summary

Because there are no estimates of overall eulachon abundance, it is very difficult to determine the exact effect of removing 1004 fish from the DPS in 2012. However, fish captured in the proposed action would be from a variety of age classes, (including juveniles, subadults, and adults), and from a number of different populations, so the effect of their removal would be smaller than it would be if only spawning adults were being removed or if the effect were concentrated to a single spawning population. In addition, of the fish taken in the ocean, many would not have survived to spawn. The most conservative estimate of reduced spawning abundance is 502 fish.

Therefore, the proposed action would capture a very small number of eulachon from several different spawning populations and age classes. Based on the high natural mortality rate of eulachon the ecological consequences of removing 1004 eulachon from the marine environment would be so minor as to be effectively unmeasurable with regard to the action's effect on the species' abundance, productivity, structure, or diversity.

2.6.2 Green Sturgeon

Based on the best available data on green sturgeon encounters in the fisheries from 2002 through 2010, NMFS expects that the operation of the Pacific Coast Groundfish fisheries in 2012 will result in the bycatch of 90 to 330 Southern DPS green sturgeon, primarily in the coastal waters adjacent to San Francisco Bay. The majority of the encounters are expected to be with subadult green sturgeon and most are expected to be released alive. Mortality of an estimated 4.3 to 17.5 subadults and 0.4 to 3.5 adults is expected as a result of bycatch in the fisheries. Sublethal impacts are expected to include stress, disruption of migration, and potential injury to individual fish. Impacts to adults would have a greater immediate effect on reproductive potential, but the mortality of or delayed development in subadults could have a substantial effect on the future adult population and reproductive potential of the population. Based on the hardy nature of green sturgeon and the available information on the condition of green sturgeon encountered and released in the fisheries, however, it is likely that green sturgeon released alive and in good condition are able to recover from the sublethal effects associated with bycatch in the fisheries without a substantive effect on overall fitness. However, more information is needed to gain a better understanding of the lethal and sublethal effects of the fisheries on Southern DPS green sturgeon (e.g., more consistent recording of green sturgeon condition upon encounter and release, studies to evaluate post-release mortality).

Because there are no estimates of overall Southern DPS green sturgeon abundance, it is very difficult to determine the exact effect of removing as many as 17 fish from the population on a yearly basis. In order to put the take into context, we used information from preliminary abundance studies to estimate the population size. Based on a rough population estimate of 350 to 1000 adults, 1838 to 5250 subadults, and 729 to 2083 juveniles in the Southern DPS green sturgeon population, the proposed operation of the fisheries in 2012 is expected to result in the lethal take of a small proportion of the Southern DPS green sturgeon population. An estimated 0.8 to 9.1% of the adult population is expected to be encountered as bycatch during the operation of the fisheries in 2012, with 0.04 to 1% of the adult population expected to be subject to lethal take. An estimated 1.6 to 16.3% of the subadult population is expected to be encountered in the operation of the fisheries in 2012, with 0.08 to 1% of the subadult population subject to lethal take. There will be no effect to the juvenile component of the DPS since the juveniles reside in freshwater and the adjacent estuaries, which are outside the action area. Given the low proportion of expected lethal take and the best available information to date regarding the potential effects of the estimated level of lethal take on population abundance and reproductive potential (see discussion in the "Summary of response analysis" sections above), it is not likely that the lethal take of Southern DPS green sturgeon under the proposed action would result in substantial impacts to the overall viability of the population. Although the proportion of the population subject to sublethal impacts is greater (as high as 16.3% of the subadult population), the best information available on the condition of green sturgeon upon capture and release indicate that most would be able to survive and recover from the effects. Thus, the sublethal impacts on Southern DPS green sturgeon are also not expected to result in substantial impacts to the overall viability of the population. NMFS recognizes that there are many uncertainties in the estimates of total bycatch, bycatch mortality, and population abundance for Southern DPS green sturgeon, as well as in the understanding of sublethal impacts on green sturgeon. This analysis was based on the best available information at this time to evaluate the impacts of one year of operation of these fisheries on Southern DPS green sturgeon. However, these uncertainties need to be addressed to support further evaluations of the impacts of these fisheries on Southern DPS green sturgeon, in future consultations.

The Southern DPS green sturgeon faces threats from other activities throughout its range, including bycatch in other fisheries conducted in coastal estuaries and freshwater rivers and habitat degradation. The total catch of green sturgeon in recent years is substantially reduced compared to historical harvest rates, in large part due to prohibitions on the retention of green sturgeon that have been implemented since the listing of the Southern DPS green sturgeon under the ESA in 2006. In addition, the state of California established revised regulations in 2006 to restrict access to the California halibut fishery. Implementation of the revised regulations has resulted in decreased California halibut landings as well as decreased green sturgeon bycatch off California. Efforts are also underway to address some of the major habitat issues facing the Southern DPS green sturgeon, particularly those that affect spawning habitat in the Sacramento River. Given these factors, improvements to the environmental baseline have been implemented in recent years and are expected in the future. However, more information is needed to better understand the cumulative effects on green sturgeon in fisheries throughout the coast (including bycatch of green sturgeon in fisheries conducted in coastal estuaries) and the mortality expected from those fisheries.

As described above, NMFS expects that the proposed action is not likely to result in a reduction in the quality of the PCEs identified for green sturgeon critical habitat. It is uncertain what the impacts of the proposed action would be on green sturgeon critical habitat because it is not known whether green sturgeon feed in marine waters and what they feed on. If green sturgeon do feed in marine waters, operation of bottom trawl fisheries may disturb benthic habitats and prey resources where green sturgeon feed. The disturbance of benthic prey resources may not affect prey resources for green sturgeon, however, because green sturgeon are generalist feeders and believed to feed opportunistically on a variety of benthic species. Additional information on green sturgeon habitat use in marine areas, particularly in coastal waters adjacent to San Francisco Bay, as well as the impacts of the fisheries on benthic habitats and communities, is needed to better inform this analysis.

2.6.3 Humpback Whales

This section discusses the effects of the action in the context of the status of the species, the environmental baseline, and cumulative effects, and offers our opinion as to whether the effects of the proposed fishing are likely to jeopardize the continued existence of humpback whales.

Humpback whales face a variety of threats including entrapment and entanglement in fishing gear, collisions with ships, acoustic disturbance, habitat degradation, and competition for resources with humans. Humpback whales are found in all oceans of the world with a broad geographical range. For management under the MMPA, stocks of humpback whales are defined based on feeding areas, with the whales feeding off of California, Oregon, and Washington currently considered one stock. The most recent population estimate of humpback whales in the North Pacific Ocean is 21,808 (CV=0.04). The most recent estimated abundance of the CA/OR/WA feeding stock is 2,043 whales (CV=0.10), with a minimum population estimate of 1,878 whales. The maximum expected rate of annual increase for the species as a whole ranges from an estimated 7.3-8.6%, with a maximum plausible rate of 11.8% annually. North Pacific populations as a whole grew by an estimated 6.8% annually over the period from 1966 to 2006. The annual growth rate for the CA/OR/WA feeding stock is estimated at 7.5%.

Effects of the proposed fishing are specific to the CA/OR/WA feeding stock, and we put effects specific to this stock in context of effects to the globally-listed species. We estimated the number of serious injuries and mortalities caused by the proposed fishing, annually, and also considered information to help put the number in context, including comparison of the stock's PBR to the estimated number of human-caused serious injuries and mortalities for the stock likely to occur in 2012, and comparison of the recent rate of increase for the species to this rate absent human-caused mortality on the CA/OR/WA stock (including entanglements from fishing). This pertinent information includes not only effects of the proposed fishing, but also environmental baseline and cumulative effects. With this information, we consider whether effects of increased human-caused serious injuries and mortalities may reduce the reproduction, numbers or distribution of humpback whales, pursuant to the regulatory definition of jeopardy.

In summary, there is a high degree of spatial overlap with the WCGF fishery, and the highest overlap is with the fixed-gear fishery. There is uncertainty about the number of past entanglements attributed to the proposed fishing, but based on precautionary assumptions we estimated that 4.2 humpback whales may be injured or killed by fisheries of the proposed action in 2012. We estimated that the total serious injuries and mortalities likely to occur in 2012 for this stock (including serious injury and mortality from the proposed fishing) is less than the U.S. allocation of the stock's PBR (6.6 whales compared to 11.3 whales or 58% of the U.S. allocation of PBR). Using these same serious injury and mortality estimates – 4.2 whales from proposed fishing and 6.6 whales from all human-sources including proposed fishing – we anticipated that population growth rate will decrease by ~0.20 percent from proposed fishing and by ~0.32 percent from all human-sources including proposed fishing. Based on food web modeling, we also expect that trophic effects of the WCGF fishery will be minor and in fact may positively affect the abundance of krill (prey of humpback whales) through removal of predators.

Because we recognize that the estimated increases in serious injury and mortality and subsequent reductions in population growth rate may be underestimates, we also considered potential upper-bound estimates (61 to 88 whales seriously injured or killed, annually), which were well above PBR. If true, these estimates would suggest that total mortality from fishing is having a substantial impact on the population's growth rate. However, we highlighted that the true level of impact is likely substantially less than these estimates for a number of reasons. Most prominently, the CA/OR/WA population has been increasing at a rate that is within the bounds of the maximum intrinsic growth rate of the species, and its current abundance is close to a level arguably associated with recovery.

From this, we conclude that impacts of proposed fishing in addition to other human-sources are not likely to substantially reduce the population abundance or trend. The lack of substantial impacts on the CA/WA/OR stock combined with generally increasing trends for humpback whales in the North Pacific and worldwide supports the conclusion that the proposed fishing will not appreciably reduce the survival or recovery of the species.

2.6.4 Steller Sea Lions

This section discusses the effects of the action in the context of the status of the species, the environmental baseline, and cumulative effects, and offers our opinion as to whether the effects of the proposed action are likely to jeopardize the continued existence of Steller sea lions.

No threats to the continued recovery of the eastern DPS were identified in the final revised recovery plan for Steller sea lions (NMFS 2008a), but there are factors that affect or have the potential to affect population dynamics of the eastern DPS, including subsistence harvest, fisheries bycatch, other sources of human-caused mortality, prey availability, and disturbance. The eastern DPS of Steller sea lions is a single population that ranges from southeast Alaska to southern California, including inland waters of Washington State and British Columbia. The total population estimate is a range between 58,334 and 72,223 sea lions, with a minimum population estimate of 52,847 sea lions. The population has increased at a rate of ~3.1% in recent decades.

We estimated the increase in Steller sea lion serious injuries and mortalities caused by the proposed fishing, annually, and also considered information to help put the increase in context. The pertinent information for context included comparison of the stock's PBR to the estimated number of human-caused serious injuries and mortalities for the DPS likely to occur over the following year, and comparison of the recent rate of increase for the species to this rate expected absent human-caused mortality for the eastern DPS, including bycatch from proposed fishing. With this information, we consider whether effects of increased human-caused serious injuries and mortalities may reduce the reproduction, numbers or distribution Steller sea lions, pursuant to the regulatory definition of jeopardy.

In summary, we estimated 13.9 Steller sea lions would be seriously injured or killed incidental to the proposed fishing in 2012, from 54.8 sea lions (from all human-sources except the proposed fishing) to 68.7 sea lions (with proposed fishing) seriously injured or killed. We estimated that the total serious injuries and mortalities likely to occur in the following year for this stock (including serious injury and mortality from proposed fishing) is substantially less than the stock's PBR (68.7 sea lions compared to 2,378 sea lions or 3 percent of PBR). Using these same serious injury and mortality estimates – 13.9 sea lions from proposed fishing and 68.7 sea lions from all human-sources including proposed fishing – we anticipated that population growth rate would decrease by ~0.03 percent from proposed fishing and by ~0.23 percent all human-sources including proposed fishing. Based on food web modeling, we also expect that trophic effects of the WCGF fishery will be minor.

From this, we conclude that impacts of proposed fishing in addition to other human-sources are not likely to substantially reduce the population abundance or trend. The lack of substantial impacts on the eastern DPS combined with the increasing population trend for this listed entity supports the conclusion that the proposed fishing will not appreciably reduce the survival or recovery of the species.

2.6.5 Leatherback Sea Turtles

This section discusses the effects of the action in the context of the status of the species and designated critical habitat, the environmental baseline, and cumulative effects, and offers our opinion as to whether the effects of the proposed action are likely to jeopardize the continued existence of leatherback sea turtles or adversely modify their critical habitat.

Leatherback sea turtles face a variety of threats depending on the region in which they occur. Identified threats in the marine environment include direct harvest, debris entanglement and ingestion, fisheries bycatch, and boat collisions, among other threats. Leatherback sea turtles are widely distributed across the oceans of the world. In the Pacific Ocean, nesting aggregations occur primarily in Mexico, Costa Rica, Malaysia, Indonesia, the Solomon Islands, Papua New Guinea, and Vanuatu. Leatherbacks that occur within the action area are most likely to originate from nesting aggregations of the western Pacific. The abundance of leatherback sea turtles is currently unknown; however the most recent global estimate for nesting females is 34,500 turtles. The trend for Pacific populations has been declining over the past three decades; however, estimates of breeding females have slightly increased from 2000 to 2007 (2,700-4,500 turtles in 2007 compared to 1,775-1,900 turtles in 2000) potentially indicating the population is stable or slightly increasing in recent years.

Effects of the proposed fishing are specific to western Pacific leatherbacks, and we put effects specific to this population in context of effects to the globally-listed species. We estimated the increase in leatherback mortalities caused by the proposed fishing, annually, and also qualitatively considered available information on population trajectory of western Pacific leatherbacks to help put the increase in context. This pertinent information includes not only effects of the proposed fishing, but also environmental baseline and cumulative effects. With this information, we consider whether effects of increased mortality may reduce the reproduction, numbers or distribution of leatherback turtles, pursuant to the regulatory definition of jeopardy.

In summary, we used precautionary assumptions to estimate that 0.4 leatherbacks may be killed incidental to the proposed fishing in 2012, from 5.4 turtles (from all human-sources except the proposed fishing) to 5.8 turtles (with proposed fishing) of the western Pacific killed in the action area. We also identify that mortality of western Pacific leatherbacks is authorized outside of the action area, for example, in the Pacific Islands region (summarized in Appendix A). We highlight that the anticipated increase in mortality attributed to the proposed fishing is less than one turtle over the following year, which is a very small increase to the level of mortality already authorized for the species both inside and outside of the action area in the same timeframe. Based on food web modeling, we also expect that trophic effects of the WCGF fishery on leatherbacks and the conservation value of their critical habitat will be minor.

From this, we conclude that proposed fishing contributes a very small additional impact to those of other human-sources, such that effects of the action are not anticipated to result in a meaningful change to the population abundance or trend. A lack of meaningful change in population abundance or trend supports the conclusion that the proposed fishing will not appreciably reduce the survival or recovery of the species.

2.7 Conclusion

2.7.1 Eulachon

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the southern DPS of eulachon. No critical habitat has been designated or proposed for this species within the action area, therefore, none would be affected.

2.7.2 Green Sturgeon

After reviewing the current status of the Southern DPS green sturgeon, the environmental baseline within the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of threatened Southern DPS green sturgeon.

After reviewing the current status of critical habitat designated for Southern DPS green sturgeon, the environmental baseline within the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to destroy or adversely modify the Southern DPS green sturgeon's designated critical habitat.

2.7.3 Humpback Whales

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of humpback whales. No critical habitat has been designated or proposed for this species, therefore, none will be affected.

2.7.4 Steller Sea Lions

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of eastern DPS Steller sea lions.

2.7.5 Leatherback Sea Turtles and their Critical Habitat

After reviewing the current status of the listed species and designated critical habitat, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of leatherback sea turtles or to destroy or adversely modify its designated critical habitat.

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

NMFS does not provide a take statement for leatherback sea turtles, because take of this species is unlikely to occur over the opinion term. The annual estimated level of serious injury or mortality incidental to proposed fishing over the following year was less than one individual, and this opinion term is one year. NMFS issues placeholder take statements for Steller sea lions and humpback whales. These take statements will remain placeholders until the provisions of MMPA 101(a)(5) are met, as described below.

A marine mammal species or population stock that is listed as threatened or endangered under the ESA is, by definition, also considered depleted under the MMPA. The ESA allows taking of threatened and endangered marine mammals only if authorized by section 101(a)(5) of the MMPA. Before incidental take of listed marine mammals may be exempted from the taking prohibition of ESA section 9(a), incidental taking must be authorized under section 101(a)(5)(E) of the MMPA. The decision of whether incidental taking is authorized under section 101(a)(5)(E) of the MMPA is based on the negligible impact determination (NID) and publication in the Federal Register a list of those fisheries for which such a determination was made. If the fishery is identified as Category I or II per the provisions of section 118, issuance of an MMPA permit is also required. Consistent with the provisions of section 101(a)(5)(E)(ii), issuance of an MMPA permit is not required for Category III fisheries. Per the first tier of fishery classification criteria under section 118[8], all U.S. fisheries are Category III with respect

[8] The fishery classification criteria is a two-tiered stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock, and then addresses the impact of individual fisheries on each stock. Per the first tier, if the total annual mortality and serious injury of a marine mammal stock, across all fisheries, is less than or equal to 10 percent of the PBR level of the stock, all fisheries interacting with the stock would be placed in Category III, at

to eastern stock Steller sea lions, because the total annual mortality and serious injury of eastern stock Steller sea lions, across all fisheries, is less than or equal to 10 percent of the PBR level of the stock (as summarized in the effects section). Therefore, for the purposes of issuing an incidental take statement for eastern Steller sea lions, a permit is not required, however, an NID and a publication in the Federal Register identifying that the determination applies to the WGCF fishery is required.

NMFS recently made an NID finding for eastern stock Steller sea lions, and concluded that the minimum estimated serious injury and mortality rate for the stock due to all commercial fisheries, combined with total human-related mortality, is less than 10% of the stock's PBR and will therefore have a negligible impact on the stock (NMFS 2010c). This NID finding is also applicable to the WCGF fishery, as NMFS will publish in the Federal Register shortly. After which time, the below incidental take statement for Steller sea lions will be valid.

Per the second tier of fishery classification criteria under section 118[9], the WA/OR/CA sablefish pot fishery is Category II with respect to the CA/OR/WA stock of humpback whales, because the total annual mortality and serious injury of this stock, across all fisheries, is more than 10 percent of the PBR level of the stock (and therefore does not qualify for Category III) and annual mortality and serious injury of the stock in this specific fishery - WA/OR/CA sablefish pot - is less than 50 percent of the PBR level of the stock. Therefore, for the purposes of issuing an incidental take statement for humpback whales, a permit is required in addition to an NID and a publication in the Federal Register identifying that the determination applies to this specific fishery. After which time, the below incidental take statement for humpback whales will be valid.

2.8.1 Amount or Extent of Take

Eulachon

NMFS anticipates that the take of threatened southern DPS eulachon will occur as a result of the proposed continued operation of the Pacific Coast Groundfish fishery in 2012. Incidental take of southern DPS eulachon occurs as a result of bycatch and handling in the

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least as related to that particular marine mammal stock. If this tier is not met, fisheries are subject to the next tier to determine classification.

[9] Tier 2, Category I: Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50 percent of the PBR level (i.e., frequent incidental mortality and serious injuries of marine mammals).
Tier 2, Category II: Annual mortality and serious injury of a stock in a given fishery is greater than 1 percent and less than 50 percent of the PBR level (i.e., occasional incidental mortality and serious injuries of marine mammals).
Tier 2, Category III: Annual mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the PBR level (i.e., a remote likelihood or no known incidental mortality and serious injuries of marine mammals).

fisheries, or mortalities resulting from encounter with fishing gear, as a consequence of fishing activity. Take of eulachon in the proposed action is expected to not exceed 1004 fish.

Green Sturgeon

NMFS anticipates that the take of threatened Southern DPS green sturgeon will occur as a result of the proposed continued operation of the Pacific Coast Groundfish fishery in 2012. Incidental take of Southern DPS green sturgeon occurs as a result of bycatch and handling in the fisheries, mortalities resulting from catch and release, or mortalities resulting from encounter with fishing gear, as a consequence of fishing activity. The incidental take limit for Southern DPS green sturgeon for the proposed action is 330 green sturgeon. The expected take would be less, ranging from 90 to 330 green sturgeon, based on bycatch estimates from 2007 through 2010. As discussed in the analysis above, the majority of the take is expected to occur in the LE groundfish bottom trawl and California halibut fisheries, with most individuals encountered being subadults. A low proportion of the expected take would be adults. In addition, the majority of the green sturgeon are expected to be released alive. Lethal take of Southern DPS green sturgeon in the proposed action is expected to not exceed 19 fish. Some portion of the lethal takes are expected to be immediate mortalities, whereas some portion are expected to be delayed mortalities after release.

Humpback Whales

Fishing that would occur under the proposed action is anticipated to result in the incidental serious injury or mortality of ~4 humpback whales over the following year (based on the anticipated annual average of 4.2 whales).

Steller Sea Lions

Fishing that would occur under the proposed action is anticipated to result in the incidental serious injury or mortality of ~14 Steller sea lions over the following year (based on the anticipated annual average of 13.9 sea lions).

2.8.2 Effect of the Take

In the accompanying biological opinion, NMFS determined that the level of anticipated incidental take of the above identified listed species in the proposed fishing is not likely to result in jeopardy to the species or destruction of critical habitat.

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

Green Sturgeon

We include one reasonable and prudent measure in this incidental take statement for the Southern DPS green sturgeon considered in this opinion. Included are the terms and conditions that must be complied with to implement this reasonable and prudent measure.

(1) Collection of biological data on observed green sturgeon: Biological data on observed green sturgeon encountered in the fisheries shall be recorded according to the green sturgeon sampling protocol in the WCGOP and A-SHOP manuals. Biological data to be collected for each observed green sturgeon include: fork length, weight, tags and scute removal patterns, photos of the head and scutes, information on fish condition, and a tissue sample. For observed green sturgeon that are dead, information on the sex of the individual as well as a whole fin ray sample should be collected. The following terms and conditions implement this reasonable and prudent measure:

   a. NMFS shall ensure that on observed tows with green sturgeon encounters, biological data are collected according to the green sturgeon sampling protocols in the observer manual.
   b. NMFS shall ensure that green sturgeon tissue samples are appropriately stored and transported for genetic analysis.

The following is an assessment of the green sturgeon sampling program that is to be conducted as part of the proposed action under the reasonable and prudent measure described above. The NMFS observer manual includes a protocol for sampling green sturgeon encountered in the Pacific Coast groundfish fishery. This protocol includes taking measurements (e.g., fork length, weight), notes on condition and the presence of tags, and photographs of each individual green sturgeon encountered. The protocol also includes collecting a tissue sample for genetic analysis. For green sturgeon released alive, a fin clip (i.e., a 5mm by 5mm piece of the anal or caudal fin) is collected. For green sturgeon that are dead, the whole first pectoral fin ray is collected and the gonads are examined to determine the individual's sex.

Although the sampling of green sturgeon encountered as bycatch in the proposed action would constitute additional handling of the fish, it is NMFS' opinion that the effects on individual fish are minimal whereas the information gathered is highly beneficial to understanding the impacts of the fisheries on the species. First, the green sturgeon handled would be those encountered in the fisheries. No additional sampling would be conducted to target green sturgeon. Handling time would be minimal (limited to a few minutes). The collection of a fin clip from live green sturgeon has been conducted in research studies and is expected to have minimal effects on individual fish, given the small size of the sample. Based on this information, it is NMFS' opinion that the sampling of green sturgeon encountered during the operation of the Pacific Coast Groundfish fishery in 2012 is not likely to jeopardize the continued existence of Southern DPS green sturgeon. The incidental take limit for sampling of green sturgeon would be the same as that for the proposed action (i.e., 330 green sturgeon). The expected take is estimated to be lower, ranging from 90 to 330 green sturgeon, with no lethal take expected as a result of the sampling.

Steller Sea Lions

We include one reasonable and prudent measure in this incidental take statement for the eastern DPS Steller sea lions considered in this opinion:

1. Bycatch of Steller sea lions incidental to the WCGF fishery will be observed and reported.

Terms and conditions to implement the reasonable and prudent measure for eastern DPS Steller sea lions:

1. The NMFS WCGFOP will observe and report bycatch for the period ending December 31, 2012 and with this information will estimate the fleetwide mortality rate for Steller sea lions incidental to the WCGF fishery to demonstrate the fishery is consistent with this opinion. This report will be provided to PRD.

2.9. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

The following conservation recommendation for eulachon would provide information for future consultations involving the continued operation of the Pacific Coast Groundfish fisheries beyond December 31, 2012:

1. Develop a rangewide abundance estimate for the southern DPS of eulachon: NMFS recognizes a high degree of uncertainty in the data available upon which the analysis in this opinion of impacts to southern DPS of eulachon was based. One source of uncertainty was the abundance of southern DPS eulachon in the marine environment. This resulted in a certain level of error associated with the estimate of the cumulative effect of the bycatch in the ocean shrimp fishery. This source of uncertainty can be

reduced or eliminated by developing an abundance estimate.

The following conservation recommendations for green sturgeon would provide information for future consultations involving the continued operation of the Pacific Coast Groundfish fishery beyond December 31, 2012:

(1) Develop increased monitoring of green sturgeon bycatch: NMFS recognizes a high degree of uncertainty in the data available upon which the analysis in this opinion of impacts to Southern DPS green sturgeon was based. One source of uncertainty was the monitoring of only a portion of the LE groundfish bottom trawl and California halibut fisheries for green sturgeon encounters. From 2002 through 2010, observer coverage in the LE groundfish bottom trawl fishery ranged from 12 to 26% and observer coverage in the California halibut fishery ranged from 3 to 25%. The green sturgeon bycatch in the observed portion of the fleet was then expanded to the whole fishery based on the proportion of the observed landings versus the total fleet landings. This resulted in a certain level of error associated with the estimate of total green sturgeon bycatch across the whole fishery. This source of uncertainty can be reduced or eliminated by increasing monitoring of green sturgeon encounters throughout the fisheries, either by increasing observer coverage or implementing some other means of recording and reporting green sturgeon bycatch. In 2011, observer coverage of the LE groundfish bottom trawl sector increased to 100%. However, observer coverage of the California halibut fishery is still below 100%, varying by year. Yet, the available bycatch data show that the majority of green sturgeon bycatch occurred in the California halibut fishery. Thus, increased monitoring of 100% of the green sturgeon bycatch in this fishery is vital to improving the understanding of green sturgeon bycatch in the fisheries. NMFS recognizes that economic and logistical constraints limit the feasibility of increasing observer coverage to 100% in the California halibut fishery during the timeframe of the proposed action. Alternate methods should be discussed and developed to obtain 100% monitoring of green sturgeon bycatch in the California halibut fishery, such as electronic monitoring of green sturgeon bycatch. At a minimum, information is needed on the number of green sturgeon encountered in each tow and whether the fish are discarded or retained.

(2) Conduct studies to improve estimates of recapture rates and post-release mortality for Southern DPS green sturgeon encountered and released alive. For example, development of a tagging program with other types of tags (e.g., one-year or two-year external acoustic tags) may provide information to better assess recapture rates and post-release mortality, as well as information on the movements and habitat use of individual fish after release. Standardizing fish condition and viability observations would complement such a tagging program, providing information to relate the condition of the fish to post-release mortality.

(3) For the California halibut fishery, work to better distinguish state from Federal fishery impacts.

(4) Work with the California Department of Fish and Game to review the regulations for the California halibut fishery with the goal of 100% monitoring and further reducing green sturgeon bycatch.

(5) Develop improved estimates of the biological characteristics of Southern DPS green sturgeon, including abundance estimates and productivity.

The following conservation recommendation for ESA-listed marine mammals and sea turtles would provide information for future consultations involving the continued operation of the Pacific Coast Groundfish fishery beyond December 31, 2012:

1. The NMFS NWR SFD will work with PRD, the NWFSC and the PFMC to scope and develop appropriate actions with the aim of implementing conservation measures in future biological opinions on the WCGF fishery.

2.10 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely to Adversely Affect" Determinations

Marine Mammals and Sea Turtles (Sei Whales, Northern Pacific Right Whales, Blue Whales, Fin Whales, Sperm Whales, Southern Resident Killer Whales and their Critical Habitat, Guadalupe Fur Seals, Green Sea Turtles, Olive Ridley Sea Turtles, and Loggerhead Sea Turtles)

The above ESA-listed marine mammal and sea turtle species may occur in the action area and may be directly affected by interaction with vessels or gear or indirectly affected by reduced prey availability or trophic effects of the proposed fishing. Sightings of the large whales along the west coast of the U.S. range from year round (Fin and Sperm whales) to seasonal (Blue whales) to rare (Sei, North Pacific Right whales). Potential exposure of the above whales to the proposed fishing effort is low relative to other ESA-listed species for which there are past documented interactions (e.g., relative to humpback whales; NWFSC 2011 and overlap indices in Appendix B of NWFSC 2011). The above identified sea turtle species rarely occur in the action area (NMFS and USFWS 2007b, c, d). Occurrence of Guadalupe fur seals in U.S. waters is also rare (Carretta et al. 2011). Any effects on species rarely sighted in the action area are extremely unlikely to occur.

Vessel traffic and fishing effort associated with proposed fishing are anticipated to be similar to past levels over the broad expanse of the west coast, and fishing vessels and gear would have a short-term presence in any specific location. There are no documented interactions of the above identified species with WCGF vessels or gear from observer programs or the stranding network, with the exception of one documented collision of a fishing vessel with a sperm whale (Jannot et al. 2010). Although sperm whales and killer whales are known to remove fish caught on long-line hooks, potentially making them more susceptible to entanglement or other types of human-interaction (summarized in NWFSC 2011), this kind of depredation behavior is not known or observed to be a widespread problem off the U.S. west coast. Nonetheless, we plan to work with the PFMC and others to determine if proactive conservation measures should be developed to minimize the potential for depredation to become a problem off the U.S. west coast (as referenced in the above conservation recommendations). Based on the low potential for exposure and the occurrence of only one past interactions of a sperm whale with WCGF vessels and gear observed, the proposed fishing effort is anticipated to have a discountable potential for interaction with any of the above marine mammal or sea turtle species during 2012.

The WCGF fishery target relatively large, commercially valuable fish species, including rockfish, hake, and various mid-water and bottom fish. Sei whales, Northern Pacific right whales, blue whales and fin whales feed on krill and small schooling fishes, such as anchovies and sardines, which are not impacted by the WCGF fishery to any significant extent. Based on food-web modeling conducted by the NWFSC, trophic effects of the WCGF fishery are expected to be minor and in fact may positively affect the abundance of krill through removal of predators, and therefore positively affect prey available to Sei whales, Northern Pacific right whales, blue whales and fin whales (Appendix A of NWFSC 2001). The above identified sea turtle species feed on a variety of species, including kelp and invertebrates such as jellyfish, sponges, and sea pens as well as pelagic prey. Food-web modeling indicates that trophic effects of the WCGF fishery are expected to be minor, because of the resiliency of the forage species evaluated (described further below). Guadalupe fur seals and sperm whales consume a variety of pelagic prey that may be either directly or indirectly affected by the WCGF fishery. However, the above referenced modeling indicates that marine mammals are unlikely to be significantly impacted by food web interactions caused by proposed fishing. The forage species evaluated were found to be resilient to direct fishing mortality (i.e., high productivity of the stocks compensated for the range of fishing harvest evaluated, such that only small prey reductions were anticipated), as would be expected from the life history of small pelagic fishes. Because of their resiliency, the forage species were likewise not impacted through indirect effects of predation or competition (NWFSC 2011).

Southern Resident killer whales consume a variety of fish and one species of squid, but salmon, and Chinook salmon in particular, are their primary prey (review in NMFS 2008c). Ongoing and past diet studies of Southern Residents conduct sampling during spring, summer and fall months in inland waters of Washington State and British Columbia (i.e., Ford and Ellis 2006; Hanson et al. 2010; ongoing research by NWFSC). Therefore, our knowledge of diet is specific to inland waters. Less is known about diet of Southern Residents off the Pacific Coast. However, chemical analyses support the importance of salmon in the year-round diet of Southern Residents (Krahn et al. 2002; Krahn et al. 2007). Additionally, Southern Residents were found to consume Chinook in two documented predation events off the coast. The predominance of Chinook salmon in the Southern Residents' diet when in inland waters, even when other species are more abundant, combined with information indicating that the killer whales consume salmon year round, makes it reasonable to expect that Southern Residents predominantly consume Chinook salmon when available in coastal waters.

As described above no direct interactions with fisheries have been observed or reported for Southern Resident killer whales. The WCGF fishery may, however, affect Southern Residents indirectly by reducing availability of their primary prey, Chinook salmon. Chinook salmon are bycatch in both the hake and non-hake sectors of the WCGF fishery, ranging in the recent past from ~2,000 to 12,000 Chinook annually (summarized in Table 11 of NWFSC 2011). Chinook salmon bycatch has decreased in both sectors of the fishery, but the hake sector represents the largest fraction of bycatch (over 90% of bycatch 2007–2009). Of the non-hake sector, most of the bycatch occurs in the limited entry groundfish bottom trawl (review in NWFSC 2011).

Much of the Chinook bycatch is represented by individuals smaller than 60 cm (younger than 2 years old). In 2007, an estimated 45% of the Chinook caught coast-wide in the groundfish fishery were less than 60 cm, and in 2008, the fraction was closer to 85% (review in NWFSC 2011). By contrast, Southern Residents predominantly consume older and larger Chinook salmon (Ford & Ellis 2006, Hanson et al. 2010), particularly 4-5 year olds that are returning to natal streams to spawn. The Chinook bycatch is represented primarily by southern stocks, originating south of the Columbia River. Stocks originating from Puget Sound, British Columbia, and Alaska represent less than 10% of total bycatch (review in NWFSC 2011). These same northern stocks represent the largest contribution to Southern Resident diet, based on feeding events in inland waters (Hanson et al. 2010).

Given the total quantity of prey available to Southern Residents throughout their range, the anticipated reduction in prey is extremely small, and although measurable is anticipated to be less than a 1% reduction under a range of Chinook bycatch and abundance scenarios (from -0.02% to -0.32%; summarized in Table 12 of NWFSC 2011). Previous work has demonstrated links between Chinook abundance and killer whale fecundity and survival (Ward et al. 2009; Ford et al. 2009). Based on a linear relationship between Chinook abundance and the probability of calving, the prey reduction anticipated here would at most reduce the probability of a female calving by 0.06% (NWFSC 2011). Given that births occur infrequently and the population is subject to both demographic and environmental stochasticity, such a change would be undetectable. Therefore, NMFS anticipates that the reduction in Chinook associated with the proposed fishing would result in an insignificant reduction in adult equivalent prey resources for Southern Residents. Future loss of Chinook salmon could also affect the prey PCE of designated critical habitat for Southern Resident killer whales. However, of the small reduction in prey along the coast evaluated above, only a small number of those fish would have potentially entered inland waters of Washington that are designated critical habitat for Southern Residents, and that reduction is not anticipated to affect the conservation value of the critical habitat.

Therefore, we find that the potential adverse effects of proposed fishing on the above identified marine mammal and sea turtle species would be either discountable or insignificant and determines that the proposed fishing may affect, but is not likely to adversely affect Sei whales, Northern Pacific right whales, blue whales, fin whales, sperm whales, Southern Resident killer whales or their critical habitat, Guadalupe fur seals, green sea turtles, olive ridley sea turtles, and loggerhead sea turtles.

<u>Critical Habitat of Steller Sea Lions</u>

We designated critical habitat for Steller sea lions in certain areas and waters of Alaska, Oregon and California, August 27, 1993 (NMFS 1993). Certain rookeries, haulouts and associated areas, as well as three special foraging areas were designated as critical habitat. Critical habitat east of 144 W includes air zones extending 3,000 feet above the terrestrial and aquatic zones, and aquatic zones extending 3,000 feet seaward from the major rookeries and haulouts. All three special foraging areas are west of 144 W, and therefore outside the action area. There is no indication that proposed fishing causes disturbance to rookeries or haul outs, and we do not anticipate any effects to either. Further, food-web modeling indicates that food web interactions and prey reductions in critical habitat (i.e., aquatic zone) are unlikely to strongly impact marine mammals, including pinnipeds (NWFSC 2011) because of the resilience of the forage species evaluated as described above. Although food-web modeling conducted by NWFSC may underestimate potential for effects on Steller sea lions, their long-term population growth suggests that any effects on their prey availability have not prevented steady population increases. Therefore, we anticipate that fishing-induced reduction in prey would have an insignificant effect on the conservation value of their critical habitat.

Therefore, we find that the potential adverse effects of proposed fishing on critical habitat of Steller sea lions are either discountable or insignificant and determines that the proposed fishing may affect, but is not likely to adversely affect designated critical habitat of Steller sea lions.

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The DQA specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the National Marine Fisheries Service. Other interested users could include the PFMC and others interested in the conservation of the affected ESUs/DPS. Individual copies of this opinion were provided to the SFD of NMFS NWR and the PFMC. This opinion will be posted on the NMFS NWR web site (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA

Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

4. REFERENCES

Adams, P. B., C. B. Grimes, J. E. Hightower, S. T. Lindley, M. L. Moser, and M. J. Parsley. 2007. Population status of North American green sturgeon, *Acipenser medirostris*. Environmental Biology of Fishes 79:339-356.

Adams, P. B., C. B. Grimes, S. T. Lindley, and M. L. Moser. 2002. Status review for North American green sturgeon, *Acipenser medirostris*. NOAA, National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA. 50 p.

Al-Humaidhi, A.W. , M.A. Bellman , J. Jannot, and J. Majewski. 2012. Observed and estimated total bycatch of green sturgeon and Pacific eulachon in 2002-2010 U.S. west coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Al-Humaidhi, A.W. 2011. Analysis of green sturgeon bycatch by sector and time in the West Coast Groundfish Fishery. 3pp. Included as Attachment 2 to: National Marine Fisheries Service. 2011. Endangered Species Act Section 7 consultation – Biological Assessment for the continued operation of the Pacific Coast Groundfish Fisheries for the period of January 1 – December 31, 2012. Prepared by the NMFS Northwest Region Sustainable Fisheries Division. 162 pp.

Al-Humaidhi, A.W., M.A. Bellman, J. Jannot, and J. Majewski. 2011. Observed and estimated total bycatch of green sturgeon and eulachon in 2002-2010 U.S. West Coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. 21pp.

Allen, B.M, and R. P. Angliss. 2011. Steller sea lion (*Eumetopias jubatus*): Eastern U. S. Stock. In: Alaska marine mammal stock assessments, 2010. U.S. Department Commerce, NOAA Technical Memorandum NMFS-AFSC-223. 292 pages.

Baker CS, Medrano-Gonzalez L, Calambokidis J, Perry A, Pichler F, Rosenbaum H, Straley JM, Urban-Ramirez J, Yamaguchi M, Von Ziegesar O, 1998. Population structure of nuclear and mitochondrial DNA variation among humpback whales in the North Pacific. Molecular Ecology 7:695-707.

Baker CS, Steel D, 2010. geneSPLASH: genetic differentiation of 'ecostocks' and 'breeding stocks' in North Pacific humpback whales. In: Symposium on the results of SPLASH humpback whale study Final report and recommendations (Calambokidis J, ed). Quebec City, Canda; 58-59.

Barlow J, Calambokidis J, Falcone EA, Baker CS, Burdin A, Clapham P, Ford JKB, Gabriele C, LeDuc R, Mattila D, Quinn TI, Rojas-Bracho L, Straley JM, Taylor B, Urbán R J, Wade P, Weller D, Witteveen B, Yamaguchi M, 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science Early online. Available http://onlinelibrary.wiley.com/doi/10.1111/j.1748-7692.2010.00444.x/pdf.

Barlow J, Ferguson M, Becker E, Redfern J, Forney KA, Vilchis I, Fiedler P, Gerrodette T, Ballance L, 2009. Predictive modeling of cetacean densities in the eastern Pacific Ocean. NOAA Technical Memorandum NMFS-SWFSC-TM-444:206 pp.

Barraclough W. E. 1964. Contribution to the marine life history of the eulachon *Thaleichthys pacificus*. J. Fish. Res. Board Can. 21:1333–1337.

Beacham, T. D., D. E. Hay, and K. D. Le. 2005. Population structure and stock identification of eulachon (*Thaleichthys pacificus*), an anadromous smelt, in the Pacific Northwest. Mar. Biotechnol. 7:363–372.

Beamesderfer, R. C. P., M. L. Simpson, and G. J. Kopp. 2007. Use of life history information in a population model for Sacramento green sturgeon. Environmental Biology of Fishes 79:315-337.

Bellman, M., E. Heery, and J. Hastie. 2008. Estimated discard and total catch of selected groundfish species in the 2007 U. S. West Coast fisheries. Pacific States Marine Fisheries Commission and Northwest Fisheries Science Center, Fishery Resource Analysis and Monitoring Division, Seattle, WA. 77 p.

Bellman, M.A., E. Heery, and J. Majewski. 2010a. Observed and Estimated Total Bycatch of Green Sturgeon in the 2002-2008 U.S. West Coast Groundfish Fisheries. West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E., Seattle, WA 98112. Available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/GreenSturgeon_TM0208Rpt_012910rv.pdf

Bellman, M.A., E. Heery, J. Jannot, and J. Majewski. 2010b. Estimated discard and total catch of selected groundfish species in the 2009 U.S. west coast fisheries. West Coast Groundfish

Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Bellman, M.A., Heery, E., and J. Majewski. 2009. Estimated discard and total catch of selected groundfish species in the 2008 U.S. West Coast fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Bellman, M.A., J. Jannot, and J. Majewski. 2011. Observed and estimated total bycatch of green sturgeon and eulachon in the 2002 – 2009 U.S. West coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. 38 pp.

Bellman, M.A., S.A. Heppell, and C. Goldfinger. 2005. Evaluation of U.S. West coast groundfish habitat conservation regulation via analysis of spatial and temporal patterns of trawl fishing effort. Canadian Journal of Fisheries and Aquatic Science 62:2886-2900.

Benson SR, 2002. Ecosystem Studies of Marine Mammals and Seabirds in Monterey Bay, CA, 1996-1999. M.S. Thesis. : San Jose State University.

Benson SR, Croll DA, Marinovic B, Chavez FP, Harvey JT, 2002. Changes in the cetacean assemblage of a coastal upwelling ecosystem during El Niño 1997-98 and the La Niña 1999. Progress in Oceanography 54:279-291.

Benson, S.R., Eguchi, T., Foley, D.G., Forney, K.A., Bailey, H., Hitipeuw, C., Betuel P. Samber, B.P., Ricardo F. Tapilatu, R.F. Rei, V., Ramohia, P., Pita, J., and Dutton,P.H. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea." Ecosphere, Vol. 2 No. 7.

Benson, S.R., Forney, K.A., Harvey, J.T., Caretta, J.V., and Dutton, P.H. 2007b. Abundance, distribution, and habitat of leatherback turtles (*Dermochelys coriacea*) off California 1990-2003. Fisheries Bulletin 105(3):337-347.

Benson, S.R., P.H. Dutton, C. Hitipeuw, B. Samber, J. Bakarbessy and D. Parker. 2007a. Post-nesting migrations of leatherback turtles (*Dermochelys coriacea*) from Jamursba-Medi, Bird's Head Peninsula, Indonesia. Chelonian Conservation and Biology. 6(1):150-154.

Biological Review Team (BRT). 2005. Green sturgeon (*Acipenser medirostris*) status review update. Prepared for the National Marine Fisheries Service. 36 pp.
Bowlby, C.E. 1994. Observations of leatherback turtles offshore of Washington and Oregon. Northwestern Naturalist 75:33-35.

Brown, R.S. Jeffries, D. Hatch, B. Wright, and S. Jonker. 2010. Field Report: 2010 Pinniped Management Activities at and below Bonneville Dam. Oregon Department of Fish and Wildlife, Salem, Oregon.

Calambokidis J, Falcone EA, Quinn T, Burdin A, Clapham P, Ford JKB, Gabriele C, LeDuc R, Matillia D, Rojas-Bracho L, Straley JM, Taylor B, Urban-Ramirez J, Weller D, Witteveen B, Yamaguchi M, Bendlin A, Camacho D, Flynn KR, Havron A, Huggins J, Maloney N, 2008. SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific. Final report for contract AB133F-03-RP-00078. Olympia, Washington: Cascadia Research.

Calambokidis J, Steiger G, Ellifrit D, Troutman B, Bowlby C, 2004. Distribution and abundance of humpback whales and other marine mammals off the northern Washington coast. Fisheries Bulletin 102:563-580.

Carretta et al. 2011. Guadalupe Sea Lion Stock Assessment Report, In NOAA Technical Memorandum NMFS U.S. Pacific Marine Mammal Stock Assessments: 2010. NOAA-TM-NMFS-SWFSC-476. June, 2011.

Carretta J, Forney KA, Oleson E, Martien K, Muto M, Lowry M, Barlow J, Baker J, Hanson MB, Lynch D, Carswell L, Brownell RJ, Robbins J, Mattila D, Ralls K, Hill M, 2010. Draft U.S. Pacific marine mammal stock assessments: 2010. NOAA Technical Memorandum NMFS-SWFSC-TM-XXX.

Cech, J. J., S. I. Doroshov, G. P. Moberg, B. P. May, R. G. Schaffter, and D. W. Kohlhorst. 2000. Biological assessment of green sturgeon in the Sacramento-San Joaquin watershed (phase 1). Final report to the CALFED Bay-Delta Program. Project #98-C-15, Contract #B-81738. *Cited in*: COSEWIC. 2004. COSEWIC assessment and update status report on the green sturgeon *Acipenser medirostris* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 31 pp.

Colway, C. and D.E. Stevenson. 2007. Confirmed records of two green sturgeon from the Bering Sea and Gulf of Alaska. Northwestern Naturalist 88:188-192.
COSEWIC. 2004. COSEWIC assessment and update status report on the green sturgeon *Acipenser medirostris* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 31 pp.

Dalla Rosa L, 2010. Modeling the foraging habitat of humpback whales. PhD thesis, University of British Columbia, Vancouver. 185 pp.

DFO (Dept. Fisheries and Oceans Canada). 2006a. Fraser River eulachon (*Thaleichthys pacificus*): 2006 population assessment and harvest recommendations for 2007. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/039.

Dommasnes, A., and Røttingen, I. 1985. Acoustic stock measurements of the Barents Sea capelin 1972.1984. A review. *In* The Proceedings of the Soviet.Norwegian Symposium on the Barents Sea Capelin. *Edited by* H. Gjøsæter. Institute of Marine Research, Bergen, Norway. pp. 45.108.

Dumbauld, B. R., D. L. Holden, and O. P. Langness. 2008. Do sturgeon limit burrowing shrimp populations in Pacific Northwest estuaries? Environmental Biology of Fishes 83:283-

296.

Dutton, D.L., C. Hitipeuw, M. Zein, S.R. Benson, G. Petro, J. Pita, V. Rei, L. Ambio, and J. Bakarbessy. 2007. Status and genetic structure of nesting populations of leatherback turtles (Dermochelys coriacea) in the western Pacific. Chelonian Conservation and Biology 6: 47-53.

Eckert, S.A. 1998. Perspectives on the use of satellite telemetry and other electronic technologies for the study of marine turtles, with reference to the first year long tracking of leatherback sea turtles. In: Proc. Of the 17th Annual Sea Turtle Symposium. NOAA Tech. Mem. NMFS-SEFSC-415. p.44

Eckert, S.A. 1999. Habitats and migratory pathways of the Pacific leatherback sea turtle. Hubbs Sea World Research Institute Technical Report 99-290.

Eckert, S.A. 2002. Distribution of juvenile leatherback sea turtle, *Dermochelys coriacea*,sightings. Marine Ecology Progress Series 230: 289-293.

Emmett, R. L., P. J. Bentley, and G. K. Krutzikowsky. 2001. Ecology of marine predatory and prey fishes off the Columbia River, 1998 and 1999. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-51.

Emmett, R. L., S. A. Hinton, S. L. Stone, and M. E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in West Coast estuaries, Volume II: Species life history summaries. ELMR Report No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD. 329 pp.

EPA (U.S. Environmental Protection Agency). 2002. Columbia River basin fish contaminant survey 1996–1998. EPA 910-R-02-006. EPA, Region 10, Seattle, WA.

Erickson, D. L. and M. A. H. Webb. 2007. Spawning periodicity, spawning migration, and size at maturity of green sturgeon, *Acipenser medirostris,* in the Rogue River, Oregon. Environmental Biology of Fishes 79:255-268.

Erickson, Dan. Fishery biologist, ODFW, Newport, OR. January 3, 2012. Personal communication with Joe Heublein (NMFS), regarding green sturgeon mortality in gillnet fisheries.

Fleming A, Jackson J, 2011. Global review of the humpback whale (*Megaptera novaeangliae*). NOAA-NMFS-SWFSC Tech Memo NMFS-SWFSC-474.

Ford, J.K.B. and G.M. Ellis. 2006. Selective foraging by fish-eating killer whales *Orcinus orca* in British Columbia. Marine Ecology Progress Series 316:185-199.

Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the U.S. west coast and within four National Marine Sanctuaries during 2005. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-406. 27p.

Frimodig, A. 2008. Informational report: Bycatch reduction devices used in the pink shrimp trawl fishery. Rep. to California Fish and Game Commission. California Dept. Fish and Game, Marine Region, State Fisheries Evaluation Project.

Fry Jr., D. H. 1979. Anadromous fishes of California, California Dept. Fish and Game, Sacramento. Online at http://cdm15024.contentdm.oclc.org/cdm4/item_viewer.php?CISOROOT=/ p178601ccp2&CISOPTR=103

Garcia, D. and L. Sarti. 2000. Reproductive cycles of leatherback turtles, pp. 163. In: Proceedings of the 18th International Sea Turtle Symposium, March 3-7, 1998, Mazatlan, Sinaloa, Mexico.

Graham, T. 2009. Scyphozoan jellies as prey for leatherback turtles off central California. Master's thesis, San Jose State University, San Jose, CA.

Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement.

Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-105, 360 p.

Hamilton, J. B., G. L. Curtis, S. M. Snedaker, and D. K. White. 2005. Distribution of anadromous fishes in the upper Klamath River watershed prior to hydropower dams—A synthesis of the historical evidence. Fisheries 30(4):10–20.

Hannah, R. W., and S. A. Jones. 2007. Effectiveness of bycatch reduction devices (BRDs) in the ocean shrimp (*Pandalus jordani*) trawl fishery. Fish. Res. 85:217–225.

Hannah, R. W., S. A. Jones, and K. M. Matteson. 2003. Observations of fish and shrimp behavior in ocean shrimp (*Pandalus jordani*) trawls. ODFW Information Rep. 2003-03. Oregon Dept. fish and Wildlife, Marine Resources Program, Newport.

Hanson, M.B., R.W. Baird, J.K.B. Ford, J. Hempelmann-Halos, D.M. Van Doornik, J.R. Candy, C.K. Emmons, G.S. Schorr, B. Gisborne, K.L. Ayres, S.K. Wasser, K.C. Balcomb, K. Balcomb-Bartok, J.G. Snewa, M.J. Ford. 2010. Species and stock identification of prey consumed by endangered southern resident killer whales in their summer range. Endangered Species Research 11: 69-82.

Hay, D. E., and McCarter, P. B. 2000. Status of the eulachon *Thaleichthys pacificus* in Canada. Department of Fisheries and Oceans Canada, Canadian Stock Assessment Secretariat, Research Document 2000-145. Ottawa, Ontario.

Hay, D. E., P. B. McCarter, R. Joy, M. Thompson, and K. West. 2002. Fraser River eulachon biomass assessments and spawning distribution: 1995–2002. Canadian Science Advisory

Secretariat research document 2002/117. DFO, Nanaimo, BC.

Heublein, J. C., J. T. Kelly, C. E. Crocker, A. P. Klimley, and S. T. Lindley. 2009. Migration of green sturgeon, Acipenser medirostris, in the Sacramento River. Environmental Biology of Fishes 84:245–258.

Heublein, Joe. Fishery biologist, NMFS, Santa Rosa, CA. January 6, 2012. Personal communication regarding observations of the effects of research handling and tagging on green sturgeon condition and survival.

Hourston, A.S., and C.W. Haegele. 1980. Herring on Canada's Pacific Coast. Can. Spec. Publ. Fish. Aquat. Sci. 48.

Huff, D.D., S.T. Lindley, P.S. Rankin, and E.A. Mora. 2011. Green sturgeon physical habitat use in the coastal Pacific Ocean. PLoS One 6(9):e25156. DOI: 10.1371/journal.pone.0025156.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River basin fish and wildlife. Northwest Power and Conservation Council, Columbia River Basin Indian Tribes, National Marine Fisheries Service, Portland, OR.

Israel, J. 2010. Memo to Melissa Neuman (NMFS) regarding unknown observer sample genotypes and assignment, dated August 11, 2010. 4 pp.

Israel, J. A., J. F. Cordes, M. A. Blumberg, and B. May. 2004. Geographic patterns of genetic differentiation among collections of green sturgeon. North American Journal of Fisheries Management 24:922-931.

Israel, J.A. and B. May. 2010. Indirect genetic estimates of breeding population size in the polyploidy green sturgeon (*Acipenser medirostris*). Molecular Ecology 2010:1058-1070.

Israel, J.A., K.J. Bando, E.C. Anderson, and B. May. 2009. Polyploid microsatellite data reveal stock complexity among estuarine North American green sturgeon (*Acipenser medirostris*). Canadian Journal of Fisheries and Aquatic Sciences 66:1491 – 1504.

Israel, J.A., M. Neuman, M.L. Moser, S.T. Lindley, B.W.McCovey Jr., D.L. Erickson, and P. Klimley. In prep. Recent advances in understanding the life history of green sturgeon (*Acipenser medirostris*) and potential anthropogenic threats to this imperiled fish.

Jannot, J., Heery, E., Bellman, M., Majewski, J. 2011. Estimated bycatch of marine mammals, seabirds, and sea turtles in the US west coast commerical groundfish fishery, 2002-2009. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

JCRMS (Joint Columbia River Management Staff). 2011. 2011 joint staff report concerning stock status and fisheries for sturgeon and smelt. Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife.

Kelly, J. T., A. P. Klimley, and C. E. Crocker. 2007. Movements of green sturgeon, *Acipenser medirostris,* in the San Francisco Bay Estuary, California. Environmental Biology of Fishes 79:281-295.

Kieckhefer T, 1992. Feeding ecology of humpack whales in continental shelf waters near Cordell Bank, California. Master's thesis. Moss Landing, CA: Moss Landing Marine Laboratories.

Kime, D. E. 1995. The effects of pollution on reproduction in fish. Rev. Fish Biol. Fish. 5:52–96.

Krahn, M.M., M.B. Hanson, R.W. Baird, R.H. Boyer, D.G. Burrows, C.K. Emmons, J.K.B. Ford, L.L. Jones, D.P. Noren, P.S. Ross, G.S. Schorr, and T.K. Collier. 2007. Persistent organic pollutants and stable isotopes in biopsy samples (2004/2006) from Southern Resident killer whales. Marine Pollution Bulletin 54:1903-1911

Krahn, M.M., P.R. Wade, S.T. Kalinowski, M.E. Dahlheim, B.L. Taylor, M.B. Hanson, G.M. Ylitalo, R.B. Angliss, J.E. Stein, and R.S. Waples. 2002. Status review of Southern Resident killer whales (*Orcinus orca*) under the Endangered Species Act, U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-54, 133p.

Lagerquist B, Mate B, Ortega-Ortiz J, Winsor M, Urbán-Ramirez J, 2008. Migratory movements and surfacing rates of humpback whales (Megaptera novaeangliae) satellite tagged at Socorro Island, Mexico. Marine Mammal Science 24:815-830.

Langness, Olaf. Fish biologist, WDFW, Vancouver, WA. December 29, 2011. Personal communication, via email to Joe Heublein (NMFS) with a copy to recipients from WDFW, ODFW, and NMFS, regarding ODFW unpublished data for the Columbia River test gillnet fishery and green sturgeon mortality estimates.

Larson, K. W., and C. E. Moehl. 1990. Entrainment of anadromous fish by hopper dredge at the mouth of the Columbia River. *In* C. A. Simenstad (ed.), Effects of dredging on anadromous Pacific coast fishes, workshop proceedings, 8–9 September 1988, p. 102–112. Univ. Washington, Sea Grant Program, Seattle.

Larson, Z. S., and M. R. Belchik. 1998. A preliminary status review of eulachon and Pacific lamprey in the Klamath River Basin. Yurok Tribal Fisheries Program, Klamath, CA.

Lian, C., Singh, R., & Weninger, Q. (December 01, 2009). Fleet restructuring, rent generation, and the design of individual fishing quota programs: Empirical evidence from the Pacific Coast groundfish fishery. Marine Resource Economics, 24, 4, 329-359.

Lindley, S. T., M. L. Moser, D. L. Erickson, M. Belchik, D. W. Welch, E. Rechisky, J. T. Kelly, J. C. Heublein, and A. P. Klimley. 2008. Marine migration of North American green sturgeon. Transactions of the American Fisheries Society 137:182-194.

Lindley, S.T., D.L. Erickson, M.L. Moser, G. Williams, O.P. Langness, B.W. McCovey, M. Belchik, D. Vogel, W. Pinnix, J.T. Kelly, J.C. Heublein, and A.P. Klimley. 2011. Electronic tagging of green sturgeon reveals population structure and movement among estuaries. Transactions of the American Fisheries Society 140:108-122.

Lutz, P. L., J.A. Musick, and J. Wyneken. 2003. The Biology of Sea Turtles, Volume II. CRC Press LLC, Boca Raton, Florida.

Manuel, Matt. Fishery biologist, Glenn-Colusa Irrigation District, Willows, CA. December 22, 2011. Personal communication with Joe Heublein (NMFS) regarding observations of the effects of research handling and tagging on green sturgeon condition and survival.

Marchal, P., Lallemand, P., and Stokes, K. 2009. The relative weight of traditions,economics, and catch plans in New Zealand fleet dynamics. Canadian Journal of Fisheries and Aquatic Sciences, 66: 291–311.

Mason, Brian. Fishery biologist, NMFS, Alaska Fisheries Science Center, Seattle, WA. June 4, 2009. Personal communication, via email sent to Susan Wang (NMFS), regarding data from the North Pacific Groundfish Observer Program on a green sturgeon encountered as bycatch in waters off Alaska in 2009.

McElhany, P., M. H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-42, 156p.

McFarlane, G. A., J. R. King, and R. J. Beamish. 2000. Have there been recent changes in climate? Ask the fish. Progr. Oceanogr. 47:147–169.

McLean, J. E., D. E. Hay, and E. B. Taylor. 1999. Marine population structure in an anadromous fish: Life history influences patterns of mitochondrial DNA variation in the eulachon, *Thaleichthys pacificus*. Mol. Ecol. 8:S143–S158.

Melvin, E.F. 2000. Streamer lines to reduce seabird bycatch in longline fisheries.Washington Sea Grant Program, University of Washington. WS-AS-03.

Moody, M. F. 2008. Eulachon past and present. Master's thesis. Univ. British Columbia, Vancouver. Online at https://circle.ubc.ca/bitstream/2429/676/1/ubc_2008_spring_moody_megan.pdf

Mora, E.A., S.T. Lindley, D.L. Erickson, and A.P. Klimley. 2009. Do impassable dams and flow regulation constrain the distribution of green sturgeon in the Sacramento River, California? Journal of Applied Ichthyology 25 (Supplement 2):39-47.

Mora, Ethan. PhD candidate, UC Davis, Davis, CA. January 10, 2012. Personal communication, via phone call with Susan Wang (NMFS), regarding estimates of green sturgeon abundance in

Southern DPS rivers in 2010 and 2011.

Morreale, S., E. Standora, F. Paladino, and J. Spotila. 1994. Leatherback migrations along deepwater bathymetric contours. In: Proc. 13th Annual Symposium Sea Turtle Biology and Conservation. NOAA Tech. Memo NMFS-SEFSC-341. p: 109.

Morrison, J., M. Quick, and M. G. G. Foreman. 2002. Climate change in the Fraser River watershed: Flow and temperature predictions. J. Hydrol. 263:230–244.

Moser, M. and S. Lindley. 2007. Use of Washington estuaries by subadult and adult green sturgeon. Environmental Biology of Fishes 79:243-253.

Moser, Mary. Research fishery biologist, NMFS NWFSC, Seattle, WA. Unpublished data regarding preliminary observations from feeding pit mapping surveys conducted in Willapa Bay, WA. *Cited in*: NMFS. 2011. Endangered Species Act Section 7 consultation – Biological Assessment for the continued operation of the Pacific Coast Groundfish Fisheries for the period of January 1 – December 31, 2012. Prepared by the NMFS Northwest Region Sustainable Fisheries Division. 162 pp.

Moyle, P. B. 2002. Sturgeons, Acipenseridae, *Pages 106 – 113 in*: Moyle, P.B. 2002. Inland fishes of California, 2nd edition. University of California Press, Berkeley and Los Angeles, CA.

Moyle, P. B., R. M. Yoshiyama, , J. E. Williams, and E. D. Wikramanayake. 1995. Eulachon *In* Fish species of special concern in California, Second Edition, p. 123-127. California Department of Fish & Game, Inland Fisheries Division, Rancho Cordova, CA.

Musick, J. A., M. M. Harbin, S. A. Berkeley, G. H. Burgess, A. M. Eklund, L. Findley, R. G. Gilmore, J. T. Golden, D. S. Ha, G. R. Huntsman, J. C. McGovern, G. R. Sedberry, S. J. Parker, S. G. Poss, E. Sala, T. W. Schmidt, H. Weeks, and S. G. Wright. 2000. Marine, estuarine, and diadromous fish stocks at risk of extinction in North America (exclusive of Pacific salmonids). Fisheries 25(11): 6–30.

Nakamoto, R. J., T. T. Kisanuki, and G. H. Goldsmith. 1995. Age and growth of Klamath River green sturgeon (*Acipenser medirostris*). U.S. Fish and Wildlife Service Project 93-FP-13, Yreka, CA. 20 pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007a. Leatherback sea turtle (Dermochelys coriacea). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007b. Green sea turtle (Chelonia mydas). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007c. Olive Ridley sea turtle (Lepidochelys olivacea). 5-Year review: Summary and Evaluation. Available from:

http://www.nmfs.noaa.gov/pr/pdfs/species/oliveridley_5yearreview.pdf

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007d. Loggerhead sea turtle (Carretta Carretta). 5-Year review: Summary and Evaluation. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/loggerhead_5yearreview.pdf

NMFS (National Marine Fisheries Service). 2004. Biological opinion on (1) proposed Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Stocks (HMS FMP), (2) operation of HMS vessels under their High Seas Fishing Compliance Act permits, and (3) proposed Endangered Species Act (ESA) regulations prohibiting shallow longline sets east of the 150° West longitude. Long Beach, CA: NMFS Southwest Region. Feb. 2004.

NMFS and USFWS. 1991. Recovery Plan for Leatherback sea turtles (*Dermochelys coriacea*) in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1998. Recovery Plan for U.S. Pacific populations of the leatherback turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring MD. 65 pp.

NMFS, 1991. Final Recovery Plan for the humpback whale (Megaptera novaeangliae). November 1991. U.S. Department of Commerice. National Oceanic and Atmospheric Administration. National Marine Fisheries Service. Office of Protected Resources.; 105 pp.

NMFS. 2006a. Reinitiation of Section 7 Consultation Regarding the Pacific Fisheries Management Council's Groundfish Fishery Management Plan. Endangered Species Act Section 7 Consultation – Supplemental Biological Opinion. NMFS Sustainable Fisheries Division, Northwest Region. March 11, 2006. PCTS #: 2006/00754.

NMFS. 2006b. Section 7 Consultation on Operation of the Diablo Canyon Nuclear Generating Station. Endangered Species Act Section 7 Consultation – Biological Opinion. NMFS, Southwest Regional Office. 9/18/2006.

NMFS. 2006c. Section 7 Consultation on Operation of the San Onofre Nuclear Generating Station. Endangered Species Act Section 7 Consultation – Biological Opinion. NMFS, Southwest Regional Office. 9/18/2006.

NMFS. 2007. Section 7 Consultation on Issuance of a Shallow-Set Longline Exempted Fishing Permit Under the Fishery Management Plan for U.S. West Coast Highly Migratory Species Fisheries. National Marine Fisheries Service, Southwest Region, Protected Resources Division. November 28, 2007. 151422SWR2007PR00268.

National Marine Fisheries Service. 2008a. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Revision. National Marine Fisheries Service, Silver Spring, MD. 325 pages.

NMFS. 2008b. Section 7 Consultation on Issuance of a Shallow-Set Longline Exempted Fishing Permit Under the Fishery Management Plan for U.S. West Coast Highly Migratory Species

Fisheries. National Marine Fisheries Service, Southwest Region, Protected Resources Division.

NMFS. 2008c. Final Recovery Plan for Southern Resident Killer Whales (Orcinus orca). National Marine Fisheries Service, Northwest Region, Seattle, WA.

NMFS. 2009. Designation of critical habitat for the threatened Southern Distinct Population Segment of North American green sturgeon: Final biological report. Prepared by NMFS Southwest Region, Long Beach, CA. 144 pp. Available online at: http://swr.nmfs.noaa.gov/gs/GS_Critical_habitat_files/GSCHD_FinalBiologicalRpt.pdf.

NMFS. 2010c. Final Marine Mammal Protection Act Section 101(a)(5)(E) – Negligible Impact Determination. Humpback Whale, Central North Pacific stock; Humpback Whale, Western North Pacific stock; Steller Sea Lion, Western U.S. stock; Steller Sea Lion, Eastern U.S. stock; Fin Whale, Northeast Pacific stock; Sperm Whale, North Pacific stock. National Marine Fisheries Service, Protected Resources Division, Alaska Regional Office. December 13, 2010. 66p. available online at: http://www.fakr.noaa.gov/protectedresources/nid/nid_whales_ssl_1210.pdf

NMFS. 2010a. Environmental assessment for the proposed application of protective regulations under Section 4(d) of the Endangered Species Act for the threatened Southern Distinct Population Segment of North American green sturgeon. Department of Commerce, NOAA, NMFS, Southwest Region, Long Beach, CA. 101 pp. Available online at: http://swr.nmfs.noaa.gov/gs/GreenSturgeon4d_Final_Environmental_Assessment.pdf.

NMFS. 2010b. Federal Recovery Outline for North American green sturgeon, Southern Distinct Population Segment. Prepared by NMFS Southwest Region, Santa Rosa, CA. 23 pp. December 2010. Available online at: http://swr.nmfs.noaa.gov/gs/jd/Green_Sturgeon_sDPS_Recovery_Outline.pdf.

NMFS. 2011c. Section 7 Consultation on Authorization of (1) the deep-set tuna longline fishery managed under the Fishery Management Plan for U.S. West Coast Highly Migratory Species, and (2) continued operation of Highly Migratory Species fishery vessels in the deep-set tuna longline fishery under permits pursuant to the High Seas Fishing Compliance Act. Endangered Species Act Section 7 Consultation – Biological Opinion. National Marine Fisheries Service, Southwest Region, Sustainable Fisheries Division. SWR2011PRD00184.

NMFS. 2011a. Section 7 Consultation for the Major Rehabilitation of the Jetty System at the Mouth of the Columbia River. Endangered Species Act Section 7 Consultation – Biological Opinion. NMFS Northwest Region. March 18, 2011. PCTS #: 2010/06104.

NMFS. 2011b. Section 7 Consultation for the Columbia River Crossing. Endangered Species Act Section 7 Consultation – Biological Opinion. NMFS Northwest Region. January 19, 2011. PCTS #: 2010/03196.

Nelson, T.C., P. Doukakis, S.T. Lindley, A.D. Schreier, J.E. Hightower, L.R. Hildebrand, R.E. Whitlock, and M.A.H. Webb. 2010. Modern technologies for an ancient fish: tools to inform management of migratory sturgeon stocks. A report for the Pacific Ocean Shelf Tracking (POST) Project.

NWFSC (Northwest Fisheries Science Center). 2008. Data report and summary analyses of the California and Oregon pink shrimp fisheries, December 2008. NWFSC, Fishery Resource Analysis and Monitoring Division, West Coast Groundfish Observer Program, Seattle, WA. 38 pp.

NWFSC (Northwest Fisheries Science Center). 2009a. Data report and summary analyses of the California and Oregon pink shrimp trawl fisheries. West Coast Groundfish Observer Program, National Marine Fisheries Service, NWFSC, Seattle, WA, 33 pp.

NWFSC (Northwest Fisheries Science Center). 2009b. Data report and summary analyses of the U.S. West Coast limited entry groundfish bottom trawl fishery. 70 p. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

NWFSC (Northwest Fisheries Science Center). 2010a. Data report and summary analyses of the U.S. west coast limited entry groundfish bottom trawl fishery. 67 pp. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/trawl_report_2010.pdf [accessed May 2011].

NWFSC (Northwest Fisheries Science Center). 2010b. Data report and summary analyses of the California and Oregon pink shrimp trawl fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, Northwest Fisheries Science Center, 2725 Montlake Blvd E., Seattle, WA 98112. 30 pp.

Northwest Fisheries Science Center (NWFSC). 2011. Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species. Northwest Fisheries Science Center, National Marine Fisheries Service. 2725 Montlake Blvd E, Seattle, WA.

Olsen, E., and coauthors. 2009. First satellite-tracked long-distance movement of a sei whale (Balaenoptera borealis) in the North Atlantic. Aquatic Mammals 35(3):313-318.

Oregon Department of Fish and Wildlife. 2006. Memorandum from Tom Rien, ODFW, regarding methods used to estimate direct harvest and incidental mortality of Southern DPS green sturgeon during fall 2006 commercial gill-net fisheries in the Columbia River downstream from Bonneville Dam. Draft dated May 10, 2006. 2 pp.

PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2010. Rationalization of the Pacific Coast Groundfish Limited Entry Trawl Fishery; Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. June 2010.

PFMC. 2005. Final Environmental Impact Statement for Amendment 19 to Conserve and Protect Essential Fish Habitat for West Coast Groundfish.

PFMC. 2008. Pacific coast groundfish fishery management plan for the California, Oregon, and Washington groundfish fishery as amended through Amendment 19,including Amendment 15. Pacific Fishery Management Council, Portland, OR 97220, July 2008. 167 p.

PFMC. 2011. Proposed Harvest Specifications and Management Measures for the 2011- 2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast

Phillips, A. J., S. Ralston, R. D. Brodeur, T. D. Auth, R. L. Emmett, C. Johnson, and V. G. Wespestad. 2007. Recent pre-recruit Pacific hake (M*erluccius productus*) occurrences in the northern California Current suggest a northward expansion of their spawning area. Calif. Coop. Ocean. Fish. Investig. Rep. 48:215–229.

Pitcher, K. W., P. F. Olesiuk, R. F. Brown, M. S. Lowry, S. J. Jeffries, J. L. Sease, W. L. Perryman, C. E. Stinchcomb, and L. F. Lowry. 2007. Status and trends in abundance and distribution of the eastern Steller sea lion (*Eumetopias jubatus*) population. Fish. Bull. 107: 102-115.

Raum-Suryan, K. L., Jemison, L. A., Pitcher, K. W. 2009. Entanglement of Steller sea lions (*Eumetopias jubatus*) in marine debris: identifying causes and finding solutions. Marine Pollution Bulletin 58: 1487-1495.

Rexstad, E. A., and E. K. Pikitch. 1986. Stomach contents and food consumption estimates of Pacific hake, *Merluccius productus*. Fish. Bull. 84:947–956.

Reynolds, J. D., N. K. Dulvy, N. B. Goodwin, and J. A. Hutchings. 2005. Biology of extinction risk in marine fishes. Proc. R. Soc. Lond. Ser. B Biol. Sci. 272:2337–2344.

Rice, D.W., 1978. The humpback whale in the North Pacific: Distribution, exploitation, and numbers. Pages 29–44 in K. S. Norris and R. R. Reeves, eds. Report on a workshop on problems related to humpback whales (Megaptera novaeangliae) in Hawaii. Contract Report to the U.S. Marine Mammal Commission. NTIS PB-280–794. 90 pp.

Ricker, W. E., D. F. Manzer, and E. A. Neave. 1954. The Fraser River eulachon fishery, 1941-1953. Fisheries Research Board of Canada, Manuscript Report No. 583.

Rien, T. 2006. Methods used to estimate direct harvest and incidental mortality of Southern DPS green sturgeon during fall 2006 commercial gill-net fisheries in the Columbia River downstream from Bonneville Dam. Oregon Department of Fish and Wildlife Draft Memorandum, 10 May, 2006, 2p.

Robbins J, Landry S, Mattila D, 2009. Estimating entanglement mortality from scar-based studies. Scientific Committee Meeting of the International Whaling Commission, 2009. SC/61/BC3.

Robbins J, Mattila D, 2004. Estimating humpback whale (Megaptera novaeangliae) entanglement rates on the basis of scar evidence. Report to the Northeast Fisheries Science Center, National Marine Fisheries Service.

Robichaud, D., K. K. English, R. C. Bocking, and T. C. Nelson. 2006. Direct and delayed mortality of white sturgeon in three gear types in the Lower Fraser River. Report prepared for Tsawwassen First Nation Fisheries, Delta, British Columbia. 50p.

Roemmich, D., and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324–1326.

Sadovy, Y. 2001. The threat of fishing to highly fecund fishes. J. Fish Biol. 59(Suppl. A):90–108.

Schweigert, J., B. McCarter, T. Therriault, L. Flostrand, C. Hrabok, P. Winchell, and D. Johannessen. 2007. Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), Appendix H: Pelagic fishes. Can. Tech. Rep. Fish. Aquat. Sci. 2667.

Seesholtz, Alicia. Environmental scientist, California Department of Water Resources, Oroville, CA. June 16, 2011. Personal communication, via email to recipients at CDFG, Cramer Fish Sciences, NMFS, ODFW, US Bureau of Reclamation, US Fish and Wildlife Service, and US Geological Survey, regarding green sturgeon egg samples collected in the lower Feather River in 2011.

Shenker, J.M. 1984. Scyphomedusae in surface waters near the Oregon coast, May-August, 1981. Estuarine Coastal Shelf Science 19:619-632.

Smith, W. E., and Saalfeld, R. W. 1955. Studies on Columbia River smelt *Thaleichthys pacificus* (Richardson). Washington Department of Fisheries, Fisheries Research Paper 1(3): 3–26.

Spangler, E. A. K. 2002. The ecology of eulachon (*Thaleichthys pacificus*) in Twentymile River, Alaska. M.S. Thesis. University of Alaska, Fairbanks.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of Dermochelys coriacea: are leatherback turtles going extinct? Chelonian Conservation and Biology 2(2):209-222.

Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405:529-530.

Stansell, R.J., K.M., Gibbons and W.T. Nagy. 2010. Evaluation of Pinniped Predation on Adult Salmonids and Other Fish in the Bonneville Dam Tailrace, 2008-2010. U.S. Army Corps. of Engineers, Bonneville Dam, Cascade Locks, Oregon. October 14, 2010.

Starbird, C.H., Baldridge, A., and Harvey, J.T. 1993. Seasonal occurrence of leatherback sea turtles (*Dermochelys coriacea*) in the Monterey Bay region, with notes on other sea turtles

1986-1991. California Fish and Game 79(2):54-62.

Stein, A.B., K,D. Freidland, and M. Sutherland, 2004. Atlantic Sturgeon Marine Bycatch and Mortality on the Continental Shelf of the Northeast United States. North American Journal of Fisheries Management 24:171–183.

Stevenson, Duane, Research fishery biologist, NMFS Alaska Fisheries Science Center, Seattle, WA, and Vanessa Tuttle, NOAA At-Sea Hake Observer Program, Seattle, WA. September 2006. Unpublished data provided to the NMFS Southwest Region regarding a green sturgeon encountered as bycatch in 2006.

Stevick P, Allen J, Clapham P, Friday N, Katona S, Larson F, Lien J, Mattila D, Palsboll P, Sigurjonsson J, Smith T, Oien N, Hammond PS, 2003. North Atlantic humpback whale abundance and rate of increase four decades after protection from whaling. Marine Ecology-Progress Series 258:263-273.

Suchman, C. L., and Brodeur, R. D., 2005. Abundance and distribution of large medusae in surface waters of the northern California Current: Deep Sea Research II, 52: 51-72.

Toft, J. E., Punt, A. E., & Little, L. R. (January 01, 2011). Modelling the economic and ecological impacts of the transition to individual transferable quotas in the multispecies US west coast groundfish trawl fleet. Ices Journal of Marine Science, 68, 7, 1566-1579

Tutty, B. D., and J. A. Morrison. 1976. Dredge monitoring capture data and entrainment estimates during the 1976 juvenile salmonid migration in the lower Fraser River. Tech. Rep. Ser. No. PAC/T-76-21. Environment Canada, Fisheries and Marine Service, Pacific Region, Habitat Protection Directorate.

Tynan C, Ainley D, Barth J, Cowles T, Pierce S, Spear L, 2005. Cetacean distributions relative to ocean processes in the northern California Current system. Deep-Sea Res II 52:145-167.
U.S. Fish and Wildlife Service (USFWS). 2008. Short-tailed albatross Recovery Plan. Anchorage, AK, 105 pp.

Van Eenennaam, J. P., J. Linares, S. I. Doroshov, D. C. Hillemeier, T. E. Willson, and A. A. Nova. 2006. Reproductive conditions of the Klamath River green sturgeon. Transactions of the American Fisheries Society 135:151-163.

Van Eenennaam,P., M. A. H. Webb, X. Deng, S. I. Doroshov, R. B. Mayfield, J. J. Cech, D. C. Hillemeier, and T. E. Willson. 2001. Artificial spawning and larval rearing of Klamath River green sturgeon. Transactions of the American Fisheries Society 130:159-165.

Washington Sea Grant. 2011. Bringing albatross conservation to West Coast groundfish fisheries: progress on outreach efforts in the longline fleet. 24 August 2011.

WCGOP, NWFSC. 2011. Biological data (unpublished), provided on June 8, 2011. Fishery Resource Analysis and Monitoring, West Coast Groundfish Observer Program. NWFSC, 2725

Montlake Blvd East, Seattle, WA.

WDFW (Washington Department of Fish and Wildlife) and ODFW (Oregon Department of Fish and Wildlife). 2001. Washington and Oregon eulachon management plan.

Willson, M. F., R. H. Armstrong, M. C. Hermans, and K Koski. 2006. Eulachon: a review of biology and an annotated bibliography. Alaska Fisheries Science Center Processed Report 2006-12. Auke Bay Laboratory, Alaska Fish. Sci. Cent., NOAA, Natl. Mar, Fish. Serv., Juneau, AK.

Woodbury, David. Fishery biologist, NMFS, Santa Rosa, CA. January 10, 2012. Personal communication, via phone call with Susan Wang (NMFS), regarding the fork length at which to differentiate subadult from adult green sturgeon and population estimates for Southern DPS green sturgeon adults.

Wydoski, R. S., and R. R. Whitney. 2003. Inland fishes of Washington, second edition, revised and expanded. University of Washington Press, Seattle.

Zamon, J. E., and D. W. Welch. 2005. Rapid shift in zooplankton community composition on the northeast Pacific shelf during the 1998–1999 El Niño-La Niña event. Can. J. Fish. Aquat. Sci. 62:133–144.

Zerbini A, Clapham P, Wade P, 2010. Assessing plausible rates of population growth in humpback whales from life-history data. Marine Biology 157:1225-1236.

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5. APPENDICES

Appendix A. Anticipated lethal and non-lethal take of leatherback sea turtles, based on active incidental take statements.

Fisheries Actions

Consultation Activity	Date Signed	Action Area	Incidental Take Authorized
Northeast Region			
NMFS NEFSC Research Vessel Activities	8/20/2007	U.S. EEZ from Gulf of Maine to Cape Hatteras, NC	**Dredge or trawl gear** 1 mortality annually
Atlantic Sea Scallop FMP	3/14/2008 - ITS ammended Feb 5, 2009	U.S. EEZ from ME to the VA/NC border	**Dredge gear - 2 year estimate** 1 - non-lethal **Trawl gear - 1 year estimate** 1 - lethal or non-lethal
Skate FMP	7/24/2003	U.S. EEZ from ME to Cape Hatteras, NC	**1-yr Estimate** 1 leatherback
Monkfish FMP	4/14/2003	U.S. EEZ from ME to the NC/SC border	**1-yr Estimate** **Gillnet Gear** 1 leatherback **Trawl Gear** 1 leatherback
American Lobster - Federal Lobster Management	10/31/2002	U.S. EEZ waters from ME to Cape Hatteras, NC & adjoining state waters	**2-yr Estimate** 9 - lethal or non lethal
Deep-Sea Red Crab FMP	2/6/2002	U.S. EEZ from ME to Cape Hatteras, NC	**1-yr Estimate** 1 - lethal or non lethal
Spiny Dogfish FMP	6/14/2001	U.S. EEZ from ME thru FL	**1-yr Estimate** 1 - lethal or non lethal
Multispecies FMP	6/14/2001	U.S. EEZ waters from ME thru the range of the species covered by the FMP (~Cape Hatteras, NC)	**1-yr Estimate** 1 lethal or non lethal
Conservation Measures for	4/16/2004	VA waters as described in the BO (no Federal	**1-yr Estimate**

the VA Pound Net Fishery		waters)	1 lethal
Tilefish FMP	3/13/2001	All waters under U.S. jurisdiction in the Atlantic Ocean north of the VA/NC border	**1-yr Estimate** 1 lethal or non lethal
Herring FMP	9/17/1999	All 3 management areas as described in the FMP; roughly waters from ME through NC	**1-yr Estimate** 1 lethal or non lethal
Atlantic Mackerel, Squid, Butterfish FMP	4/28/1999	U.S. EEZ from ME to the NC/SC border	**1-yr Estimate** 1 lethal or non lethal
Southeast Region			
South Atlantic and Gulf of Mexico Stone Crab FMP	9/28/2009	U.S. EEZ South Atlantic and Gulf of Mexico	**3-yr Estimate** 1 lethal or non lethal
South Atlantic and Gulf of Mexico Spiny Lobster FMP	8/27/2009	U.S. EEZ South Atlantic and Gulf of Mexico	**3-yr Estimate** 1 lethal or non lethal
South Atlantic and Gulf of Mexico Coastal Migratory Pelagics Fishery	8/13/2007	U.S. EEZ from the Mid- and South Atlantic (NY/NJ border to E. Coast FL) and Gulf of Mexico (W. FL to TX)	**3-yr Estimate** 2 - lethal or non-lethal
South Atlantic Snapper-Grouper Fishery	6/7/2006	U.S. EEZ in South Atlantic (VA/NC to E. Coast FL)	**3-yr Estimate** 25 total (15 lethal)
Caribbean SFA Amendment	8/19/2005	U.S. EEZ Caribbean Sea	**1-yr Estimate** 1 non-lethal and 6 lethal
Gulf of Mexico Reef Fish Fishery FMP	10/13/2009	U.S. EEZ in Gulf of Mexico (W. Coast FL to TX)	**3-yr Estimate 2009-2011** 11 lethal **3-yr Estimate - After 2011** 11 lethal
Atlantic Pelagic Longline Fishery for HMS	6/1/2004	U.S. EEZ in Atlantic, Gulf of Mexico, and Caribbean Sea	**3-yr Estimates** 1764 total (594 lethal)
Atlantic shark fisheries (commercial shark bottom longline, drift gillnet, recreational shark fisheries)	5/20/2008	U.S. EEZ in Atlantic, Gulf of Mexico, and Caribbean Sea	**3-yr Estimate** 74 total (47 lethal)
FMP for Dolphin-Wahoo	8/27/2003	U.S. Atlantic EEZ	**1-yr Estimate** 11 non-lethal and 1 lethal

Shrimp Trawling in the Southeast United States - Sea Turtle Cons. Regs and Shrimp FMP	12/2/2002	U.S. EEZ in South Atlantic (VA/NC to E. Coast FL) and Gulf of Mexico (W. Coast FL to TX)	**1-yr Estimate** 3,090 total (80 lethal)
Southwest Region			
Highly Migratory Species Fishery Management Plan (CA/OR drift gillnet fishery)	2/4/2004	West coast EEZ	3 alive and 2 dead, annually
ETP purse seine fishery (large vessels only)	12/8/1999, ITS amended 1/8/01 and then 7/7/04	Eastern Tropical Pacific Ocean	20 alive and 1 dead, every 10 years
Pacific Islands Region			
Hawaii Based Shallow-Set (Swordfish) Longline Fishery	10/15/2008	Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific	**1-yr Estimate** 16 alive and 4 dead
U.S. WCPO Purse Seine Fishery	11/1/2006	EEZs of 16 Pacific Island Countries party to the South Pacific Tuna Treaty and High Seas	**1-yr Estimate** 11 alive
Hawaii Based Deep-Set (Tuna) Longline Fishery	10/4/2005	Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific	**3-yr Estimate** 39 alive and 18 dead
Hawaii Based Shallow-Set (Swordfish) Longline Fishery	2/23/2004	Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific	**1-yr Estimate** 16 alive and 2 dead
Western Pacific Pelagics FMP handline, troll, pole and line and America Samoa Longline	2/23/2004	Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific	**1-yr Estimate** 1 alive

Non-fisheries Actions

Consultation Activity	Date Signed	Action Area	Incidental Take Authorized
Northeast Region			
Long Island NY to Manasquan NJ Beach Nourishment	12/15/1995	South shore of Long Island, Sandy Hook to Manasquan, NJ and New York Bight area for borrow sites	**1-yr Estimate** 4 lethal
Sandy Hook Channel Dredging	6/10/1996	Sandy Hook Channel (in NY Bight) as described and identified in the BO	**1-yr Estimate** 1 lethal
Ambrose Channel, NJ Sand Mining	10/11/2002	4.63 km section of Ambrose Channel located outside of the entrance to Lower NY Bay between Rockaway Pt, NY and Sandy Hook, NJ and the area between the Channel and the processing facility at South Amboy	**Total Anticipated Take for the entire 10-yr project** 1 lethal
Cape Henry, York Spit, York River Entrance, and Rappahannock Shoal Channels - Maintenance Dredging	7/24/2003	Cape Henry Channel, York Spit Channel, York River Entrance Channel and the Rappahannock Shoal Channel, the Wolf Trap Alternative Placement Area and the Dam Neck Ocean Management Area, and the waters between and immediately adjacent to these areas.	**Based on cubic yards of material dredged as noted below** 120 non-lethal for any combination of the four turtle species
VA Beach Hurricane Protection	12/2/2005	The borrow area surrounding Thimble Shoals Channel and the Atlantic Ocean Offshore borrow site (off Cape Henry, VA), Virginia Beach, and the waters between and immediately adjacent to these areas where project vessels will travel and sand will be transported.	**Anticipated Take for each dredge cycle (once every 3 years)** Up to 45 takes for any combination of the four turtle species during relocation trawling
Cape Wind	11/13/2008	Nantucket Sound,	**1-yr Estimate**

		Massachusetts	3-7 sea turtles exposed to harassing noise levels during each pile driving event and 13-28 sea turtles exposed to harassing levels of noise during the geophysical survey will be a combination of these species.
Southeast Region			
DOT - Port Pelican LLC Deepwater Port	4/14/2004	Gulf of Mexico	**40-year Estimate** 2 dead (all species combined)
USCOE - Sabine-Neches Waterway Channel Improvement Project	8/13/2007	Jefferson and Orange County, TX and Cameron Parish, LA	**4.75-yr Estimate** 1 alive
NRC - Operation of the Cooling Water Intake System at the Brunswick Steam Electric Plant - NC	1/20/2000	Intake/Discharge canals associated with plant	**1-yr Estimate** 50 alive
NRC - Continued Operation of the St. Lucie Power Plant	5/4/2001	St. Lucie Power Plant, Unit 1 & 2 and the piping canals, making up the circulating seawater cooling system.	**1-yr Estimate** 1000 alive, 1 dead
NRC - Cooling water intake system at the Crystal River Energy Complex	8/8/2002	Crystal River Energy Complex, Unit 1,2, & 3 and discharge canal, and the intake canal and intake structures, which includes the bar racks, traveling screens, and sea water pump components	**1-yr Estimate** 75 alive, 3 dead
MMS - Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sales of Areas 169, 172, 175, 178, 182, 171, 174, 177 & 180	1/6/1998	Gulf of Mexico Central Planning Area (Waters off AL, MS, and LA) & Gulf of Mexico Western Planning Area (Waters off LA, TX)	**1-yr Estimate** 25
MMS - Eastern Gulf of Mexico Oil and Gas Lease Sale 181	6/15/2001	Eastern Gulf of Mexico	**30-yr Estimate** 1 (all turtle species combined)
MMS - Gulf of Mexico Outer Continental Shelf Lease Sale 184	7/11/2002	Western Gulf of Mexico	**30-year Estimate** 1 (all turtle species combined)
MMS - Gulf of Mexico Outer	11/29/2002	U.S. EEZ in the Gulf of Mexico	**1-yr Estimate**

Continental Shelf Multi-Lease Sale (185, 187, 190, 192, 194, 196, 198, 200, 201)			1 (all turtle species combined)
MMS - Freeport McMoran Injection Well of E&P Waste into Salt Caverns and Caprock at Main Pass, Block 229	4/1/2004	Gulf of Mexico	**26-year Estimate** 206
MMS - OCS Oil and Gas Leasing Program 2007-2012	6/29/2007	Gulf of Mexico	**40-yr Estimate** 21 alive, 10 dead
USN - Navy Activities off the Southeastern U.S. along the Atlantic Coast	5/15/1997	Charleston, SC to approximately, Sebastian Inlet, FL; from the coast out to approx. 80 nm	**1-yr Estimate** 12
USAF - Air-to-Surface Gunnery Testing - Detonation of High Explosive Gunnery Munitions in EGTR	12/17/1998	123,00 sq. miles in NE Gulf of Mexico @ Eglin Gulf Test Range	**1-yr Estimate** 2
USN - Establishment of the Mine Warfare Center of Excellence (MWCE) at the Navy's existing complex at Ingleside/Corpus Christi, Texas	10/26/1999	Naval Air Station Corpus Christi and Naval Station Ingleside, and areas within MMS Lease Blocks 732, 733, 734, 793, 799, and 816	**1-yr Estimate** 2
USAF - Search and Rescue Training in the GOM	12/22/1999	175 sq. nm area of GOM off N. Florida	**1-yr Estimate** 2
USMC - Marine Corps Air Station	9/27/2002	2 target bombings, target ranges, BT-9 and BT-11, Located of off the Neuse River and Pamlico Sound in NC	**10-year Estimate** 21 alive, 7 dead
USN - Mine Warfare Exercises (MINEX) and Explosive Ordnance Disposal (EOD) Unit Level Training at Several Locations Along the East Coast of the U.S.	10/9/2002	Onslow Bay, NC (an irregular shaped area extending from [the shoreline] approximately 6-48 km offshore); Charleston, SC (an boxed area extending approximately 5-30 km offshore)	**5-yr Estimate** 1
USAF - Eglin Air Force Base and Training Range Mission Activities	10/20/2004	Warning Areas (W-151, W-168, and W-470) as well as Eglin Water Test Areas(EWTA-1 Through EWTA-6)	**1-yr Estimate** 1

USAF - Eglin Gulf Test and Training Range, Precision Strike Weapons (PSW) Test	3/14/2005	Gulf of Mexico, Eglin Air Force Base; The two test locations located within W-151 at a distance of approximately 15-24 NM from shore in 45.7 m of water.	**5-yr Estimate** 1
USCG - Hurricane Katrina Coastal Debris Removal Trawling	1/23/2006	Mississippi Sound	**1.25-yr Estimate** 1 alive
NASA - Evaluation of EFH for Sharks and Selected Sportfishes in an MPA off Cape Canaveral	2/21/2006	Atlantic Ocean between Lat. 28°15'N & 28°45'N; 16-24 km from shore	**1-yr Estimate** 6 alive, 2 dead
NMFS - NER Funding for the grant proposal to use longlines to sample for Red Drum off NC, SC, and GA	10/11/2006	Sampling areas off NC, SC, GA, FL (maps of areas available upon request)	**3-yr Estimate** 3 alive, 1 dead
DOI - New Management Plan for Dry Tortugas National Park (continued authorization of recreational fishing)	7/7/2006	Dry Tortugas National Park	**1-yr Estimate** 1
NMFS Funding - Cooperative State-Fed Program - Longline Study of Adult Red Drum in NC, SC, GA	8/18/2008	Sampling areas off NC, SC, GA	**1-yr Estimate** 1 lethal or non-lethal
Rudloe, Gulf Specimen Marine Laboratories - Incidental Take Permit (Aquarium collections)	5/15/2003	Florida Panhandle	**1-yr Estimate** 3 alive (for collection)
Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf	8/28/2006	Gulf of Mexico	**1-yr Estimate** 3 non-lethal or lethal
Southwest Region			
Nuclear Regulatory Commission - Diablo Canyon	9/18/2006	Diablo Cove, San Luis Obispo County, CA	**1-yr Estimate** 3 alive (1 with serious injury), 1 dead
Nuclear Regulatory Commission - San Onofre Nuclear Generating Station	9/18/2006	Near San Clemente, CA	**1-yr Estimate** 3 alive (1 with serious injury), 1 dead
Pacific Islands Region			

Scripps Institution of Oceanography for a marine seismic survery in the ETP	3/8/2006	Eastern Tropical Pacific	2 alive

Agenda Item F.3.c
Supplemental Science Centers PowerPoint
March 2012

Science, Service, Stewardship

NMFS Groundfish Science Report

March 2012

Michelle McClure and John Stein

NOAA FISHERIES SERVICE

Overview

- Electronic monitoring – science approach and outreach
- Cooperative Research
- Hake

NOAA FISHERIES SERVICE

Video Monitoring - NE Example

NOAA
FISHERIES
SERVICE

Monitoring Purposes in U.S. Fisheries

- Scientific data collection – assessments, socioeconomic, ecological and ecosystem research
- Compliance – are regulations being followed? [Important for fishermen as well as law enforcement!!]
- Management – data to support real-time management (quota filling, etc.)

NOAA
FISHERIES
SERVICE

Science Goals for WCG Monitoring

- ✓ Information to support robust stock assessments
  - ✓ Abundance
  - ✓ Distribution
  - ✓ Characteristics – age, weight, etc.
- ✓ Information to support protected resource management
- ✓ Information to support effective fisheries
- ✓ Contribute to ecosystem management

Using This Opportunity

- Trade-offs in uncertainty
- How much biological data?
- Monitoring rare events
- Auditing
- Expanding to other fishing groups
- Trade-offs in cost

Outreach for EM

- April/May
- Coastwide
- Joint with other NOAA Fisheries Units
- Explain EM Phase I projects, anticipated transition and get input
- NOAA Travel Caps

Cooperative Research – NWC 2012

COOPERATIVE RESEARCH NATIONAL CRITERIA

- Be regionally based;
- Be developed and conducted through partnerships among industry, managers, academia, fish commissions
- Be funded on a competitive basis and be based on regional fishery management needs.

NOAA FISHERIES SERVICE

COOPERATIVE RESEARCH MSA Section 318 PRIORITIES

- Collecting data to improve, supplement, or enhance stock assessments, including the use of fishing vessels or acoustic or other marine technology
- Assessing the amount and type of bycatch or post-release mortality occurring in a fishery
- Conducting conservation engineering projects designed to reduce bycatch, including avoidance of post-release mortality

NOAA FISHERIES SERVICE

COOPERATIVE RESEARCH
MSA Section 318 PRIORITIES

- Identifying areas of particular concern as well as conducting projects relevant to the conservation of habitat

- Collecting and compiling economic and social data

- In addition, MSRA Section 408 (a)(4) requires the agency “to conduct research, including cooperative research with fishing industry participants, on deep sea corals and related species, and on survey methods

NOAA FISHERIES SERVICE

PFMC RESEARCH AND DATA NEEDS

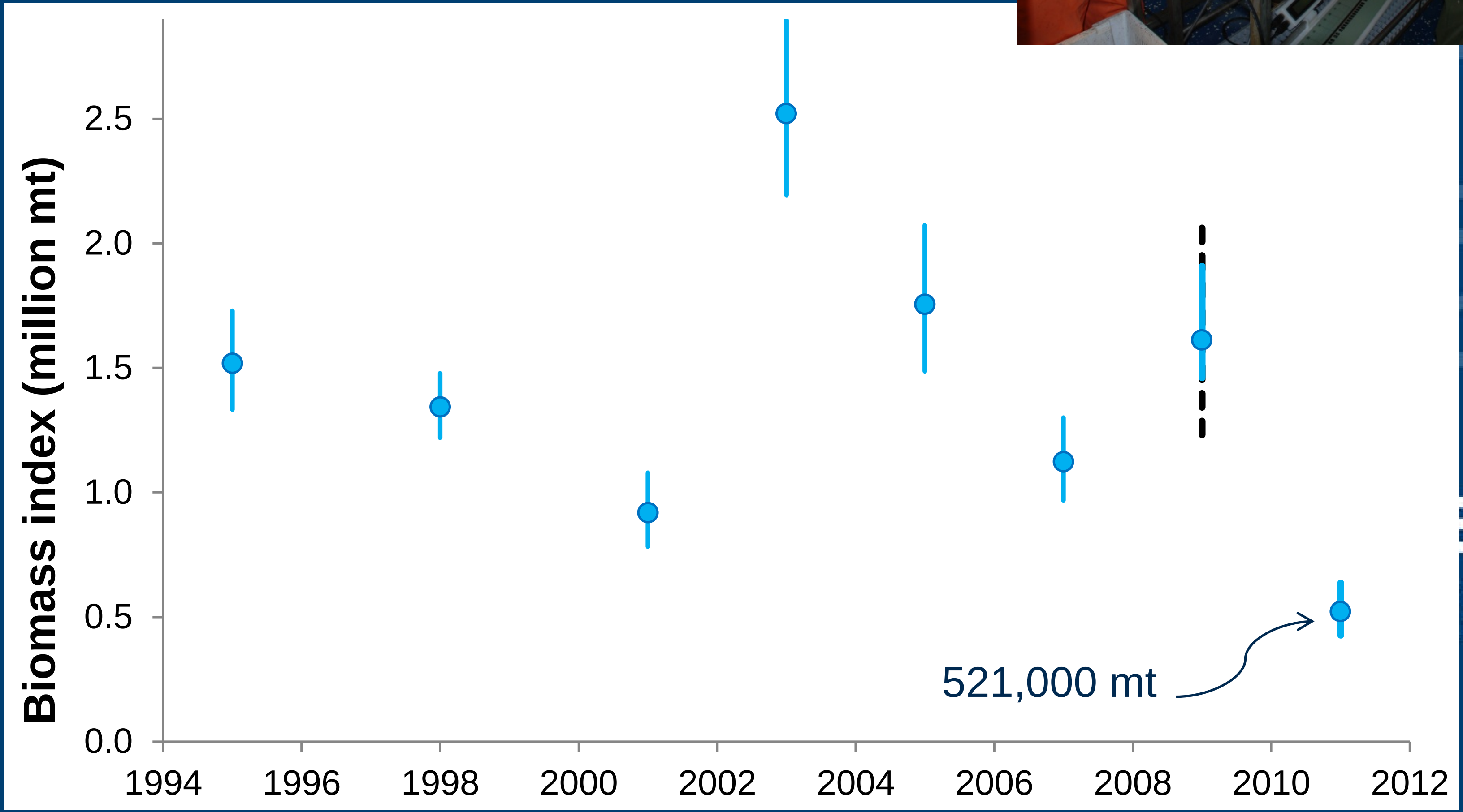
Project Name	Collaborators Partners	Groundfish FMP Priorities	Salmon FMP Priorities	Essential Fish Habitat/Bycatch	Ecosystem Priorities
WCGSI/ WA & OR Project CROOS	Salmon Fishers and Salmon Commission	--	Genetic Stock ID; Minimize time area closures -	--	Collection of Ecosystem/ Oceanographic data for PDO / Ocean-scape genetic ecology
Mesh Configuration On Codend Selectivity In Groundfish Bottom Trawl Fishery	Commercial fishermen and F/V platforms plus Netmaker and ODFW	Catch Share Fishery Bycatch Reduction	--	Bycatch reduction gear analysis	__
So. CA Hook and Line Groundfish Survey	Charter Industry F/V And PSMFC	New untrawlable Survey Methodologies ; GLM abundance indices for six rockfish species; Genetic stock structure	—	Video Habitat-Species associations	Oceanographic Data and genetic tag recapture

Hake

- Biomass estimate
- Assessment
- Scientific Review Group
- 2012 Survey and Research

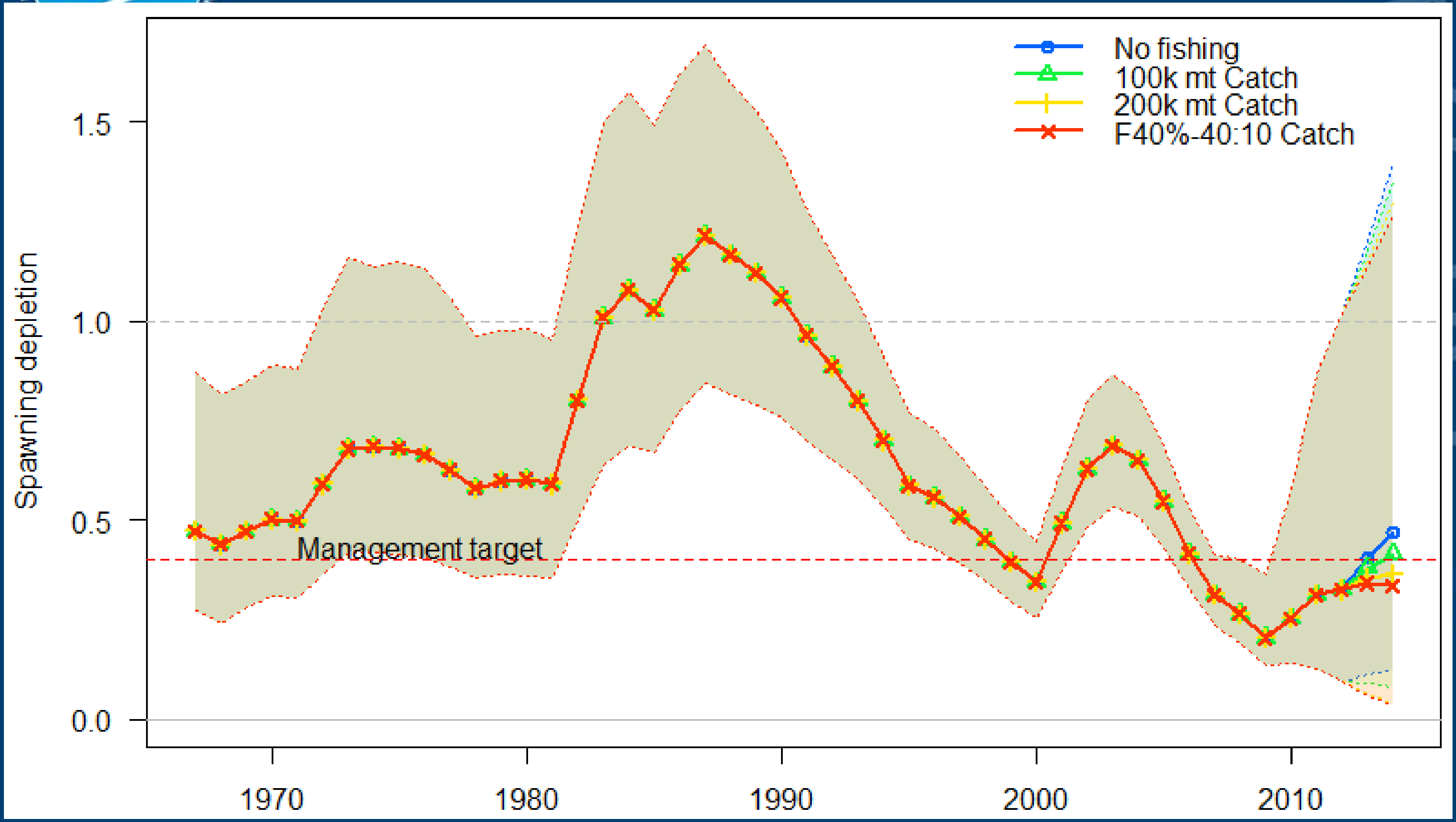
Science, Service, Stewardship

Acoustic Survey index:



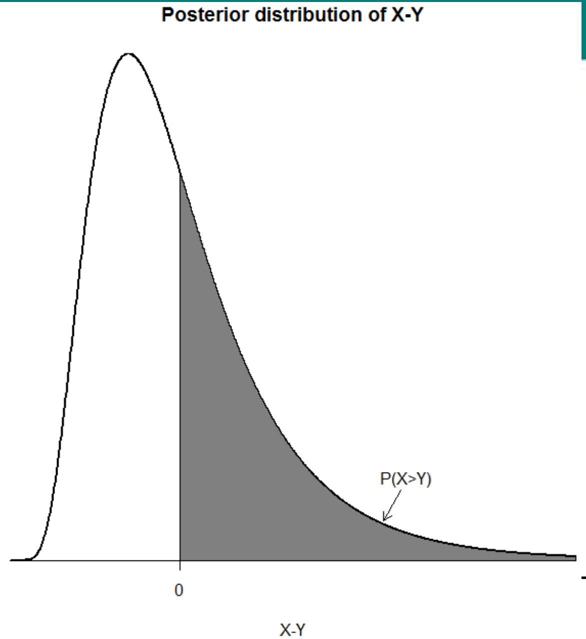
Science, Service, Stewardship

Model Projections:



NOAA FISHERIES SERVICE

Management metrics:



Catch	$P(SB_{2013}>SB_{2012})$	$P(SB_{2013}>SB_{40\%})$	$P(SB_{2013}>SB_{25\%})$	$P(SB_{2013}>SB_{10\%})$	P(Fishing intensity in 2012 > 40% Target)
0	>99%	51%	80%	99%	0%
50,000	99%	49%	78%	98%	<1%
100,000	88%	46%	76%	96%	7%
150,000	74%	44%	73%	95%	17%
200,000	58%	42%	70%	94%	31%
251,809	47%	40%	68%	93%	47%
393,751	28%	35%	61%	91%	70%

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FISHERIES
SERVICE

Scientific Review Group

- Survey methods were appropriate
- 2009 and 2011 biomass estimates incompatible; assessment more consistent with 2011 estimate
- Assessment used one model as base case (SS)
  - base model was accepted
  - Canadian model employed as a sensitivity test
- Research recommendations
  - Annual survey
  - MSE

NOAA FISHERIES SERVICE

2012 Survey Considerations

- Resources and logistic constraints
- Trade-offs
  - Certainty of result
  - Forward-looking research
- Long-term benefits

SCOPING FOR AMENDMENT 24: IMPROVEMENTS TO THE GROUNDFISH MANAGEMENT PROCESS

Under this agenda item the Council is tasked to begin scoping an amendment (Amendment 24) to the Pacific Coast Groundfish Fishery Management Plan (Groundfish FMP) to address problems that have become apparent in the current biennial process for developing and implementing harvest specifications and management measures. These problems have manifested in repeatedly late implementation of final regulations for harvest specifications and management measures, and in the 2011-12 cycle, the unusual use of a Secretarial Amendment to achieve finality. In response, the Council formed the Groundfish Process Improvement Committee (GPIC) to look into developing a more workable process for future management cycles. After hearing the GPIC and other Advisory Body reports at their April and June 2011 meetings, and deciding the only way to achieve timely completion of the 2013-14 final regulations was to vastly narrow the scope of consideration, the Council supported further investigation of developing an FMP amendment to address process problems in time for the 2015-16 cycle. This agenda item represents the start of that process.

Attachment 1 is a staff white paper that describes different ways to address problems with the current process. It includes three example alternatives to help the Council begin scoping the range of measures that could be included in an FMP amendment. The white paper also lays out a proposed schedule for an FMP amendment process intended to implement changes by the end of 2013 so that the next harvest specifications and management measures cycle could use the revised process. Under the proposed schedule, the Council would review and adopt a range of alternatives at their November 2012 meeting and take final action in March 2013.

At this meeting, the Council should provide guidance on a preliminary range of alternatives for further analysis, including any specific target areas for focused development. The Council may also want to establish a small ad hoc work group to advance the development of this material. From a workload timing perspective, it is anticipated such a work group would begin to spend concerted effort after the June Council meeting, with a the objective of completing a report by mid-October to include in the advance Briefing Book for the November 2012 Council meeting. Attachment 2 discusses the potential composition of such a workgroup.

Council Action:

Provide Direction for Development and Scheduling of the Amendment 24 Process.

Reference Materials:

1. Agenda Item F.4.a, Attachment 1: Staff White Paper on an FMP Amendment to Change the Groundfish Specifications and Management Measures Process.
2. Agenda Item F.4.a, Attachment 2: Amendment 24 (Groundfish Harvest Specifications Process Improvement) Ad-Hoc Workgroup.

<u>Agenda Order:</u>

a. Agenda Item Overview Kit Dahl
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Provide Direction for Development and Scheduling of the Amendment 24 Process

PFMC
02/13/12

An FMP Amendment to Change the Groundfish Specifications and Management Measures Process

Pacific Fishery Management Council
Staff White Paper (Scoping Information Document)

1 Introduction

This white paper provides information for the Council to begin scoping an amendment (Amendment 24) to the Pacific Coast Groundfish Fishery Management Plan (Groundfish FMP) to address problems that have become apparent in the current biennial process for developing and implementing harvest specifications and management measures. Problems with the current process were brought to the fore with implementation of the 2011-12 harvest specifications and management measures, because pursuant final regulations were not published until May 11, 2011, instead of the start date of the fishing year, January 1. This delay was due to NMFS' finding that the draft environmental impact statement (DEIS) evaluating the proposed action, which included an FMP amendment to revised overfished species rebuilding plans, was not adequate to support decision-making, delaying conclusion of the implementation process.

In response to problems that emerged during the last management cycle the Council formed the Groundfish Process Improvement Committee (GPIC) and several constituent subcommittees to look into various aspects of the management process with the objective of developing a more workable process for future management cycles. The GPIC laid the groundwork to develop a decision-making and implementation schedule for the 2013-14 biennial cycle and investigated long-term solutions. As part of their information gathering effort the GPIC found that there have been difficulties in implementing regulations by the start of the January 1 fishing year since the first biennial process, 2005-06.

After hearing the Committee's report at their April 2011 meeting the Council supported further investigation of developing an FMP amendment to address process problems in time for the 2015-16 cycle. Table 1 shows a proposed schedule for an FMP amendment process to accomplish this objective.

2 The Current Groundfish FMP Framework and Biennial Process for Developing Harvest Specifications and Management Measures

2.1 Key FMP Provisions Relating to the Biennial Process

Chapters 4, 5, and 6 in the Groundfish FMP describe elements of policy and process for managing groundfish fisheries.

Chapter 4 lays out the policy framework for achieving optimum yield.[1] From an operational standpoint, the management outcome of this policy framework is the annual catch limits (ACLs) for the fishery management units (stocks and stock complexes), which are established as part of the biennial process. The biennial process is also an opportunity for the Council to evaluate progress in rebuilding the seven groundfish stocks currently managed under rebuilding plans. While section 4.6.3.1 describes rebuilding

[1] The FMP describes optimum yield as "a decisional mechanism for resolving the Magnuson-Stevens Act's multiple purpose and policies, implementing an FMP's objectives, and balancing the various interests that comprise the national welfare" (p. 19).

plan objectives that may be used in such an evaluation, from an operational standpoint the key decision is deciding whether to adjust the rebuilding target year (T_{TARGET}), because the Magnuson-Stevens Act directs councils to "specify a time period for rebuilding the fishery…" (§304(e)(4)). The target year in turn determines an associated harvest rate, which in the short term translates into the ACL for that stock. Chapter 4 provides guidelines for establishing and modifying the target year.

Chapter 5 describes the biennial management process. As amended, this chapter provides quite a bit of flexibility in the timing of necessary Council decisions (which are enumerated in section 5.1) stating only that the Council will develop their recommendations over three meetings, the first of which will "usually" be November.

Chapter 6 catalogs the range of management measures available to the Council. With respect to the biennial process section 6.2 provides an important framework relating Council decision-making to the regulatory process for implementing regulations. It outlines four methods for establishing or modifying regulations:

1. **Automatic management actions** taken by NMFS to address nondiscretionary measures (such as closing a fishery on attainment of a quota).
2. **Notice actions requiring one Council meeting**, which apply to actions with a "temporary effect," likely need frequent adjustment, and which have been previously analyzed for their effects; usually these are actions classified as routine and referred in the Council process as "inseason management actions."
3. **Full notice and comment rulemaking requiring three Council meetings**; the Council's biennial specifications process is so classified; this results in a longer regulatory process, because of the requirement to publish proposed regulations for public comment followed by the publication of the final rule.
4. **Full notice and comment rulemaking requiring two Council meetings** required for discretionary management measures having a permanent effect that are highly controversial or directly allocate the resource. This process may be used to establish new management measures outside the biennial process.

While the details of the regulatory process may be tedious, an understanding of their relationship to Council decision-making is important when considering changes to the biennial harvest specifications process, because Council policies and recommendations must be translated into regulations to have an ultimate effect on the fishery.

2.2 Requirements from Applicable Law

Table 2 estimates the time intervals associated with Council decision-making and the procedural requirements of applicable law based on the schedule adopted for the 2013-14 biennial process.[2] The applicable identified in the table have these process elements:

- The National Environmental Policy Act (NEPA) provides an umbrella framework to incorporate analyses required under applicable law and support decision-making. Since 2003 an EIS has been prepared for annual and biennial harvest specifications and management measures. If an EIS is prepared, a two-stage process is required. A DEIS is filed with the Environmental Protection Agency. The EPA then publishes a Notice of Availability, which triggers a minimum 45-day public comment period. Once this is concluded, any comments received must be

[2] Other Federal laws may apply to a particular decision imposing additional timing considerations. However, the three laws described here most directly influence the timing of groundfish harvest specifications.

addressed in a final EIS (FEIS), which is also filed with EPA. A 30-day cooling off period then ensues before the responsible official may sign the Record of Decision (ROD), which serves as the legal determination of the agency's action. The ROD must be signed before the final rule is published and in the case of a related FMP amendment, before the determination on approval of the amendment. Alternatively an environmental assessment (EA) may be prepared to determine whether significant environmental impacts are likely to result. Based on the EA, the agency may make a Finding of No Significant Impact (FONSI) and not proceed to an EIS. Preparation of a draft and final document with formal public comment is not required for an EA. In addition, an EA is supposed to be "a concise public document" with "brief discussions" (40 CFR 1508.9). Preparing an EA is generally a simpler, shorter process compared to an EIS. Prior to 2003 an EA was prepared annually to evaluate groundfish harvest specifications and management measures.

- The Administrative Procedures Act (APA) and Magnuson-Stevens Act (MSA) §304(b) govern the promulgation of regulations, which is the principal way in which harvest specifications and management measures are implemented. This includes a 15-day window for NMFS review of the proposed regulations, preparation of a proposed rule, which is published in the Federal Register and followed by a 30-day public comment period, publication of a final rule in the Federal Register and a 30-day cooling off period after publication before the regulations become effective. All together, once the regulations have been initially drafted, this process takes 90-120 days. (In unusual circumstances the process can take longer.)
- If the harvest specifications process also requires an FMP amendment (for example to incorporate a new rebuilding plan) then MSA §304(a) comes into play. Once the proposed amendment is formally transmitted to NMFS by the Council NMFS must immediately publish a Notice of Availability for the amendment, which triggers a 60-day public comment period. NMFS must take a final decision on the amendment within 30 days of the end of the public comment period. Taken together 95 days are typically allotted for this process.

As shown in Table 2 these process requirements can overlap, although the overall timing is dictated by the successive conclusion of the requirements of the laws. First, the NEPA process must conclude with the signing of a ROD (or in the case of an EA a FONSI). If an FMP amendment is involved then the Secretarial decision usually precedes publication of the final rule.

In addition to these statutory requirements, NMFS has established internal review requirements consistent with the Quality Assurance Plan published by the Northwest Region in 2007. For the NEPA document this review involves the Sustainable Fisheries Division, the Regional NEPA Coordinator, NOAA General Council, NMFS Headquarters staff, and the NOAA Office of Program Planning and Integration. In addition, proposed regulations and FMP amendments require some level of internal review separate from the NEPA review process.

The Council and NMFS are currently in the midst of developing harvest specifications and management measures for the 2013-14 period. The Council committed to limiting the scope of proposed changes to harvest specifications and management measures for this cycle and also "frontloading" their decisions by identifying a preliminary preferred alternative at the November 2011 meeting. Furthermore, the NEPA schedule is accelerated by shortening time periods for developing and reviewing the document, and releasing the DEIS in advance of final Council action (i.e., without identifying a final preferred alternative, which would be included in the FEIS). It is too early to state with complete confidence that this accelerated process will result in regulations being in place by January 1, 2013, because unforeseen events could derail this tight schedule. Furthermore, the Council may bridle at the limited scope imposed on their decisions.

3 Problem Statement

It has become increasingly difficult to complete all the steps necessary in time to implement the regulations by the start of the next 2-year period as the decisions have become more complicated over the past decade or so. Standards for evaluating effects have shifted over time, in part due to litigation, adding to the difficulty in preparing adequate analyses.

The longer time period and frontloading means that the data supporting analyses (including stock assessments) is several years old by the time harvest specifications and management measures are implemented. For the 2013-14 harvest specifications data are by and large from 2010 and earlier; information on baseline conditions during the previous (2011-12) management period is largely unavailable for inclusion in the EIS.

Related to this, the Council has limited ability to respond to new information that indicates, for example, that an ACL can be increased while still meeting policy objectives ("green light" decisions). Longer time lags between data availability and implementation could make this worse. The status of widow rockfish, which has been determined to be rebuilt, is an example.

This implementation problem is essentially a timing problem: There hasn't been enough time between when the Council makes its final decision (typically June) and when the regulations have to be in place (the following January) to complete all the process steps adequately. Initiating the process even earlier exacerbates the "data staleness issue" outlined above.

This represents in part a tradeoff between the scope for Council decision-making and the level of analysis and documentation (and thus time) needed to implement the decision.

Based on the problem as outlined above, changes to the harvest specifications process (including an FMP amendment) should meet the following objectives:

- Implement the regulations at the start (January 1) of the management period.
- Better explain the decisions before the Council and document the rationale supporting the decisions taken.
- Reduce the complexity and difficulty of conducting the analysis and documentation needed to implement the regulations.
- Reexamine the policy evaluation framework for overfished stock rebuilding, recognizing that small changes in the probability of rebuilding by a previously established target year may not be meaningful and should not prompt a change in the harvest rate.[3]
- Seek ways to retain or increase flexibility to respond to new information with management changes.
- Implement any changes for use in the 2015-16 management cycle (see Table 1).

Council action will not include new fishery management measures (e.g., new allocations, new stock complexes, lingcod size limit changes) in this FMP amendment so that it focuses exclusively on process improvements.

[3] The probability of rebuilding by T_{TARGET}, the median rebuilding year, and the harvest rate are interrelated metrics. Fishery managers only control the harvest rate.

4 Possible Ways to Address the Problem

The following sections describe different types of process changes that could be considered in developing a new decision-making, evaluation, and implementation process for harvest specifications. They should not be interpreted as comparative alternatives; all of these types of changes could be combined in different ways to formulate different alternatives for Council decision-making and supporting analyses. Section 5 describes a few example alternatives to help the Council begin scoping potential process improvements.

4.1.1 Increase the Length of the Management Period

The management period could be lengthened to 4-6 years, or an open ended period, in combination with a comprehensive NEPA analysis at the start of the period. (The length of an open ended period would be predicated on the continued relevance of the initial comprehensive NEPA analysis). Changes to harvest specifications and management measures could occur during the management period supported by tiered NEPA analyses of more narrow scope. "Sideboards" on the scope of Council decision-making (changes to management) that could occur during the management period would need to be established. These sideboards would relate to the scope of the larger NEPA document's impact evaluation.

4.1.2 Limit the Scope of Council Decisions

Analysis and documentation has to be more complex when the Council has more decision-making scope. This adds to the amount of time needed for analysis and documentation, internal review, and statutory timing requirements (e.g., public comment periods). Some ways decision-making scope could be reduced are:

- Do not establish new management measures; only routine management measures are applied when ACLs and/or allocations are changed.[4] Establishing new management measures as routine measures would be done in a separate process, which could be better timed with data availability (e.g., WCGOP bycatch rates). A longer (or open ended) management period could provide more flexibility in timing such a process. The timing and workload implications of related rulemaking would have to be taken into account.
- Do not "bundle" FMP amendments into the harvest specifications process. Most often, FMP amendments are completed in connection with new or revised rebuilding plans. However, the Chapter 4 framework in the Groundfish FMP allows most adjustments to be made through regulations.

4.1.3 Change the Timing of Council Decision-making and/or the Start of the Management Period

Under the process used for the 2013-14 harvest specifications, analysis and document preparation begins when the Council adopts a range of alternatives at the November 2011 meeting, providing approximately thirteen and a half months for process requirements. The schedule involves several compromises such as releasing a DEIS before Council final action and expedited internal review.

There is limited scope for the Council to choose harvest specifications earlier, because these decisions depend on approved stock assessments. It might be possible for the Council to adopt alternatives in September, however, if the stock assessment process can somehow accommodate this.

[4] Some exceptions may be needed to address an emerging conservation concern.

The start of the management period could be delayed, for example from January 1 to March 1, to allow more time to complete process requirements. This would not necessarily require a change in the start of the fishing year (currently January 1) if clear procedures were implemented for establishing "interim" ACLs (and allocations) for any intervening period between the fishing year start and the new management period. Routine management measures (in-season management) would be applied as necessary in relation to the "interim" ACLs.

4.1.4 Standardize and Simplify the Documentation

Specify (and simplify) the scope and elements of the analysis:

- Standardize the format for describing and documenting the decisions to be made as part of the process
- Clearly identify and standardize metrics for evaluating impacts (projected fishing mortality, stock biomass, revenue, personal income)
- Reduce the range of direct and indirect impacts evaluated (fishing mortality and related revenue during the management period) while documenting cumulative impacts (stock status, habitat, ecosystem, protected species stock status, community welfare) in a more generalized fashion
- Link the baseline description (affected environment) to impact evaluation metrics and separately document them (e.g., annual SAFE)

Establish thresholds:

- Adverse impact thresholds to determine the level of documentation required (e.g., EIS versus an EA)
- Thresholds to inform the scope of decisions taken. If a discrete list of decisions can be developed (see above) it may be possible to rate them in terms of the process requirement (notice rulemaking, full notice-and-comment rulemaking, FMP amendment, etc.) and the likely level of analysis and documentation associated with them. This would inform the Council about the process implications of particular types of decisions.

4.1.5 Change Internal Review and Process Requirements

Work with NMFS NWR to determine if there are circumstances where the amount of time required for internal review could be reduced. Although workload and other demands may preclude it, a team-based rather than a sequential review process would be more time efficient and could deliver better results. In a team-based approach, instead of a review model, all players are continuously involved in the preparation of analyses. This requires a high level of transparency and communication to be effective. Those players that traditionally assume reviewing responsibility (NWR, GC) would need to articulate expectations in detail early in the process and preparers would have to regularly report how those expectations are being met in the analysis and documentation.

5 Example Alternatives

Scoping of potential alternatives would benefit from consideration of mixes of the various types of improvements outlined in section 4. However, for illustrative purposes, three example alternatives are shown below. These are merely skeletal examples at this point to promote understanding of possibilities and thinking about what mix of topics might be described for further analysis.

Retain the current 2-year management period but new regulations become effective on March 1 in the first year. This would provide two additional months to complete the process requirements. Developing a legally compliant framework to limit the scope of required analysis could help reduce workload. Demonstrating that a FONSI can be reached for the harvest specifications would reduce NEPA process requirements (i.e., an EA instead of an EIS could be prepared). Procedures for managing the fishery for the 2 months between the end of the last 2-year cycle and the implementation of new regulations would have to be developed. This example alternative demonstrates a relatively limited, simple fix but may end up being only a "band-aid" approach that does not address underlying process issues.

Lengthen the management period to 5 or 6 years supported by an initial comprehensive NEPA analysis and annual or biennial tiered NEPA analyses for subsequent actions during the management period. Before the start of the longer management period an EIS would be prepared to evaluate the full range of effects that would be expected from the application of the decisional framework for determining optimum yield during the management period (outlined in Chapter 4 of the FMP) and related management measures. Adjustments to harvest levels in response to new scientific information and any new management measures that might be needed during the management period would be implemented through a two Council meeting process, full notice-and-comment rulemaking, and "tiered" NEPA (EA) analyses. If an FMP amendment is needed in relation to harvest management objectives (e.g., a new rebuilding plan) this would be accomplish through a separate process.

Separate harvest specification decisions from the development of management measures. Adjustments to harvest specifications would be accomplished annually or biennially while only adjusting routine management measures to constrain catch below ACLs. Management measures other than routine measures would be implemented separately. A fixed process could be established to periodically implement management measures or they could be implemented on a case-by-case basis, as needed.

The process used to establish harvest specifications under the North Pacific Council's Groundfish FMPs for the Bering Sea and Aleutian Islands (BASI) management area and the Gulf of Alaska (GOA) provides an example of a streamlined process for establishing harvest specifications. In 2007 NMFS Alaska Region prepared an EIS evaluating alternative harvest strategies for annual harvest specifications. Since then the Region annually prepares a Supplementary Information Report (SIR) to determine whether the current year's harvest specifications trigger the need to prepare a supplemental EIS (SEIS).[5] As noted in the 2011 SIR, "Not every change requires an SEIS; only those changes that cause effects which are significantly different from those already studied require supplementary consideration." The Region has not yet found a need to prepare an SEIS for subsequent annual harvest specifications. In addition to relying on the range of impacts identified in the original EIS, the Region relies on information in annual SAFE documents on stock status (stock assessments), ecosystem status, and economic conditions to reach its conclusion in the SIR.

Any attempt to adopt a similar framework for setting harvest specifications under the Pacific Council's Groundfish FMP would have to account for the different circumstances on the west coast. These include the need to rebuild overfished species and the larger number of fishery management units for which harvest specifications are established. The Alaska harvest specifications process is open ended; each year the SIR determines whether an SEIS is necessary. Alternatively, in adapting this process to west coast circumstances, the Council may want to consider the pros and cons of setting a fixed duration for the applicability of the EIS with SEISs prepared every 5 years or so that would review current circumstances

[5] CEQ regulations at 40 CFR 1502.9(c)(1) identify the triggers for preparing an SEIS: 1) substantial changes to the proposed action or 2) significant new circumstances or information bearing on the proposed action and its impacts, any of which are relevant to environmental concerns.

in relation to evaluation in the original EIS. A fixed duration could provide greater stability in workload planning but would obligate periodic preparation of supplemental analyses. Another consideration is that the Alaska approach relies on documenting current environmental conditions in their SAFE. It is likely that something similar would be needed if such a process were used by the Council and NMFS Northwest Region.[6]

[6] The Groundfish FMP, as amended, states that either a SAFE document or NEPA document (EIS or EA) will be prepared every other year to provide the best available scientific information to the Council for setting harvest specifications and gauging their effects.

Table 1. Proposed decision-making and implementation process for the FMP Amendment. The table presupposes and FMP amendment would be implemented in time for application to the next management period (starting in 2015)

Council Meeting / Date	FMP Amendment	Next Management Cycle (assumes current process)
March 2012	Initial scoping	
September 2012		
November 2012	Adoption of a range of alternatives, selection of a preliminary preferred alternative (PPA) for public review	
March 2013	Council final action	
April 2013	FMP amendment submitted for Secretarial Review	
June 2013		Stock assessments adopted for management
September 2013		Remaining stock assessments adopted; initial action on harvest specifications and management measures
November 2013	Secretarial Review completed and any related regulations implemented	Adopt range of alternatives and identify preliminary preferred alternative for harvest specifications
April 2014		Final action on harvest specifications; PPA for management measures
June 2014		Final action on all components of the decision
January 2015		Regulations implemented

Table 2. Time involved in process requirements. Note that percentages of total process time sum to greater than 100 percent because statutory processes overlap in time.

NEPA	Days	Percent by Process	Percent of total process time*
DEIS preparation	92	25%	
Internal review	79	22%	
DEIS publication	19	5%	
DEIS comment period	45	12%	
FEIS preparation	31	8%	
Internal review	26	7%	
FEIS publication	6	2%	
FEIS comment period	30	8%	
Prepare ROD	37	10%	
Subtotal	365	100%	87%
APA			
Prepare proposed rule	26	15%	
Internal review	25	15%	
PR comment period	30	18%	
Prepare final rule	31	18%	
Internal review	30	18%	
Cooling off	28	16%	
Subtotal	170	100%	40%
MSA			
Prepare amendment	58	36%	
Internal review	6	4%	
Publish NOA	6	4%	
Public comment	60	38%	
Secretarial decision	30	19%	
Subtotal	160	100%	38%
Total time			**420 days**
By Process Type			
Documentation	305		73%
Internal review and publication	197		47%
Public comment	193		46%

*Percent of 420 days

AMENDMENT 24 AD-HOC WORKGROUP

The Council may wish to establish a small ad hoc workgroup to develop analytical materials for further consideration at the November, 2012 Council meeting. In 2001 the Council formed the Ad Hoc Groundfish Management Process Committee to oversee development of Groundfish FMP Amendment 17, which implemented the change from an annual cycle based on a September – November Council meeting process to the current biennial process. It was composed primarily of Council members, but also included a representative from the NMFS NWFSC who was also the Groundfish Management Team Chair, a NOAA General Council representative, and a member of the public.[1] However, in this case there may be considerable detailed analysis preparation needed on intricacies such as NEPA time lines, NMFS internal review processes, and new science turnaround schedules. Therefore, the Council may wish to appoint a more technically oriented workgroup, and convene a different group that includes Council Members for policy consideration input immediately before or after the November, 2012 Council meeting. Potential seats for an ad hoc workgroup might include:

- Council staff
- NOAA GC seat
- SSC seat
- State GMT seats
- GAP seat
- NMFS NWR, NWFSC, and NEPA coordinator seats

The Council could alternatively assign advancement of analytical materials to the Groundfish Process Improvements Committee (PIC), which includes a mix of Council Members and non-Council Members.[2]

PFMC
02/13/12

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[1] Membership included Council Members Phil Anderson, Burnie Bohn, LB Boydstun, Ralph Brown, Jim Lone (Chair), Bill Robinson, as well as Eileen Cooney (NOAA GC), Jim Hastie (GMT Chair), and Bob Eaton (member of the public).

[2] Membership at time of appointment included Council Members Frank Lockhart, Michele Culver, Gway Kirchner, Rod Moore, and Dan Wolford; GMT Members Joanna Grebel, Jason Cope, Corey Niles, and Lynn Mattes; SSC Member Owen Hamel; GAP Member Dan Waldeck; NWR Representatives Kevin Duffy and Sara Williams; NOAA GC Representative Sheila Lynch; and Council staff.

GROUNDFISH ADVISORY SUBPANEL REPORT ON SCOPING FOR AMENDMENT 24: IMPROVEMENTS TO THE GROUNDFISH MANAGEMENT PROCESS

The Groundfish Advisory Subpanel (GAP) listened to the presentation by Dr. Kit Dahl regarding Amendment 24 to the groundfish fishery management plan (FMP) and discussed several issues related to this scoping session. For this statement, we reference Attachments 1 and 2 under this agenda item.

Overwhelmingly, the GAP members recognize the need for a more efficient harvest specifications and management measures process and suggest Amendment 24 move forward, provided it does not detract from regulatory work already in progress.

This is merely the first pass at an idea for changing this process so the GAP did not want to provide detailed recommendations at this point beyond suggesting an ad hoc committee, as proposed in Attachment 2, be organized to develop and discuss ideas.

The GAP's primary discussion centered around issues members felt could cause complications that potentially increase the complexity of a process already mired in procedural muck. Specifically:

1. **Increasing the length of the management period**: Developing a comprehensive environmental impact statement (EIS) for a specified timeframe, five years or more, or an open-ended timeframe was initially dismissed as a bad idea. Of utmost concern was the potential inability to incorporate new science or unexpected management issues. These may be alleviated, provided National Marine Fisheries Service (NMFS) can assure the industry of at least two things:

    a. **Red light/green light**: This is a process that was attempted in the past but not approved for use by the Pacific Council, as it was on the East Coast. Under the Pacific Council's Groundfish Fishery Management Plan (FMP), new biological data cannot be used to increase ACLs in the middle of a management period, only to decrease them. Compare that to the situation in New England: In October 2011, in the middle of New England's management cycle, NOAA/NMFS approved a 56 percent increase in the amount of Northeast skate fishermen could land in 2011-12 based on updated scientific information presented at the June New England Fishery Management Council (NEFMC) meeting. NMFS used an emergency action that increased fishermen's quotas for their fishing year that began in May 2011 and ends in April 2012. The GAP would need assurance that a true red light/green light situation could be used on the West Coast and that the default would *not* be red light/red light.

       The GAP questions whether issues such as new gear types and management issues not covered by a comprehensive Environmental Impact Statement (EIS), such as some of those discussed by the Trawl Rationalization Regulatory

Evaluation Committee (TRREC) or experimental gears, could effectively be handled by a simple process within a timely manner.

b. **Federal mandates and input from advisory bodies, the public**: GAP members are concerned that increased requests from groups and organizations both inside and outside of the Council process would pad the extended management period and result in a stalled process and a situation worse than it is now.

c. **Compliance with National Environmental Protection Act (NEPA)**: A comprehensive EIS or programmatic EIS, with periodic environmental assessments (EA) used for new information or introduction of new issues could be used, provided NMFS can assure the industry this process will be acceptable and usable to its full extent. A discussion of the North Pacific Fishery Management Council (NPFMC) groundfish EIS and related NEPA documentation in Alaska is worth exploring as well.

2. **Limiting the scope of Council discussions**: This is an issue worth considering, but again, the GAP does not want to get trapped into a situation in which new issues cannot be dealt with in a timely manner. Establishing new management measures as routine measures through a separate process that are timed with data availability is worth considering.

3. **Standardizing and simplifying documentation**: Documentation accounts for 73 percent of the process requirements, according to Table 2 on Attachment 1. A comprehensive review and standardization of what truly is needed could have an impact on changing the amount of time necessary for this part of the process.

4. **Internal review and process requirements**: The NMFS Northwest Region's necessity for review of all documentation by several internal sections, developed in part to streamline the process, has added layers of redundancy that may be unnecessary in some instances. Perhaps some of the documentation, if simplified, may not have to be reviewed by all sections. Or, perhaps the team approach, such as is suggested in Attachment 1, could be utilized. This option bears discussion with the NMFS Northwest Region staff to realize process time savings.

5. **Changing the timing of Council decision-making and/or the start of the management period**: This situation occurred recently, when regulations were not ready for the start of the management cycle in 2011. The default was to fall back to earlier regulations until the 2011-12 regulations were finalized. A delay in implementing regulations to March in any management year – basically, institutionalizing what happened in 2011 – is one option but one the GAP does not support. As in 1(b), above, the GAP is concerned that workloads will expand to fill the time available for completion. The Draft Amendment 24 document did not appear to include use of interim regulations to start fisheries January 1 while harvest specification and management measure regulations are finalized in the rulemaking process.

Summary

The GAP agrees with the need to review the harvest specifications process but GAP members also are concerned about creating a longer, multi-year process because it could increase the data-staleness problem and make it harder to incorporate new data. This is a critical issue that needs to be addressed as this amendment moves forward.

Ultimately, we feel an ad hoc workgroup is the best option for helping advisory bodies and the Council work through this issue.

The constitution of the group, as identified in Attachment 2, should be small enough to provide the opportunity to get something accomplished yet also voice the concerns from all sectors of the industry. GAP members suggest we should be able to nominate someone not necessarily on the GAP but who has a good understanding of the process and all gear types to participate in the workgroup. The GAP feels it's important to ensure a broad industry perspective is represented; the Groundfish Process Improvements Committee (GPIC) was heavy on the NMFS staff perspective.

There is a critical need for the workgroup to focus on the core responsibilities of setting groundfish specifications and also focusing on Magnuson-Stevens Act (MSA) and related Federal mandates. Rather than plan changes for the existing process, the GAP suggests the ad hoc workgroup consider first reviewing the MSA to determine the bare bones requirements of the Act and then develop processes and procedures that meet those requirements. The GAP also agrees with the Groundfish Management Team (GMT) on this point; examining how NEPA requirements relate to MSA directives is of utmost importance.

Once the core responsibilities and the process to do them are defined, the group can work on the process to balance harvest specifications setting with development and implementation of new management measures aimed at longer-term improvements. It's important not to lose sight of the needs of non-trawl fishery sectors who have received less attention from the Council and NMFS because of the recent focus on trawl rationalization. Other gear types (e.g., fixed-gear sablefish and bycatch issues, recreational fisheries, new open access gear types) and/or issues that could benefit the industry and also, in some instances, benefit the process as a whole (e.g., exempted fishing permits) need to be given consideration.

Additionally, we advise requesting someone involved in the North Pacific NEPA and EIS processes – or advisors from other areas – share their knowledge with the group in an effort to provide alternate views and ideas. It was indicated to the GAP that someone from the North Pacific has already expressed an interest in assisting us with this work.

PFMC
03/05/12

GROUNDFISH MANAGEMENT TEAM REPORT ON SCOPING FOR AMENDMENT 24: IMPROVEMENTS TO THE GROUNDFISH MANAGEMENT PROCESS

The Groundfish Management Team (GMT) reviewed materials under this agenda item and provides the following comments for Council consideration. Most of all, the GMT continues to view the potential improvements discussed under this agenda item as necessary and important and hopes the Council will make development of Amendment 24 a high priority. With the large number of species and fishery sectors managed under this fishery management plan (FMP), complexity in the management process seems unavoidable. Nonetheless, the team sees areas for improvement.

Scope of alternatives under consideration

The Council staff white paper (Attachment 1, Agenda Item F.4.a) provides thoughtful analysis and recommendations for improving the process for adjusting harvest specifications and management measures. The GMT recommends that the Council move forward with a wide range of alternatives and not remove any alternatives from consideration at this time. There are a lot of potential approaches and the Council may wish to leave itself and staff flexibility to consider alternatives not identified in the white paper.

Alternative Approaches to Analyzing Significant Environmental Impacts

As described in the white paper, the decision to produce an environmental impact statement (EIS) each cycle is largely responsible for the review and implementation timelines that have made the January 1 start date challenging. A key piece of Amendment 24 will involve a close look at how the analytical requirements of NEPA relate to the Magnuson-Stevens Act (MSA) standards, guidelines, etc. that speak directly to the Council's conservation and management responsibilities. The white paper describes how the North Pacific Fishery Management Council approaches the NEPA requirement to analyze and disclose significant impacts to the environment differently than we do with this FMP. There are even differences in the way the NEPA significant impacts question is addressed in other FMPs at this Council. The Amendment 24 process should involve a close look at the various options for integrating NEPA significant impact analysis with the analysis necessary for decisionmaking under the MSA.

The Council may also wish to explore how the developing Fishery Ecosystem Plan could help address this issue. This new plan might produce analysis and information on how the groundfish fisheries affect and are affected by the marine environment. These relationships between the environment and the fishery are the key focus of NEPA significant impacts analysis.

The following headers review to sections in the Council staff white paper. The discussions here briefly summarize the team's initial thoughts on the information presented within those sections.

Increase the Length of Time of the Management Period

The team noted some confusion in our discussion about increasing the time window of the EIS and increasing the length of the management period. The latter may refer to making adjustments to harvest specifications or management measures less frequently (i.e. an EIS would be produced less often because changes are made less often). This distinction is important to keep in mind. As mentioned above, it could be possible to extend the time window of an EIS without a change to the frequency with which the Council makes management changes.

Limit the Scope of Council Decisions

The GMT understands that analyzing new management measures (i.e., those not contemplated in the FMP or regulation) contributes a significant portion of the analysis and review workload in the current process. Analyzing some management measures separate from the harvest specifications—e.g., something akin to the PIE rule approach taken for the Amendment 20 and 21 follow up management measures—may save time and reduce the burden of review both within the Council process as well as within NMFS.

Change the Timing of Decision-Making

The GMT notes that modifying the timing of decision making could conflict with decision making in other FMPs or may not be practicable due to other workload priorities or create tradeoffs involving the information available for analysis. For example, moving the timing of the stock assessment process might be an option looked at under Amendment 24. The analysts supporting development of Amendment 24 will have to look hard at the tradeoffs involved with such moves.

Change Start of the Management Period

Modifying the start of the management period to March 1 would effectively formalize the current practices. The GMT questioned whether this potential solution would effectively improve the situation.

Standardize and Simplify the Documentation

The GMT recognizes the need to clearly communicate the objectives and results of harvest specification and management measure analyses. Efforts to standardize and simplify analysis presentation based on issue content are recommended as part of all alternatives looked during consideration of Amendment 24. Clear guidelines on analyses, in addition to increased opportunity for communication between the analysts and reviewers would greatly improve the process.

Change Internal Review and Process Requirements

Modification to the current review and process requirements may not be possible because certain processes have hard wired timelines that cannot be amended under this process (e.g., APA, MSA, and NEPA timelines). The GMT notes that either the review or preparation processes, or both, can be modified to achieve a savings. Again, we would suggest that one of the primary focuses of the Amendment 24 Ad Hoc Workgroup should be reviewing the various legal and administrative standards that are currently being met under the umbrella of the current EIS in a more efficient manner.

New Alternatives

The GMT discussed that there may be a benefit to seeking out "lessons learned" from other regions and even other natural resource policy process in order to determine if their efficiencies are transferable. To the extent possible, the team thought it would be helpful to invite professionals from these other processes to present their experiences to those charged with development of Amendment 24.

Process Related Issues

Ad-Hoc Work Group and Schedule

The GMT supports the formation of a process to develop analytical materials and provide strategic direction during consideration of Amendment 24. We did not reach consensus on a recommendation as to the composition of workgroups or exact form of the process. At this stage, we would highlight that the team and Council staff could be engaged with the 2013-14 analysis until July 31st. It could be difficult to have full team participation before that time. However, individual team members and Council staff could be available to participate on work groups or to produce analyses in support of Amendment 24 over the spring and early summer.

On a similar note, the GMT reviewed the proposed schedule. As the Council has discussed at this meeting, it is unclear how or if the Pacific Dawn lawsuit (and the court imposed deadlines) would affect the ability of NMFS staff to fully engage in this process. Successful development of Amendment 24 will depend on full participation by all parties involved and no new emerging issues which would shift staff to other workload.

PFMC
03/05/12
11:16 a.m.

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON SCOPING FOR AMENDMENT 24: IMPROVEMENTS TO THE GROUNDFISH MANAGEMENT PROCESS

The Scientific and Statistical Committee (SSC) reviewed the scoping document for Amendment 24 (Agenda Item F.4.a, Attachment 1). Dr. Kit Dahl and Mr. John DeVore presented background information and example alternatives. The SSC has the following comments:

Some potential changes to the management process may allow for stock assessments for be done every year. The SSC has noticed that there have been clear benefits from the switch to the current two year assessment cycle. There has been standardization of methods across a larger number of assessments. In addition, the availability of a dedicated period of time (the "off year") has allowed time for research and improvements in data inputs and assessment methods.

Changes in the rebuilding target year, associated harvest rate and annual catch limits (ACLs) for a rebuilding species can have significant management implications. For most overfished species, rebuilding rates are very slow, and actual changes in stock status and productivity are not likely to occur quickly. Some change can be expected in rebuilding analyses due simply to the probabilistic nature of these analyses. The management process should be designed to take into account the time needed for actual changes in stock status or productivity to be detected by stock assessments and rebuilding analyses.

Finally, in considering alternatives to groundfish management process, it might prove useful to explore approaches taken by other Fishery Management Councils, in addition to those of the North Pacific Fishery Management Council.

PFMC
03/03/12

Agenda Item F.5
Situation Summary
March 2012

STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

In the Council stock assessment process, there is a year in which assessments are done to inform decisions for the following biennial management cycle, followed by a year for deciding the new groundfish harvest specifications and management measures. This agenda item concerns planning for new groundfish stock assessments that are anticipated to be done in 2013, which will be used to decide the harvest specifications and management measures for 2015 and 2016 groundfish fisheries.

In the past, the Council has focused on overfished species and stocks experiencing directed fishing as priority candidates for stock assessment, and has shown interest in at least one new species as a stock assessment target.

The decision on which stocks to assess next year entails whether the assessment should be a full assessment that requires peer review by a stock assessment review (STAR) Panel or an update assessment that requires only a review by the Council's SSC. Council policy on this subject has been schedule no more than ten full assessments in a given year with no more than two full assessments reviewed at each STAR Panel. Therefore, a maximum of five STAR Panels should be considered for next year. Dr. Michelle McClure, Division Director at the National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC), will report on proposed stock assessments and a proposed 2013 stock assessment review schedule for the next biennial fishery management cycle (Agenda Item F.5.b, NMFS Report).

There are three Terms of Reference that guide the stock assessment process; one which specifies how the next assessment process should occur and defines the roles and responsibilities of various entities contributing to this process, one which guides the development of rebuilding analyses that are used to develop harvest specifications and rebuilding plans for overfished species, and one that guides how new methods are reviewed and recommended for scientific activities that inform analyses used in management decision-making. These Terms of Reference have been reviewed by some members of the SSC and others and are included as Agenda Item F.5.a, Attachments 1, 2, and 3, respectively. The Council may want to modify these Terms of Reference for the next assessment cycle.

The Council is to consider the input from NMFS, the advisory bodies, and the public before providing a preliminary decision on 2013-2014 stock assessment priorities by species, type of assessment (full or update), and language for the three draft Terms of Reference. The Council is scheduled to make final decisions on stock assessment planning at their June meeting, although there has been some discussion about deferring some of these decisions for the September meeting so as to consider the results of a planned workshop on data-limited stocks.

Council Action:

1. **Adopt for Public Review the List of Stocks To Be Assessed in 2013.**
2. **Adopt for Public Review the Preliminary Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2013-2014.**
3. **Adopt for Public Review the Preliminary SSC Terms of Reference for Groundfish Rebuilding Analysis.**
4. **Adopt for Public Review the Preliminary Terms of Reference for the Methodology Review Process for Groundfish and Coastal Pelagic Species.**
5. **Adopt for Public Review the 2013 Groundfish Stock Assessment Review Schedule.**

Reference Materials:

1. Agenda Item F.5.a, Attachment 1: Draft Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2013-2014.
2. Agenda Item F.5.a, Attachment 2: Draft SSC Terms of Reference for Groundfish Rebuilding Analysis.
3. Agenda Item F.5.a, Attachment 3: Draft Terms of Reference for the Methodology Review Process for Groundfish and Coastal Pelagic Species.
4. Agenda Item F.5.b, NMFS Report: Considerations for Selecting Species for Assessment in 2013.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary Guidance for three Terms of Reference, a List of Stocks to be Assessed, and an Assessment Schedule

PFMC
02/10/12

Agenda Item F.5.a
Attachment 1
March 2012

TERMS OF REFERENCE

FOR THE

GROUNDFISH AND COASTAL PELAGIC SPECIES STOCK ASSESSMENT AND REVIEW PROCESS FOR 2013-2014

DRAFT

FEBRUARY 8, 2012

Published by the Pacific Fishery Management Council

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INTRODUCTION

The purpose of this document is to outline the guidelines and procedures for the Pacific Fishery Management Council's (Council) groundfish and coastal pelagic species (CPS) stock assessment review (STAR) process and to clarify expectations and responsibilities of the various participants. This document applies to assessments of species managed under the Pacific Coast Groundfish Fishery Management Plan and Management Plan for the CPS. The STAR process has been designed to provide for peer review as referenced in the 2006 Reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (RMSA), which states that "the Secretary and each Regional Fishery Management Council may establish a peer review process for that Regional Fishery Management Council for scientific information used to advise the Regional Fishery Management Council about the conservation and management of the fishery (see Magnuson-Stevens Act section 302(g)(1)(E))." This peer review process is designed to investigate the technical merits of stock assessments and other scientific information used by the Council's Scientific and Statistical Committee (SSC). The process outlined here is not a substitute for the SSC, but should work in conjunction with the SSC. This document is included in the Council's Statement of Organization, Practices and Procedures as documentation of the review process that underpins scientific advice from the SSC.

The review of stock assessments requires a routine, dedicated effort that simultaneously meets the needs of NMFS, the Council, and others. Program reviews, in-depth external reviews, and peer-reviewed scientific publications are used by federal and state agencies to provide quality assurance for the basic scientific methods employed to produce stock assessments. The extended time frame required for such reviews is not suited to the routine examination of assessments that are, generally, the primary basis for harvest recommendations. The SSC has developed a separate terms of reference for reviewing new methods that might be used in stock assessments, including methods and tools to incorporate ecosystem processes.

The STAR process is a key element in an overall procedure designed to review the technical merits of stock assessments and other relevant scientific information. This process allows the Council to make timely use of new fishery and survey data, analyze and understand these data as thoroughly as possible, provide opportunity for public comment, assure that the results are as accurate and error-free as possible, and identify the best available science for management decisions. Parties involved in implementing the STAR process are Council members, Council staff, members of Council Advisory Bodies, including the SSC, the Groundfish and CPS Management Teams (GMT and CPSMT), the Groundfish Advisory Panel (GAP) and CPS Advisory Subpanel (CPSAS), the National Marine Fisheries Service (NMFS), state agencies, and interested persons.

This current version of the STAR terms of reference (TOR) reflects recommendations from previous participants in the STAR process, including STAR panel members, SSC members, stock assessment teams (STATs), Council staff, and Council advisory groups. Nevertheless, no set of guidelines can be expected to deal with every contingency, and all participants should anticipate the need to be flexible and address new issues as they arise.

Stock assessments are conducted to assess the abundance and trends of fish stocks, and provide the fundamental basis for management decisions regarding appropriate harvest levels. Assessments use statistical population models to integrate and simultaneously analyze survey, fishery, and biological data. Environmental and ecosystem data may also be integrated in stock assessments. Hilborn and Walters (1992)[1] define stock assessments as "the use of various statistical and mathematical calculations to make quantitative predictions about the reactions of fish populations to alternative management choices." In this document, the term "stock assessment" includes activities, analyses and reports, beginning with data collection and continuing through to scientific recommendations presented to the Council and its advisors. To best serve their purpose, stock assessments should attempt to identify and quantify major uncertainties, balance realism and parsimony and make best use of the available data.

There are two distinct types of assessments, which are subject to different review procedures. A "full assessment" is a new assessment or an assessment that may be substantially different from the previously conducted assessment. A full assessment involves a re-examination of the underlying assumptions, data, and model parameters previously used to assess the stock. Full assessments are reviewed via the full STAR process. There is a limit on the number of full assessments that can be conducted and reviewed during an assessment cycle. Some assessment models have relatively few modeling or data issues and provide relatively stable results as new data are added, such that it is not necessary to develop a completely new assessment every time the species is assessed. In these cases, an update assessment may be preferable. An "update assessment" is defined as an assessment that maintains the model structure of the previous full assessment and is generally restricted to the addition of new data to previously evaluated time series that have become available since the last assessment. Update assessments are reviewed by the relevant subcommittee of the SSC (Groundfish or CPS) rather than by a STAR panel.

The RMSA recently changed the terminology and process for determining harvest levels. The previous Allowable/Acceptable Biological Catch (ABC) has been replaced by the Overfishing Limit (OFL). However, the largest allowable harvest level is still the ABC (now "Acceptable Biological Catch"), which is buffered from the OFL based on the risk of overfishing adopted by the Council (which must be less than 50%). The P* approach uses a probability of overfishing (which the Council has set to be less than or equal to 45% or 0.45) and a measure of uncertainty in the assessment of current stock status (σ, the standard error of the biomass estimate in log space) to determine the appropriate buffer with which to reduce the harvest level from the OFL to the ABC (Ralston et al. 2011[2]). The Annual Catch Limit (ACL) is equivalent to what the Council previously called the Optimum Yield (OY). For groundfish species, the upper limit for the ACL is calculated using the 40:10 harvest control rule (and 25:5 rule for flatfish species) while for CPS, each species has a specific control rule to calculate the Harvest Guideline (HG), which is the upper limit for the ACL for CPS. The Annual Catch Target (ACT) is the targeted catch level, representing a further reduction from the ACL to account for management/implementation uncertainty. The OFL must be given in the stock assessment (along with, in some cases, σ). The ABC is determined from the OFL given σ and P*. For CPS, the assessment reports the application of the HG. The OFL, ABC, ACL, any ACTs, and (for CPS) the HGs are reported in the Council's Stock Assessment and Fishery Evaluation (SAFE) report.

STOCK ASSESSMENT PRIORITIZATION

Stock assessments for Pacific sardine and Pacific mackerel are conducted annually, with full

[1] Hilborn, R., and C. J. Walters. 1992. Quantitative fisheries stock assessment: Choice, dynamics and uncertainty. Chapman and Hall.
[2] Ralston, S., Punt, A.E., Hamel, O.S., DeVore, J. and R.J. Conser. 2011. An approach to quantifying scientific uncertainty in stock assessment. *Fishery Bulletin* 109: 217-231.

assessments occurring every third year, and update assessments during interim years. Assessments for groundfish species are conducted every other year as part of the biennial harvest specification cycle. A relatively small number of the more than 90 species in Council's Groundfish Fishery Management Plan are selected each cycle for full or update assessments. To implement the RMSA requirements to establish ABCs and OFLs for all species in fishery management plans, simple assessment methods such as Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA) have now been applied to the majority of groundfish species. It is the goal of the Council to substantially increase the number of groundfish stocks with full assessments.

In April 2006, the SSC recommended, and the Council adopted, a new approach to prioritize groundfish species for category 1 stock assessments based on: 1) economic or social importance of the species, 2) vulnerability and resilience of the species, 3) time elapsed since the last assessment (NMFS advises assessments to be updated at least every five years), 4) amount of data available for the assessment, 5) potential risk to the stock from the current or foreseeable management regime, and 6) qualitative trends from surveys (when available). It was also recommended that overfished groundfish stocks that are under rebuilding plans be evaluated each assessment cycle to ensure adequate progress towards achieving stock recovery.

The proposed stocks for category 1 assessments should be discussed and finalized by the Council at least a year in advance of a new assessment cycle to allow sufficient time to assemble relevant data and arrange STAR panels.

STAR Goals and Objectives

The goals and objectives of the groundfish and CPS STAR process are to:

1) ensure that full stock assessments represent the best available scientific information and facilitate the use of this information by the Council to adopt OFLs, ABCs, ACLs, (HGs), and ACTs;
2) meet the mandates of the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) and other legal requirements;
3) follow a detailed calendar and fulfill explicit responsibilities for all participants to produce required reports and outcomes;
4) provide an independent external review of stock assessments;
5) increase understanding and acceptance of stock assessments and peer reviews by all members of the Council family;
6) identify research needed to improve assessments, reviews, and fishery management in the future; and
7) use assessment and review resources effectively and efficiently.

ROLES AND RESPONSIBILITIES OF STAR PARTICIPANTS

Shared Responsibilities

All parties have a stake in assuring adequate technical review of stock assessments. NMFS, as the designee of the Secretary of Commerce, must determine that the best scientific advice has been used when it approves fishery management recommendations made by the Council. The Council uses advice from the SSC to determine that the information on which it bases its recommendations represents the best available science. Scientists and fishery managers providing technical documents to the Council for use in management need to assure that their work is technically correct.

The Council, NMFS and the Secretary of Commerce share primary responsibility to create and foster a successful STAR process. The Council oversees the process and involves its standing advisory bodies, especially the SSC. For groundfish, NMFS provides a stock assessment coordinator (SAC) to facilitate and assist in overseeing the process, while for CPS a designated SWFSC staff member performs this role. Together NMFS and the Council consult with all interested parties to plan and prepare TOR, and develop a calendar of events with a list of deliverables for final approval by the Council. NMFS and the Council share fiscal and logistical responsibilities and both should ensure that there are no conflicts of interest in the process[3].

The STAR process is sponsored by the Council, because the Federal Advisory Committee Act (FACA) limits the ability of NMFS to establish advisory committees. FACA specifies a procedure for convening advisory committees that provide consensus recommendations to the federal government. The intent of FACA was three-fold: to limit the number of advisory committees; to ensure that advisory committees fairly represent affected parties; and to ensure that advisory committee meetings, discussions, and reports are carried out and prepared in full public view. Under FACA, advisory committees must be chartered by the Department of Commerce through a rather cumbersome process. However, the Sustainable Fisheries Act exempts the Council from FACA per se, but requires public notice and open meetings similar to those under FACA.

STAR Panel Responsibilities

The role of the STAR panel is to conduct a detailed technical evaluation of a full stock assessment to advance the best available scientific information to the Council. The specific responsibilities of the STAR panel are to:

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[3] The proposed NS2 guidelines state: "Peer reviewers who are federal employees must comply with all applicable federal ethics requirements. Peer reviewers who are not federal employees must comply with the following provisions. Peer reviewers must not have any real or perceived conflicts of interest with the scientific information, subject matter, or work product under review, or any aspect of the statement of work for the peer review. For purposes of this section, a conflict of interest is any financial or other interest which conflicts with the service of the individual on a review panel because it: (A) Could significantly impair the reviewer's objectivity; or (B) Could create an unfair competitive advantage for a person or organization; (C) Except for those situations in which a conflict of interest is unavoidable, and the conflict is promptly and publicly disclosed, no individual can be appointed to a review panel if that individual has a conflict of interest that is relevant to the functions to be performed. Conflicts of interest include, but are not limited to, the personal financial interests and investments, employer affiliations, and consulting arrangements, grants, or contracts of the individual and of others with whom the individual has substantial common financial interests, if these interests are relevant to the functions to be performed. Potential reviewers must be screened for conflicts of interest in accordance with the procedures set forth in the NOAA Policy on Conflicts of Interest for Peer Review subject to OMB's Peer Review Bulletin."

1) review draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g., previous assessments and STAR panel reports, when available);
2) discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting, work with the STATs to correct deficiencies, and when possible suggest new tools or analyses to improve future assessments; and
3) develop STAR panel reports for all reviewed species to document meeting discussion and recommendations.

The STAR panel chair has, in addition, the responsibility to: 1) develop a STAR panel meeting agenda; 2) ensure that STAR panel participants follow the TOR; 3) guide the STAR panel and a STAT to mutually agreeable solutions; and 4) coordinate review of revised stock assessment documents before they are forwarded to the SSC.

Groundfish and CPS STAR panels include a chair appointed from the relevant SSC subcommittee (Groundfish or CPS), and three other experienced stock assessment analysts knowledgeable of the specific modeling approaches being reviewed. Of these three other members, at least one should be appointed from the Center for Independent Experts (CIE) and at least one should be familiar with west coast stock assessment practices. Selection of STAR panelists should aim for balance between outside expertise and in-depth knowledge of west coast fisheries, data sets available for those fisheries, and modeling approaches applied to west coast groundfish and CPS. Expertise in ecosystem models or processes and knowledge of the role of groundfish and CPS in the ecosystem is also desirable, particularly if the assessment includes ecosystem models or environmental processes. Reviewers should not have financial or personal conflicts of interest, either current to the meeting, within the previous year (at minimum), or anticipated. For groundfish, an attempt should be made to identify one reviewer who can consistently attend all STAR panel meetings in an assessment cycle. The pool of qualified technical reviewers is limited, therefore staffing of STAR panels is a subject to constraints that can make it difficult to meet the conditions above.

STAR panel meetings should also include representatives of the relevant management team (MT) and advisory panel (AP), with responsibilities as laid out in these TOR, and a Council staff member to help advise the STAR panel and assist in recording meeting discussions and results. The STAR panel, STATs, the MT and AP representatives, and the public are all legitimate meeting participants who should be accommodated in discussions. It is the STAR panel chair's responsibility to coordinate discussion and public comment so that the assessment review is completed on time.

A STAR panel normally meets for one week. The number of assessments reviewed per panel should not exceed two, except in extraordinary circumstances if the SSC and NMFS agree that it is advisable, feasible, and/or necessary. When separate assessments are conducted at the sub-stock level (i.e., black rockfish), each assessment is considered an independent full assessment for review purposes. Contested assessments, in which alternative assessments are brought forward by competing STATs using different modeling approaches, would typically require additional time (and/or panel members) to review adequately, and should be scheduled accordingly. While contested assessments are likely to be rare, they can be accommodated within the STAR process. The STAR panel should thoroughly evaluate each analytical approach, comment on the relative merits of each, and, when conflicting results are obtained, identify the reasons for the differences. The STAR panel is also charged with selecting a preferred base model.

STAR Panel Requests for Additional Analyses

STAR panel meetings are not workshops. In the course of a meeting, the panel may ask the STAT for a reasonable number of sensitivity runs, request additional details on the proposed base model presented, or ask for further analyses of alternative runs. It is not unusual for the review to result in a change to the initial base model (given that both the STAR panel and the STAT agree). However, the STAR panel is not authorized to conduct an alternative assessment representing its own views that are distinct from those of the STAT, nor can it impose an alternative assessment on the STAT. Similarly, the panel should not impose their preferred methodologies when this is a matter of professional opinion. Rather, if the panel finds an assessment to be inadequate, it should document its opinion and suggest potential remedial measures for the STAT to take to rectify perceived shortcomings of the assessment. For groundfish species, the SSC reviews the STAR panel report and recommends whether an assessment should be further reviewed at the so-called "mop-up" panel meeting, a meeting of the SSC's Groundfish subcommittee that occurs after all of the STAR panels, primarily to review rebuilding analyses for overfished stocks. If a recommendation on whether to send the assessment to the mop-up panel meeting is needed before the full SSC is able to review the STAR panel report, the SSC Chair, Vice Chair, and Groundfish subcommittee Chair will make preliminary decision. This recommendation is subject to confirmation by the full SSC at its next scheduled meeting. For CPS, if an assessment is found not to be acceptable for use in management, a full assessment would be conducted the following year.

The STAR panels are expected to be judicious in their requests of the STATs. Large changes in data (such as wholesale removal of large data sets) or in analytical methods often result in such great changes to the assessment that it cannot be adequately reviewed during the course of the STAR panel meeting. Therefore caution should be exercised in making such changes, and in many cases such changes should be relegated to future research recommendations and/or methodology review. If a groundfish STAR panel agrees that significant changes are necessary, and the assessment is not otherwise acceptable, a recommendation for further review at the mop-up panel is warranted. Similarly, if the STAR panel agrees that the assessment results strongly indicate that current F_{MSY} value or management target and threshold are inappropriate, it should identify this in its report and recommend further analysis to support a change to more appropriate values.

STAR panel requests to the STAT for additional model runs or data analyses must be clear, explicit, and in writing. They should reflect the consensus opinion of the entire panel and not the minority view of a single individual or individuals. The STAR panel requests and recommendations should be listed within the STAR panel's report along with rationale and STAT response to each request.

To the extent possible, analyses requested by the STAR panel should be completed by the STAT during the STAR panel meeting. It is the obligation of the STAR panel chair, in consultation with other panel members, to prioritize requests for additional analyses. In situations where a STAT arrives with a well-constructed, thorough investigated assessment, it may be that the panel finishes its review earlier than scheduled (i.e., early dismissal of a STAT). If follow-up work by the STAT is required after the review meeting (such as MCMC integration of an alternative model created during the STAR panel meeting), this should be completed before the briefing book deadline for the Council meeting at which the assessment is scheduled for review. It is the STAR panel responsibility to track STAT progress. In particular, the chair is responsible for communicating with STAT to determine if the revised stock assessment document is complete. Any post-STAR drafts of the stock assessment must be reviewed by the STAR panel chair. The assessment document can only be given to Council staff for distribution after it has been endorsed by the STAR panel chair, and when it is accompanied by a complete and approved STAR panel report. Likewise, the final draft that is published in the Council's SAFE document must also be approved by the STAR panel chair prior to being accepted by Council staff.

For some stocks selected for full assessments, the available data may prove to be insufficient to support a category 1 assessment. In such cases, the STAT should consider whether simpler approaches appropriate for a category 2 assessment can be applied. Simpler approaches usually make stronger assumptions and estimate fewer parameters, but are less demanding of data. It is the responsibility of the STAR panel, in consultation with the STAT, to consider the strength of inferences that can be drawn from analyses presented, and identify major uncertainties. If useful results have been produced, the STAR panel should review the appropriateness and reliability of the methods used to draw conclusions about stock status and/or exploitation rates, and either recommend or reject the analysis on the basis of its ability to provide useful information into the management process. If the STAR panel agrees that important results have been generated, it should forward its findings and conclusions to the SSC and the Council for consideration in setting of OFLs, ABCs, and ACLs (for groundfish) and HGs (for CPS). A key section of the assessment is that on research needed to improve the assessment. Highlighting research priorities should increase the likelihood that future stocks assessments can be raised to category 1.

Uncertainty and Decision Tables in Groundfish Stock Assessments

The STAR panel review focuses on technical aspects of the stock assessment. It is recognized that no model or data set is perfect or issue free. Therefore, outputs of a broad range of model runs should be evaluated to better define the scope of the accepted model results. The panel should strive for a risk-neutral perspective in its deliberations, and discuss the degree to which the accepted base model describes and quantifies the major sources of uncertainty in the assessment. Confidence intervals for model outputs, as well as other measures of uncertainty that could affect management decisions, should be provided in completed stock assessments and the reports prepared by STAR panels. The STAR panel may also provide qualitative comments on the probability of results from various model runs, especially if the panel does not consider the probability distributions calculated by the STAT capture all major sources of uncertainty. However, as a scientific peer review body, the STAR panel should avoid matters of policy. Assessment results from model runs that are technically flawed or questionable on other grounds, should be identified by the panel and excluded from the alternatives upon which management advice is to be developed.

During the review meeting, the STAR panel and the STAT should strive to reach a consensus on a single base model. Once a base model is agreed upon, it is essential that uncertainty around the base model be captured and communicated to managers. One way to accomplish this objective is to bracket the base model with what is agreed to be the major axis of uncertainty (e.g., spawner-recruit steepness, the virgin level of recruitment, the natural mortality rate, survey catchability, etc.; and, less often, recent year-class strength, weights on conflicting CPUE series, etc.). Alternative models should show contrast in their management implications, which, in practical terms, means that that they should result in different estimates of current stock size and status, and the OFL. Markov chain Monte Carlo (MCMC) integration, where possible, is an acceptable method for reporting uncertainty about the base model. However, point estimates from the Maximum Likelihood Estimation (MLE) method should be used for status determinations even when MCMC runs are available.

Once alternative models, which capture the overall degree of uncertainty in the assessment, are formulated, a 2-way decision table (alternative models versus management actions) should be developed to illustrate the repercussions of uncertainty to managers. The ratio of probabilities of alternative models should be 25:50:25, with the base model being twice as likely as the low and high stock size alternatives. Potential methods for assigning probabilities to alternative models include using the statistical variance of the model estimates of stock size, posterior Monte Carlo simulation, or expert judgment, but other approaches are acceptable as long as they are fully documented. An ideal bracketing of the base model is one for which the geometric mean of the high and low stock size alternative model final biomass levels approximates the base model biomass level. This is because the distribution of possible stock sizes is necessarily bounded at the low end, while the right tail can extend much further from the point estimate, and thus the probability density should look more log-normal than normal. If the bracketing models are far from this ideal (e.g. if the base model is closer to the upper bracketing model in absolute terms than to the lower bracketing model), the three levels should be reconsidered and either one or more of them adjusted (such that in certain cases, if there is a great deal of confidence in the bracketing models, the base model could be reconsidered), or a justification for the severely non-lognormal structure of alternatives be given. Similarly, if more than one dimension is used to characterize uncertainty, resulting in, for example, a 3-by-3 decision table, careful consideration of how the complete table brackets the uncertainty should be undertaken.

Areas of Disagreement

STATs and STAR panels are required to make an honest attempt to resolve any areas of disagreement during the meeting. Occasionally, fundamental differences of opinions may remain between the STAR panel and STAT that cannot be resolved during the STAR panel meeting. In such cases, the STAR panel must document the areas of disagreement in its report. While identifying areas of disagreement the following questions should be discussed at the meeting:

1) Are there any differences in opinion about the use or exclusion of data?
2) Are there any differences in opinion about the choice of base model?
3) Are there any differences in opinion about the characterization of uncertainty?

The STAT may choose to submit a supplemental report supporting its view, but in that case, an opportunity must be given to the STAR panel to prepare a rebuttal. These documents would then be appended to the STAR panel report as part of the record of the review meeting. In some cases STAR panel members may have fundamental disagreements among themselves that cannot be resolved during the review meeting. In such cases, STAR panel members may prepare a minority report that would also become part of the record of the review meeting. The SSC would then review all information pertaining to STAR panel and STAR panel/STAT disputes, and issue its recommendation.

STAR Panel Report

The STAR panel report should be developed and approved by the full panel shortly after the STAR panel meeting. The STAR panel chair appoints members of the panel to act as rapporteurs and draft the report (or specific sections thereof) according to the STAR panel chair guidance on format and level of detail. The STAR panel chair is responsible for preparing the final draft of the panel report, obtaining panel approval, providing a copy for STAT review and comment, and submitting it to the Council in a timely fashion (i.e., by briefing book deadline).

The STAR panel report should include:

- Summary of the STAR Panel meeting:
    - Names and affiliations of STAR panel members, STAT and STAR panel advisors;
    - Brief overview of the meeting (where the meeting took place, what species was assessed, what was the STAR panel recommendation, etc.);
    - Brief summary of assessment model and the data used;
    - List of analyses requested by the STAR panel, the rationale for each request, and a brief summary of the STAT response to the request;
- Description of the base model and, for groundfish species the alternative models used to bracket uncertainty;
- Comments on the technical merits and/or deficiencies in the assessment and recommendations for remedies;
- Areas of disagreement regarding STAR panel recommendations:
    - Between the STAR panel and STAT(s).
    - Among STAR panel members (including concerns raised by MT and AP representatives);
- Unresolved problems and major uncertainties, e.g., any special issues that complicate assessment and/or interpretation of results.
- Management, data, or fishery issues raised by the MT or AP representatives during the STAR panel.
- Prioritized recommendations for future research and data collection, including methodology and ecosystem considerations for the subsequent assessment.

For groundfish species, the STAR panel also makes a recommendation on whether the next assessment of the same species should be full or update, and explain reasons for its recommendation.

The STAR panel report should be made available for review by the STAT with adequate time prior to the briefing book deadline (i.e., a week in most circumstances, but at minimum a full 24 hours, in cases when the time between the STAR panel and the deadline is particularly compressed) so that the STAT can comment on issues of fact or differences in interpretation. If differences of opinion come up during review of the STAR panel report, the STAR panel and STAT should attempt to resolve them. Otherwise, the areas of disagreement must be documented in the STAR panel report.

The chair will also solicit comment on the draft report from the MT and AP representatives. The purpose of this is limited to ensuring that the report is technically accurate, and reflects the discussion that occurred at meeting, and should not be viewed as an opportunity to reopen debate on issues. The STAR panel chair is the final arbiter on wording changes suggested by STAT and the MT and AP representatives as the report is the panel's report of the meeting. Any detailed commentary by MT and AP representatives should be drafted separately, reviewed by full advisory body, and included in the briefing book.

The STAR panel chair is responsible for providing the Council staff with the final version of the STAR panel report. The STAR panel chair is also expected to attend SSC meeting and, if requested, MT meetings and the relevant portions of the Council meetings, where stock assessments and harvest projections are discussed, explain the reviews and provide technical information and advice.

Stock Assessment Team Responsibilities

The stock assessment team (STAT) is responsible for conducting a complete and technically sound stock assessment that conforms to accepted standards of quality, and in accordance with these TOR. The STAT is responsible for preparing three versions of the stock assessment document:

1) a "draft" for discussion during STAR panel meeting;
2) a "revised draft" for presentation to the SSC, the Council, and relevant MT and AP; and
3) a "final version" to be published in the Council's SAFE document.

The draft assessment document should follow an outline in Appendix A with an executive summary as in the template in Appendix B. In the draft document, the STAT should identify a candidate base model, fully-developed and well-documented, for STAR panel to review. For CPS, the STAT should submit a draft assessment document to the STAR panel chair and Council staff two weeks prior to the STAR panel meeting. For groundfish, a draft assessment document should be submitted by the STAT to the STAR panel chair, Council staff, and the NMFS Stock Assessment Coordinator (SAC) three full weeks prior to the STAR panel meeting, to determine whether the document is sufficiently complete to undergo review. If the draft assessment is judged complete, the draft assessment and supporting materials would be distributed to the STAR panel and relevant MT and AP representatives two weeks prior to the STAR panel meeting. If the assessment document does not meet minimum criteria of the TOR, the review would be postponed to a subsequent assessment cycle or to the mop-up panel. The mop-up panel generally is not able to review more than two assessments. Therefore, the review options are limited for assessments not completed on time. The STAT is also responsible for bringing model files and data (in digital format) to the STAR panel meeting so that they can be analyzed on site.

In most cases, the STAT should produce a revised draft of the assessment document within three weeks of the end of the STAR panel meeting. The revised draft must include a point-by-point response of the STAT to each of the STAR panel's recommendations. The revised draft must be finalized before the briefing book deadline for the Council meeting at which the assessment is scheduled for review. Post-STAR drafts must be reviewed and approved by the STAR panel chair prior to being submitted to Council staff. This review is limited to editorial issues, verifying that all required elements are included, and confirming that the document reflects the discussion and decisions made during the STAR panel.

The final version of the assessment document is produced after the assessment has been reviewed by the SSC. Other than changes recommended by the SSC, only editorial and other minor alterations should be made to the revised draft for the final version. Electronic versions of the final assessment document, model files, and key output files should be submitted by the STATs to Council staff (for CPS) and to Council staff and the SAC (for groundfish) for inclusion in a stock assessment archive. Any tabular data that are inserted into the final documents in an object format should also be submitted in alternative forms (e.g., spreadsheets), which allow selection of individual data elements.

A STAT for which no base model was endorsed by a STAR panel should, in most cases, provide the pre-STAR draft assessment (or corrected/ updated version thereof, as agreed upon with the STAR panel) to the Council by the briefing book deadline. If the STAR panel, nonetheless, recommends using outputs of certain sensitivity runs to bracket uncertainty in the assessment, the results of those runs should be appended to the draft assessment and provided to the Council and its advisory bodies.

STATs are strongly encouraged to develop assessments in a collaborative environment by forming working groups, holding pre-assessment workshops, and consulting with other stock assessment and ecosystem assessment scientists. STAT meetings with Integrated Ecosystem Assessment (IEA) teams are strongly encouraged to evaluate alternative models and analyses that incorporate ecosystem considerations and cross-FMP interactions that may affect stock dynamics. STAT members should attend the relevant stock assessment workshops, if possible. STATs should coordinate early in the process with state representatives and other data stewards to ensure timely availability of data. STATs are also encouraged to organize independent meetings with industry and interested parties to discuss data and issues. The STAT should initiate contact with the AP representative early in the assessment process, keep the AP informed of the data being used and respond to any concerns that are raised. The STAT should also contact the MT representative for information about changes in fishing regulations that may influence model structure and the way data are used in the assessment. The STAT should be well represented at the STAR panel meeting to ensure timely completion of the STAR panel requests. Barring exceptional circumstances, STAT members, who are not attending the STAR panel meeting, should be available remotely to assist with responses when needed. Each STAT conducting a full assessment should appoint a representative to attend the Council meeting where the assessment is scheduled to be reviewed and give presentations of the assessment to the SSC and other Council advisory bodies. In addition, the STAT should be prepared to respond to MT requests for model projections for the MT's to develop ACL alternatives.

For stocks that are estimated to be below overfished thresholds (or those previously declared overfished and not yet rebuilt), the STAT must complete a rebuilding analysis according to the SSC's TOR for Rebuilding Analyses and prepare a document that summarizes the analysis results. For groundfish, it is recommended that this rebuilding analysis be conducted using the software developed by Dr. André Punt (University of Washington). Groundfish rebuilding analyses are reviewed at the mop-up panel.

National Marine Fisheries Service Responsibilities

The NMFS Northwest Fisheries Science Center (NWFSC) and the Southwest Fisheries Science Center (SWFSC) assist in organizing stock assessment reviews of groundfish and CPS, respectively. For groundfish, the NMFS also provides a stock assessment coordinator (SAC) to facilitate and assist in overseeing the STAR process.

The NMFS (through the SAC for groundfish and a designated SWFSC staff member for CPS) works with the STATs and other STAR process participants to develop a proposed list of stocks to be assessed for the consideration by the Council. NMFS also develops a draft STAR panel schedule for the Council review. NMFS identifies STAR panel members based on criteria for reviewer qualifications, and, for groundfish, makes every effort to designate one independent reviewer who can attend all STAR panel meetings to provide consistency among reviews. The costs associated with these reviewers are borne by the NMFS. The NMFS also helps organize STAR panel meetings and develops meetings' schedules.

The NMFS (along with the Council staff and the STAR panel chair) coordinates with the STATs to facilitate delivery of required materials by scheduled deadlines and in compliance with the TOR. The NMFS also assists Council staff and the STAR panel chair in a pre-review of assessment documents, to assure they are received on time and complete, and in a post-STAR review of the revised assessment document for consistency with the TOR.

Council Staff Responsibilities

The role of Council staff is to coordinate, monitor and document the STAR process to ensure compliance with these TOR.

Council staff coordinates with the STAR panel chair and the NMFS (the SAC in the case of groundfish; a designated SWFSC staff member for CPS) in a pre-review of assessment documents, to assure they are complete and received on time. If an assessment document is not in compliance with the TOR, Council staff returns the assessment document to the STAT with a list of deficiencies, a notice that the deadline has expired, or both. Council staff also coordinates with the STAR panel chair, STAT and the NMFS in a post-STAR review of the revised assessment document for consistency with the TOR. When inconsistencies are identified, the STAT is requested to make appropriate revisions in time for briefing book deadlines.

Council staff attends and monitors all STAR panel meetings to ensure continuity and adherence to the TOR and the independent review requirements of Council Operating Procedure 4. If inconsistencies with the TOR occur during STAR panel meetings, Council staff coordinates with the STAR panel chair to develop solutions to correct the inconsistencies. Council staff also attends and monitors the SSC review of stock assessments to ensure compliance with the TOR.

Council staff is responsible for timely issuance of meeting notices and distribution of stock assessments and other appropriate documents to relevant groups. Council staff also collects and maintains electronic copies of assessment documents, STAR panel, SSC, MT and AP reports as well as letters from the public and any other relevant documents. These documents are typically published in the Council's SAFE document.

Management Team Responsibilities

The management team (MT) is responsible for identifying and evaluating potential management actions based on the best available scientific information. Particularly, the MT uses stock assessment results and other information to make ACL and ACT recommendations to the Council.

A MT representative, usually appointed by the MT chair, is responsible to attend the STAR panel meeting and serve as advisor to the STAT and STAR panel on changes in fishing regulations that may influence data used in the assessment and the nature of the fishery in the future. The MT representative does not serve as a member of the STAR panel.

Successful separation of science (e.g., STAT and STAR panels) from management (e.g., MT) depends on assessment reviews being completed by the time the MT meets to discuss preliminary ACL and ACT recommendations. The MT should not seek revision or additional review of the stock assessments, after they have been endorsed by the STAR panel. The MT chair should communicate any unresolved issues to the SSC for consideration. The MT, however, can request additional model projections from the STAT, in order to develop a full evaluation of potential management actions.

Advisory Panel Responsibilities

An Advisory Panel (AP) representative, usually appointed by the AP chair, is responsible to attend the STAR panel meeting and serve as advisor to the STAT and STAR panel. The AP representative should review the data sources being used in the assessment prior to development of the stock assessment model and insure that industry concerns regarding the adequacy of data used by the STAT are communicated and addressed early in the assessment process. The AP representative does not serve as a member of the STAR panel, but, as a legitimate meeting participant, may provide appropriate information and advice to the STAT and STAR panel during the meeting.

The AP representative (along with STAT and STAR panel chair, if requested) is expected to attend the MT meeting at which preliminary ACL and ACT recommendations are developed. The AP representative is also expected to attend subsequent MT and Council meetings where the relevant harvest recommendations are discussed.

Scientific and Statistical Committee Responsibilities

The Council's Scientific and Statistical Committee (SSC) plays multiple roles within the STAR process and provides the Council and its advisory bodies with technical advice related to the stock assessments and the STAR process. The SSC assigns a member of its relevant subcommittee (Groundfish or CPS) to act as the STAR panel chair. The STAR panel chair attends the assigned STAR panel meeting and fulfills responsibilities described in the section "STAR Panel Responsibilities".

The STAR panel chair presents the STAR panel report at the SSC and Council meetings at which stock assessments are reviewed. If requested, the STAR panel chair also attends the MT meeting, at which preliminary ACL and ACT recommendations are developed, to discuss the STAR panel report and assist with interpreting the assessment results.

The full SSC conducts a final review of the stock assessment. This review should not repeat the detailed technical review conducted by the STAR panel. The SSC also reviews the STAR panel recommendations and serves as arbitrator to resolve disagreements between the STAT and the STAR panel if such disagreements occurred during the review meeting. The SSC is responsible to review and endorse any additional analytical work requested from the STAT by the MT after the stock assessment has been reviewed by the STAR panel. To insure independence in the SSC review, the SSC members who served on the STAT or STAR panel for the stock assessment being reviewed are required to recuse themselves; their involvement in the review being limited to providing factual information and answering questions.

The SSC is responsible for making OFL recommendations to the Council. The SSC is also responsible for assigning groundfish species managed by the Council to a specific category (or tier) based on definitions of species categories in Appendix C. It is also the SSC's responsibility to determine when it is appropriate to make changes to proxies or the use of estimated values of F_{MSY} and B_{MSY}.

UPDATE ASSESSMENTS

For CPS, update assessments typically occur during two years out of every three. For groundfish, the initial recommendation whether the next assessment should be full or update is made by the STAR panel during the STAR panel meeting. The final recommendation is made by the SSC.

An update assessment is generally restricted to the addition of new data that have become available since the last full assessment. It must carry forward the fundamental structure of the last full assessment reviewed and endorsed by a STAR panel, the SSC and the Council. Assessment structure here refers to the population dynamics model, data sources used as inputs to the model, the statistical platform used to fit model to the data, and generate management quantities used to set harvest specifications. Particularly, when an update assessment is developed, no substantial changes should be made to:

1) the particular sources of data used;
2) the software used in programming the assessment;
3) the assumptions and structure of the population dynamics model underlying the stock assessment;
4) the statistical framework for fitting the model to the data and determining goodness of fit; and
5) the analytical treatment of model outputs in determining management reference points.

Significant changes to the assessment should be postponed until the next full assessment. Minor alternations to the input data and the assessment can be considered as long the update assessment clearly documents and justifies the need for such changes. A step-by-step transition (via sensitivity analysis) from the last full assessment to an update assessment under review should be provided. Minor alternations can be considered under only two circumstances: first, when the addition of new data reveals an unanticipated sensitivity of model, and second, when there are clear and straightforward improvements in the input data and how it is processed and analyzed for use in the model. Examples of minor alterations include a) changes in how compositional data are pooled across sampling strata, (b) the weighting of the various data components (including the use of methods for tuning the variances of the data components), and (c) changes the time periods for the selectivity blocks, d) correcting data entry errors, e) bug fixes in software programming. This list is not meant to be exhaustive, and other alternations can be considered if warranted. Ideally, improved data or methods used to process and analyze data would be reviewed by the SSC prior to being used in assessments.

In certain cases no new data, other than estimates of recent catch, would be available (e.g., cowcod). If the estimated catch is near the value projected by the previous assessment/rebuilding analysis, no new insight would be obtained by rerunning the assessment model. In such cases, it is appropriate for the update to simply provide a status report on recent catch.

Review of Update Assessments

Update assessments and status reports are reviewed by the relevant SSC subcommittee (Groundfish or CPS), during a single meeting. Review of groundfish update assessments typically occurs early the assessment cycle and requires one day for all updates. Review of CPS update assessments lasts for 2-3 days with an option of early dismissal of a STAT. The STAT is responsible for producing the update assessment document (or status report) and submitting it to Council staff in a timely manner, before the relevant SSC subcommittee reviews the assessment. The document should follow the outline in Appendix A. The STAT, however, can reference the last full assessment (or other relevant documentation) for description of methods, data sources, stock structure, etc., given that they have not been changed. Any new information to the assessment must be presented in sufficient detail for the subcommittee to determine whether the update meets the Council's requirement to use the best available scientific information.

The document must include a retrospective analysis illustrating the model performance with and without the most recent data (new to the update assessment) and discuss whether the new data and update assessment results are sufficiently consistent with those from the last full assessment. The assessment document should include a detailed step-by-step transition from the last full assessment to the update under review. The updated decision table, if there is one, should be of the same format as in the last full assessment; it should highlight differences among alternative models defined using the same axes of uncertainty as those of the last full assessment.

In additional to the update assessment (or status report) document, Council staff also provides the subcommittee with a copy of the last full stock assessment reviewed via STAR process and the STAR panel report. The chair of the subcommittee designates a lead reviewer from the subcommittee members for each update assessment and status report to document the meeting discussion, produce a review report, and ensure that each review is conducted according to the TOR. MT and the AP representatives also participate in the review.

The review of update assessments is not expected to require additional model runs or extensive analytical requests during the meeting, although changes in assessment outputs may necessitate some model exploration. The review focuses on two main questions:

1) Does the assessment meet the criteria of a stock assessment update?
2) Can the results of the update assessment form the basis of Council decision making?

If the answer to either of these questions is negative, a full stock assessment for the species would typically be recommended for the next assessment cycle (for groundfish) or the next year (for CPS). For groundfish, if the subcommittee agrees that the update assessment results require additional, but limited exploration before being endorsed for management use, further review at the mop-up meeting, in the end of the assessment cycle, could be recommended. In cases like this, the subcommittee needs to develop a list of requests for the STAT to address before the mop-up meeting.

Shortly after the meeting, the subcommittee issues a review report that includes: 1) comments on the technical merits and/or deficiencies of the update assessment; 2) explanation of areas of disagreement between the subcommittee and STAT (if any); and 3) recommendations on the adequacy of the update assessment for use in management. The report may also include subcommittee recommendations for modifications that should be made when the next full assessment is conducted.

The report is reviewed by the full SSC at the next Council meeting. If the subcommittee review concludes that it is not possible to use the update assessment, the SSC is responsible for evaluating all model runs examined during the review meeting and providing recommendations on appropriate fishing level to the Council.

APPENDIX A: OUTLINE FOR STOCK ASSESSMENT DOCUMENTS

This is a general outline of elements that should be included in stock assessment reports for groundfish and CPS managed by the Pacific Fishery Management Council. Not every item listed in the outline is relevant (or available) for every assessment. Therefore, this outline should be considered a flexible guideline on how to organize and communicate stock assessment results. Items with asterisks (*****) are optional for draft assessment documents prepared for STAR panel meetings but should be included in the final document.

A. Title page and list of preparers – the names and affiliations of the stock assessment team (STAT) either alphabetically or as first and secondary authors.

B. Executive Summary (should follow the template in Appendix B).

C. Introduction
   1. Scientific name, distribution, the basis for the choice of stock structure, including regional differences in life history or other biological characteristics that should form the basis of management units.
   2. A map showing the scope of the assessment and depicting boundaries for fisheries or data collection strata.
   3. Important features of life history that affect management (e.g., migration, sexual dimorphism, bathymetric demography).
   4. Ecosystem considerations (e.g., ecosystem role and trophic relationships of the species, habitat requirements/preferences, relevant data on ecosystem processes that may affect stock or parameters used in the stock assessment, and/or cross-FMP interactions with other fisheries). This section should note if environmental correlations or food web interactions were incorporated into the assessment model. The length and depth of this section would depend on availability of data and reports from the IEA, expertise of the STAT, and whether ecosystem factors are informational to contribute quantitative information to the assessment.
   5. Important features of current fishery and relevant history of fishery.
   6. Summary of management history (e.g., changes in mesh sizes, trip limits, or other management actions that may have significantly altered selection, catch rates, or discards).
   7. Management performance, including a table or tables comparing Overfishing Limit (OFL), Annual Catch Limit (ACL), Harvest Guideline (HG) [CPS only], landings, and catch (i.e., landings plus discard) for each area and year
   8. Description of fisheries for this species off Canada, Alaska and/or Mexico, including references to any recent assessments of those stocks.

D. Assessment
   1. Data
      a. Landings by year and fishery, historical catch estimates, discards (generally specified as a percentage of total catch in weight and in units of mt), catch-at-age, weight-at-age, abundance indices (typically survey and CPUE data), data used to estimate biological parameters (e.g., growth rates, maturity schedules, and natural mortality) with coefficients of variation (CVs) or variances if available. Include complete tables and figures and date of extraction.
      b. Sample size information for length and age composition data by area, year, gear,

market category, etc., including both the number of trips and fish sampled.
   c. All data sources that include the species being assessed, which are used in the assessment, and provide the rationale for data sources that are excluded.
   d. Clear description of environmental or ecosystem data if included in the assessment.
2. History of modeling approaches used for this stock – changes between current and previous assessment models
   a. Response to STAR panel recommendations from the most recent previous assessment.
   b. Report of consultations with AP and MT representatives regarding the use of various data sources in the stock assessment.
   c. If environmental or ecosystem data are incorporated, report of consultations with technical teams that evaluated ecosystem data or methodologies used in the assessment.
3. Model description
   a. Complete description of any new modeling approaches.
   b. Definitions of fleets and areas.
   c. Assessment program with last revision date (i.e., date executable program file was compiled).
   d. List and description of all likelihood components in the model.
   e. Constraints on parameters, selectivity assumptions, natural mortality, treatment of age reading bias and/or imprecision, and other fixed parameters.
   f. Description of stock-recruitment constraints or components.
   g. Description of how the first year that is included in the model was selected and how the population state at the time is defined (e.g., B_0, stable age structure, etc.).
   h. Critical assumptions and consequences of assumption failures.
4. Model selection and evaluation
   a. Evidence of search for balance between model realism and parsimony.
   b. Comparison of key model assumptions, include comparisons based on nested models (e.g., asymptotic vs. domed selectivities, constant vs. time-varying selectivities).
   c. Summary of alternate model configurations that were tried but rejected.
   d. Likelihood profile for the base-run (or proposed base-run model for a draft assessment undergoing review) configuration over one or more key parameters (e.g., M, h, Q) to show consistency among input data sources.
   e. Residual analysis for the base-run configuration (or proposed base-run model in a draft assessment undergoing review) e.g., residual plots, time series plots of observed and predicted values, or other approaches. Note that model diagnostics *are* required in draft assessments undergoing review.
   f. Convergence status and convergence criteria for the base-run model (or proposed base-run).
   g. Randomization run results or other evidence of search for global best estimates.
   h. Evaluation of model parameters. Do they make sense? Are they credible?
   i. Are model results consistent with assessments of the same species in Canada and Alaska? Are parameter estimates (e.g., survey catchability) consistent with estimates for related stocks?
5. Point-by-point response to the STAR panel recommendations**.* Not required in draft assessment undergoing review**.
6. Base-model(s) results

a. Table listing all explicit parameters in the stock assessment model used for base model, their purpose (e.g., recruitment parameter, selectivity parameter) and whether or not the parameter was actually estimated in the stock assessment model.
b. Population numbers at age × year × sex (if sex-specific *M*, growth, or selectivity) (May be provided as a text or spreadsheet file).*** Not required in draft assessment undergoing review**.
c. Time-series of total, 1+ (if age 1s are in the model), summary, and spawning biomass (and/or spawning output), depletion relative to B_0, recruitment and fishing mortality or exploitation rate estimates (table and figures).
d. Selectivity estimates (if not included elsewhere).
e. Stock-recruitment relationship.
f. OFL, ABC and ACL (and/or ABC and OY or HG) for recent years.
g. Clear description of units for all outputs.
h. Clear description of how discard is included in yield estimates.
i. Clear description of environmental or ecosystem data if included in the assessment.

7. Uncertainty and sensitivity analyses. The best approach for describing uncertainty and the range of probable biomass estimates in groundfish assessments may depend on the situation. Important factors to consider include:
   a. Parameter uncertainty (variance estimation conditioned on a given model, estimation framework, data set choice, and weighting scheme), including likelihood profiles for important assessment parameters (e.g., natural mortality). This also includes expressing uncertainty in derived outputs of the model and estimating CVs using appropriate methods (e.g., bootstrap, asymptotic methods, Bayesian approaches, such as MCMC). Include the CV of spawning biomass in the first year for which an OFL has not been specified (typically end year +1 or +2).
   b. Sensitivity to data set choice and weighting schemes (e.g., emphasis factors), which may also include a consideration of recent patterns in recruitment.
   c. Sensitivity to assumptions about model structure, i.e., model specification uncertainty.
   d. Retrospective analysis, where the model is fitted to a series of shortened input data sets, with the most recent years of input data being dropped.
   e. Historical analysis (plot of actual estimates from current and previous assessments).
   f. Subjective appraisal of the magnitude and sources of uncertainty.
   g. If a range of model runs is used to characterize uncertainty it is important to provide some qualitative or quantitative information about relative probability of each. If no statements about relative probability can be made, then it is important to state that all scenarios (or all scenarios between the bounds depicted by the runs) are equally likely
   h. If possible, ranges depicting uncertainty should include at least three runs: (a) one judged most probable; (b) at least one that depicts the range of uncertainty in the direction of lower current biomass levels; and (c) one that depicts the range of uncertainty in the direction of higher current biomass levels. The entire range of uncertainty should be carried through stock projections and decision table analyses.

E. Harvest control rules (CPS only)

The OFL, ABC and HG harvest control rules for actively managed species apply to the U.S. (California, Oregon, and Washington) harvest recommended for the next fishing year and are defined as follows:

- OFL = BIOMASS * F_{MSY} * U.S. DISTRIBUTION
- ABC = BIOMASS * BUFFER * F_{MSY} * U.S. DISTRIBUTION
- ACL LESS THAN OR EQUAL TO ABC
- HG = (BIOMASS-CUTOFF)* FRACTION * U.S. DISTRIBUTION
- ACT EQUAL TO HG OR ACL, WHICHEVER VALUE IS LESS

where F_{MSY} is the fishing mortality rate that maximizes catch biomass in the long term.

Implementation for Pacific Sardine

1. BIOMASS is the estimated stock biomass (ages 1+) at the start of the next year from the current assessment,
2. CUTOFF (150,000 mt) is the lowest level of estimated biomass at which harvest is allowed,
3. FRACTION is an environment-based percentage of biomass above the CUTOFF that can be harvested by the fisheries. Given that the productivity of the sardine stock has been shown to increase during relatively warm-water ocean conditions, the following formula has been used to determine an appropriate (sustainable) FRACTION value:

   FRACTION = 0.248649805(T_2) - 8.190043975(T) + 67.4558326,

   where T is the running average sea-surface temperature at Scripps Pier, La Jolla, California during the three preceding years. Under the harvest control rule, FRACTION is constrained and ranges between 5% and 15% depending on the value of T.
4. U.S. DISTRIBUTION is the percentage of BIOMASS in U.S. waters (87%).

Implementation for Pacific Mackerel

1. BIOMASS is the estimated stock biomass (ages 1+) at the start of the next year from the current assessment,
2. CUTOFF (18,200 mt) is the lowest level of estimated biomass at which harvest is allowed,
3. FRACTION (30%) is the fraction of biomass above CUTOFF that can be taken by fisheries, and
4. U.S. DISTRIBUTION (70%) is the average fraction of total BIOMASS in U.S. waters.

The CUTOFF and FRACTION values applied in the Council's harvest policy for mackerel are based on simulations published by MacCall et al. in 1985.

F. Reference points (groundfish only)

1. Unfished spawning stock biomass, summary age biomass, and recruitment, along with unfished spawning stock output.
2. Reference points based on $B_{40\%}$ for rockfish and roundfish and on $B_{25\%}$ for flatfish (spawning biomass and/or output, SPR, exploitation rate, equilibrium yield).
3. Reference points based on default SPR proxy (spawning biomass and/or output, SPR, exploitation rate, equilibrium yield).
4. Reference points based on MSY (if estimated) (spawning biomass and/or output, SPR,

exploitation rate, equilibrium yield).

5. Equilibrium yield curve showing various B_{MSY} proxies.

G. Harvest projections and decision tables (groundfish only) *** Not required in draft assessment undergoing review**.

   1. Harvest projections and decision tables (i.e., a matrix of alternative models (states of nature) versus management actions) should cover the plausible range of uncertainty about current stock biomass and a set of candidate fishing mortality targets used for the stock. See section "*Uncertainty and Decision Tables in Groundfish Stock Assessment*" (this document, pp.12-13) on how to define alternative states of nature. Management decisions in most cases represent the sequence of catches including estimate of OFL based on F_{MSY} (or its proxy) and those obtained by applying the Council 40-10 harvest policy to each state of nature; however other alternatives may be suggested by the GMT as being more relevant to Council decision making.
   2. Information presented should include biomass, stock depletion, and yield projections of OFL, ABC and ACL for ten years into the future, beginning with the first year for which management action could be based upon the assessment.

H. Regional management considerations.

   1. For stocks where current practice is to allocate harvests by management area, a recommended method of allocating harvests based on the distribution of biomass should be provided. The MT advisor should be consulted on the appropriate management areas for each stock.
   2. Discuss whether a regional management approach makes sense for the species from a biological perspective.
   3. If there are insufficient data to analyze a regional management approach, what are the research and data needs to answer this question?

I. Research needs (prioritized).

J. Acknowledgments: include STAR panel members and affiliations as well as names and affiliations of persons who contributed data, advice or information but were not part of the assessment team. *** Not required in draft assessment undergoing review.**

K. Literature cited.

L. An appendix with the complete parameter and data in the native code of the stock assessment program. (For a draft assessment undergoing review, these listings can be provided as text files or in spreadsheet format.)

APPENDIX B: TEMPLATE FOR AN EXECUTIVE SUMMARY

Items with asterisks (*****) are optional for draft assessment documents prepared for STAR panel meetings but should be included in the final document.

Stock	Species/area, including an evaluation of any potential biological basis for regional management.
Catches	Trends and current levels-include table for last ten years and graph with long term data.
Data and assessment	Date of last assessment, type of assessment model, data available, new information, and information lacking.
Stock biomass	Trends and current levels relative to virgin or historic levels, description of uncertainty-include table for last 10 years and graph with long term estimates.
Recruitment	Trends and current levels relative to virgin or historic levels-include table for last 10 years and graph with long term estimates
Exploitation status	Exploitation rates (i.e., total catch divided by exploitable biomass, or the annual SPR harvest rate) – include a table with the last 10 years of data and a graph showing the trend in fishing mortality relative to the target (y-axis) plotted against the trend in biomass relative to the target (x-axis).
Ecosystem considerations	A summary of reviewed environmental and ecosystem factors that appear to be correlated with stock dynamics, e.g., variability in the physical environment that directly or indirectly affects the vital rates (growth, survival, productivity/recruitment) of fish stocks, and/or trophic interactions that affect predators and prey. Note what, if any, ecosystem factors are used in the assessment and how.
Reference points (groundfish)/ Harvest control rules (CPS)	Groundfish: Management targets and definition of overfishing, including the harvest rate that brings the stock to equilibrium at $B_{40\%}$ (the B_{MSY} proxy) and the equilibrium stock size that results from fishing at the default harvest rate (the F_{MSY} proxy). Include a summary table that compares estimated reference points for SSB, SPR, Exploitation Rate and Yield based on SSB proxy for MSY, SPR proxy for MSY, and estimated MSY values. CPS: Results of applying the control rule to compute the harvest guideline, including specification of each of the quantities on which the harvest guideline is based (BIOMASS, CUTOFF, FRACTION, U.S. DISTRIBUTION)
Management performance	Catches in comparison to OFL, ABC, [HG], and OY/ACL values for the most recent 10 years (when available), overfishing levels, actual catch and discard. Include OFL (encountered), OFL (retained) and OFL (dead) if different due to discard and discard mortality.
Unresolved problems and major uncertainties	Any special issues that complicate scientific assessment, questions about the best model scenario, etc.
Decision table (groundfish only)*	Projected yields (OFL, ABC and ACL), spawning biomass, and stock depletion levels for each year.
Research and data needs	Identify information gaps that seriously impede the stock assessment.
Rebuilding Projections*	Reference to the principal results from rebuilding analysis if the stock is overfished. For groundfish, see Rebuilding Analysis terms of reference for detailed information on rebuilding analysis requirements.

APPENDIX C: DEFINITIONS OF SPECIES CATEGORIES FOR GROUNDFISH ASSESSMENTS

Category 3: **Data poor**. OFL is derived from historical catch.	**a**	No reliable catch history. No basis for establishing OFL.
	b	Reliable catches estimates only for recent years. OFL is average catch during a period when stock is considered to be stable and close to BMSY equilibrium on the basis of expert judgment.
	c	Reliable aggregate catches during period of fishery development and approximate values for natural mortality. Default analytical approach DCAC.
	d	Reliable annual historical catches and approximate values for natural mortality and age at 50% maturity. Default analytical approach DB-SRA.
Category 2: **Data moderate**. OFL is derived from model output (or natural mortality).	**a**	M*survey biomass assessment (as in Rogers 1996).
	b	Historical catches, fishery-dependent trend information only. An aggregate population model is fit to the available information.
	c	Historical catches, survey trend information, or at least one absolute abundance estimate. An aggregate population model is fit to the available information.
	d	Full age-structured assessment, but results are substantially more uncertain than assessments used in the calculation of the P* buffer. The SSC will provide a rationale for each stock placed in this category. Reasons could include that assessment results are very sensitive to model and data assumptions, or that the assessment has not been updated for many years.
Category 1: **Data rich**. OFL is based on F_{MSY} or F_{MSY} proxy from model output. ABC based on P* buffer.	**a**	Reliable compositional (age and/or size) data sufficient to resolve year-class strength and growth characteristics. Only fishery-dependent trend information available. Age/size structured assessment model.
	b	As in 1a, but trend information also available from surveys. Age/size structured assessment model.
	c	Age/size structured assessment model with reliable estimation of the stock-recruit relationship.

SSC TERMS OF REFERENCE FOR GROUNDFISH REBUILDING ANALYSIS

May 2010

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1. Introduction

Amendment 11 to the Groundfish Fishery Management Plan (FMP) established a harvest control rule for determining optimum yields (OYs). The 40:10 policy was designed to prevent stocks from falling into an overfished condition. Part of the amendment established a default overfished threshold equal to 25% of the unexploited population size[1] (B_0), or 50% of B_{MSY}, if known. By definition, groundfish stocks falling below that level are designated to be in an overfished state ($B_{25\%} = 0.25 \times B_0$[2]). To prevent stocks from deteriorating to that point, the policy specified a precautionary threshold equivalent to 40% of B_0. The policy required that OY, when expressed as a fraction of the allowable biological catch (formerly "ABC"), be progressively reduced at stock sizes less than $B_{40\%}$. Because of this linkage, $B_{40\%}$ has sometimes been interpreted to be a proxy measure of B_{MSY}, i.e., the stock biomass that results when a stock is fished at F_{MSY}. In fact, theoretical results support the view that a robust biomass-based harvesting strategy would be to maintain stock size at about 40% of the unfished level (Clark 1991, 2002). In the absence of a credible estimate of B_{MSY}, which can be very difficult to estimate (MacCall and Ralston 2002), $B_{40\%}$ is a suitable proxy to use as a rebuilding target.

The recently revised Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that U.S. fishery management councils avoid overfishing by setting annual catch limits (ACLs) rather than OYs. Stock assessments now will provide overfishing level (OFL) estimates and acceptable biological catch (ABC) will be derived from OFL by reducing OFL to account for scientific uncertainty. The ACL cannot exceed the ABC.

Following the 2008 assessment season, the Pacific Fishery Management Council ("Council") revised the reference points for flatfish, as separate from other groundfish species. The new reference points include an MSY proxy fishing rate of $F_{30\%}$, a target spawning output (biomass or potential) of $B_{25\%}$ and an overfished threshold of $B_{12.5\%}$. Similarly, (it has been proposed that) the 40:10 policy has been replaced by a 25:5 policy for flatfish.

Under the MSA, rebuilding plans are required for stocks that have been designated to be in an overfished state. Amendment 12 of the Groundfish FMP provided a framework within which

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[1] The absolute abundance of the mature portion of a stock is loosely referred to here in a variety of ways, including: population size, stock biomass, stock size, spawning stock size, spawning biomass, spawning output; i.e., the language used in this document is sometimes imprecise. However, the best fundamental measure of population abundance to use when establishing a relationship with recruitment is spawning output, defined as the total annual output of eggs (or larvae in the case of live-bearing species), accounting for maternal effects (if these are known). Although spawning biomass is often used as a surrogate measure of spawning output, for a variety of reasons a non-linear relationship often exists between these two quantities (Rothschild and Fogarty 1989; Marshall *et al*. 1998). Spawning output should, therefore, be used to measure the size of the mature stock when possible.

[2] Estimates of stock status are typically obtained by fitting statistical models of stock dynamics to survey and fishery data. In recent years, the bulk of stock status determinations have been based on Stock Synthesis 3, an age- and size-structured population dynamics model (Methot 2005, 2007). Stock assessment models can be fitted using Maximum Likelihood or Bayesian methods. For both types of estimation methods, a stock is considered to be in an overfished state if the best point estimate of stock size is less than 25% of unfished stock size. This corresponds to the maximum likelihood estimate for estimation methods based on Maximum Likelihood methods, to the maximum of the posterior distribution (MPD) for estimation methods in which penalties are added to the likelihood function, and to the mode of the posterior distribution for Bayesian analyses. The median of the Bayesian posterior is not used for determination of overfished status.

rebuilding plans for overfished groundfish resources could be established. Amendment 12 was challenged in Federal District Court and found not to comply with the requirements of the MSA because rebuilding plans did not take the form of an FMP, FMP amendment, or regulation. In response to this finding, the Council developed Amendment 16-1 to the Groundfish FMP which covered three issues, one of which was the form and content of rebuilding plans.

The Council approach to rebuilding depleted groundfish species, as described in rebuilding plans, was re-evaluated and adjusted under Amendment 16-4 in 2006 so they would be consistent with the opinion rendered by the Ninth Circuit Court of Appeals in *Natural Resources Defense Council, Inc. and Oceana, Inc.* v. *National Marine Fisheries Service, et al.,* 421 F.3d 872 (9th Cir. 2005), and with National Standard 1 of the MSA. The court affirmed the MSA mandate that rebuilding periods "be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock of fish within the marine ecosystem" (Section 304(e)). The court opinion also recognized that some harvest of overfished species could be accommodated under rebuilding plans to avoid disastrous economic impacts to West Coast fishing communities dependent on groundfish fishing. This harvest can only be incidental and unavoidable in fisheries targeting healthy stocks and, under Amendment 16-4 rebuilding plans, more emphasis was placed on shorter rebuilding times and the trade-off between rebuilding periods and associated socioeconomic effects.

Rebuilding Plans include several components, one of which is a rebuilding analysis. Simply put, a rebuilding analysis involves projecting the status of the overfished resource into the future under a variety of alternative harvest strategies to determine the probability of recovery to B_{MSY} (or its proxy $B_{40\%}$) within a pre-specified time-frame.

2. Overview of the Calculations Involved in a Rebuilding Analysis

This document presents guidelines for conducting a basic groundfish rebuilding analysis that meets the minimum requirements that have been established by the Council's Scientific and Statistical Committee (SSC), those of Amendment 16-1 of the Groundfish FMP, and those arising from the 9th Circuit Court decision. It also outlines the appropriate documentation that a rebuilding analysis needs to include. These basic calculations and reporting requirements are essential elements in all rebuilding analyses to provide a standard set of base-case computations, which can then be used to compare and standardize rebuilding analyses among stocks. The steps when conducting a rebuilding analysis are:

1. Estimation of B_0 (and hence B_{MSY} or its proxy).
2. Selection of a method to generate future recruitment.
3. Specification of the mean generation time.
4. Calculation of the minimum possible rebuilding time, T_{MIN}.
5. Identification and analysis of alternative harvest strategies and rebuilding times.

The specifications in this document have been implemented in a computer package developed by Dr André Punt (University of Washington). This package can be used to perform rebuilding analyses for routine situations. However, the SSC encourages analysts to explore alternative calculations and projections that may more accurately capture uncertainties in stock rebuilding than the standards identified in this document, and which may better represent stock-specific concerns. In the event of a discrepancy between the generic calculations presented here and a stock-specific result developed by an individual analyst, the SSC groundfish subcommittee will review the issue and recommend which results to use.

The SSC also encourages explicit consideration of uncertainty in projections of stock rebuilding, including comparisons of alternative states of nature using decision tables to quantify the impact of model uncertainty (see Section 8 below).

3. Estimation of B_0

B_0, defined as mean unexploited spawning output, can be estimated from the fit of some form of spawner-recruit model or empirically using the estimates of recruitment from the stock assessment. Most of the recent assessments of west coast groundfish have been based on stock assessments that integrate the estimation of the spawner-recruit model with the estimation of other population dynamic parameters. These stock assessments therefore link the recruitments for the early years of the assessment period with the average recruitment corresponding to B_0. Estimates of B_0 from empirical methods will not be the same as those estimated as an embedded parameter within an assessment model. As a result, the estimate of B_0 from the stock assessment model should be the default for the B_0 used in rebuilding analyses when the stock assessment integrates the spawner-recruit model. Justification for the use an empirical estimate of B_0 is therefore needed when a direct estimate of B_0 is available from a stock assessment model, and the difference in B_0 estimates must also be documented. Stock assessment models which integrate the estimation of the spawner-recruit model also provide estimates of B_{MSY}. However, at this time, the SSC recommends that these estimates not be used as the target for rebuilding. Rather, the rebuilding target should be taken to be the agreed proxy for B_{MSY} (e.g. $0.4B_0$ for most groundfish stocks) in all cases.

For the purpose of estimating B_0 empirically, analysts should select a sequence of years, within which recruitment is believed to be reasonably representative of the natality from an unfished stock. The average recruitment for these years can then be multiplied by the spawning output-per-recruit in an unfished state (which depends on growth, maturity, fecundity and natural mortality) to estimate equilibrium unfished spawning output. In selecting the appropriate sequence of years, analysts have generally utilized years in which stock size was relatively large, in recognition of the paradigm that groundfish recruitment is positively correlated with spawning stock size (Myers and Barrowman 1996). Moreover, due to the temporal history of exploitation in the West Coast groundfish fishery (see Williams 2002), this has typically led to consideration of the early years from an assessment model[3]. Thus, for example, in the case of widow rockfish, the time period within which recruitments were selected when estimating B_0 was 1958-62 (He *et al*. 2003).

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[3] Individual recruitments estimated from age-structured stock assessment models do not all exhibit the same precision or accuracy. Recruitments estimated at the very beginning of the modeled time period may suffer from mis-specification of the initial condition of the population (e.g., an assumed equilibrium age structure). Likewise, recruitments estimated at the end of the sequence may be imprecise due to partial recruitment of recent year classes. Thus, it may be advisable to trim the beginning and/or ending year-classes to address this problem

An alternative view of the recruitment process is that it depends to a much greater degree on the environment than on adult stock size. For example, the decadal-scale regime shift that occurred in 1977 (Trenberth and Hurrell 1994) is known to have strongly affected ecosystem productivity and function in both the California Current and the northeast Pacific Ocean (Roemmich and McGowan 1995; MacCall 1996; Francis *et al*. 1998; Hare *et al*. 1999). With the warming that ensued, West Coast rockfish recruitment appears to have been adversely affected (Ainley *et al*. 1993; Ralston and Howard 1995). Thus, if recruitment was environmentally forced, it would be more sensible to use the full time series of recruitments from the stock assessment model to estimate B_0. These two explanatory factors are highly confounded for West Coast groundfish, i.e., generally high biomass/favourable conditions prior to 1980 and low biomass/unfavourable conditions combined with increasing fishing impacts on groundfish stocks thereafter. Using all recruitments to estimate B_0 will therefore usually result in a lower value of B_0 (and hence target spawning output) than when an abbreviated series of recruitments is taken from early in the time series.

There is no incontrovertible evidence to favour one of these two hypotheses over the other. For example, both theoretical and observational considerations support the view that groundfish recruitment will decline with spawning output (e.g., Myers and Barrowman 1996; Brodziak *et al*. 2001). On the other hand, recent advances in our understanding of the North Pacific Ocean indicate that profound changes have occurred in the marine ecosystem since the turn of the last century (PICES 2005). In fact, an argument can be made that the effects of environmental and density-dependent factors on the spawner-recruit relationship are additive (e.g., Jacobson and MacCall 1995), which may allow us to quantitatively determine the relative importance of these two factors in the future.

For each of these two empirical methods of estimating B_0, the actual distribution for B_0 can be approximated by re-sampling recruitments, from which the probability of observing any particular stock biomass can be obtained. This approach was taken in the original bocaccio rebuilding analysis (MacCall 1999), where it was concluded that the first year biomass was unlikely to have occurred if the entire sequence of recruitments were used to determine B_0.

4. Selection of a Method to Generate Future Recruitment

One can project the population forward once the method for generating future recruitment has been specified, given the current state of the population from the most recent stock assessment (terminal year estimates of numbers at age and their variances) and the rebuilding target. There are several ways of generating future recruitment, but they fundamentally reduce to two basic kinds of approaches. These are: (1) base future recruitments on an empirical evaluation of spawner-recruit estimates and (2) use the results of a fitted spawner-recruit model (e.g., the Beverton-Holt or Ricker curves). To date, rebuilding analyses have been conducted using both approaches, and both are acceptable, as long as due consideration is given to the advantages and disadvantages of both. Ideally, reference points (e.g., B_0, B_{MSY} and F_{MSY}) and the results from projections should be compared to better assess the actual extent of uncertainty associated with these quantities.

4.1 Fitting a Spawner-Recruit Model

It is possible generate future recruitments by fitting spawner-recruit models to the full time series of spawner-recruit data. SS3-based assessments all assume a structural spawner-recruit model, either estimating or pre-specifying the steepness of the curve[4]. Ideally, the use of spawner-recruit models allows the data (or prior information) to determine the extent of compensation rather than assuming either one of two extremes (constant recruitment or constant recruits/spawner), and is also more internally consistent if the original assessment assumed a particular form of spawner-recruit model. However, this approach can be criticized because stock productivity is constrained to behave in a pre-specified manner according to the particular spawner-recruit model chosen, and there are different models to choose from, including the Beverton-Holt and Ricker formulations. These two models can produce very different reference points, but are seldom distinguishable statistically. Moreover, there are statistical issues when a spawner-recruit model is estimated after the assessment is conducted, including: (1) time-series bias (Walters 1985), (2) the "errors in variables problem" (Walters and Ludwig 1981), and (3) non-homogeneous variance and small sample bias (MacCall and Ralston 2002). Thus, analyses based on a spawner-recruit model should include a discussion of the rationale for the selection of the spawner-recruit model used (e.g. estimated within the assessment model, estimated outside of the model based on the estimates of spawning output and recruitment), and refer to the estimation problems highlighted above and whether they are likely to be relevant and substantial for the case under consideration. A rationale for the choice of spawner-recruit model should also be provided. In situations where steepness is based on a spawner-recruit meta-analysis (e.g., Dorn 2002), the reliability of the resulting relationship should be discussed.

4.2 Empirical Approaches

There are two ways to use empirical estimates of recruitment from a stock assessment to generate future recruitment, both of which utilize estimates at the tail end of the time series (i.e., the most recent estimates). These two methods have formed the basis of several rebuilding analyses that have been accepted by the SSC.

(1) Recent recruitment is standardized to the amount of the spawning output (recruits-per-spawner, R/S_i). Annual R/S_i is then randomly re-sampled and multiplied by S_i to obtain year-specific stochastic values of R_i.
(2) Recent recruitments are randomly re-sampled to determine the year-specific stochastic values of R_i.

Note that use of R/S_i as the basis for projecting the population forward ties recruitment values in a directly proportional manner to spawning output; if spawning output doubles, resulting recruitment will also double, all other things being equal. As the stock rebuilds, this becomes an increasingly untenable assumption because there is no reduction in reproductive success at very high stock sizes, which is to say there is no compensation (i.e., steepness = 0.2). In contrast, re-sampling R_i values, results in errors in the opposite direction. Namely, recruitment does not increase as stock size increases as would be expected of most rebuilding stocks. This type of

[4] The "steepness" of a spawner-recruit curve is related to the slope at the origin and is a measure of a stock's productive capacity. It is expressed as the proportion of virgin recruitment that is produced by the stock when reduced to $B_{20\%}$, and ranges between 0.2 and 1.0.

calculation effectively implies perfect compensation (i.e., steepness = 1). Thus, these two ways of projecting the population forward (using re-sampled R_i or re-sampled R/S_i) bracket the range of population responses that are likely to occur in the real world. The method selected to generate future recruitment should ensure that potential recruitment values are consistent with stock sizes between the current level and the rebuilding target, i.e., they would be considered plausible throughout the duration of rebuilding projection.

5. Determination of the Minimum and Maximum Times to Recovery

The minimum time to recovery (denoted T_{MIN}) is defined as the median time for a stock to recover to the target stock size, starting from the time when a rebuilding plan was actually implemented (usually the year after the stock was declared overfished) to when the target level is first achieved, assuming no fishing occurs. Next, the mean generation time should be calculated as the mean age of the net maturity function. A complication that can occur in the calculation of mean generation time, as well as B_0 (see above), is when growth and/or reproduction have changed over time. In such instances, the parameters governing these biological processes should typically be fixed at their most recent, contemporary, values, as this best reflects the intent of “prevailing environmental conditions” as stated in the NMFS Guidelines for National Standard 1. Exceptions may occur if there are good reasons for an alternative specification (e.g., using growth and maturity schedules that are characteristic of a stock that is close to B_{MSY}).

Although no longer used directly in Council decision-making for overfished stocks, rebuilding analyses should report the maximum time to recovery (denoted T_{MAX}). T_{MAX} is ten years if T_{MIN} is less than 10 years. If T_{MIN} is greater than or equal to 10 years, T_{MAX} is equal to T_{MIN} plus one mean generation. Likewise, rebuilding analyses should report an estimate of the median number of years needed to rebuild to the target stock size if all future fishing mortality is eliminated from the first year for which the Council is making a decision about[5] ($T_{\mathrm{F=0}}$). This will typically differ from T_{MIN}.

Finally, when a stock rebuilding plan has been implemented for some time and recruitments have been estimated from an assessment, it may be that explicit, year-specific estimates of recruitment are available for the earliest years of the rebuilding time period. In such instances, rebuilding forecasts should be conducted setting the recruitments from the start of the rebuilding plan to the current year based on the estimates from the most recent assessment, rather than through re-sampling methods (see above).

6. Harvest During Rebuilding

The Council is required to rebuild overfished stocks in a time period that is as short as possible, but can extend this period to take into account the needs of fishing communities. The simplest rebuilding harvest strategy to simulate and implement is a constant harvest rate or “fixed F” policy. All rebuilding analyses should, therefore, consider fixed F strategies. Other strategies are possible, including constant catch and phase-in strategies, in which catch reductions are phased-in before the OYs transition to a fixed F strategy. In these latter cases, analysts should always

[5] This year will generally not be the current year, but rather the year following the current two-year cycle.

assess whether fishing mortality rates exceed F_{MSY} (or its proxy), as this would constitute overfishing.

Analysts should consider a broad range of policy alternatives to give the Council sufficient scope on which to base a decision. The following represent a minimum set of harvest policies that should be reported:

1. The spawning potential ratio[6] listed in the Rebuilding Plan in the FMP (Amendment 16-4 for the stocks that are currently overfished) [only stocks already under rebuilding plans].
2. The spawning potential ratio corresponding to the optimum yields adopted for the current year (or biennium) [only stocks already under rebuilding plans].
3. The spawning potential ratio on which the current optimum yields were based [only stocks already under rebuilding plans; this spawning potential ratio will differ from that in 2) if the stock assessment has changed substantially since the last assessment].
4. The spawning potential ratio which will rebuild the stock to the target level with 0.5 probability by the T_{TARGET} specified in the FMP [only stocks already under rebuilding plans].
5. The spawning potential ratio which will rebuild the stock to the target level with 0.5 probability by the T_{MAX} specified in the FMP [only stocks already under rebuilding plans].
6. The spawning potential ratio which will rebuild the stock to the target level with 0.5 probability by the T_{MAX} calculated using the most recent biological and fishery information.
7. The OFL, ABC and 40:10 control rules.
8. No future harvest.
9. Spawning potential ratios which achieve recovery to the target level with 0.5 probability for years between $T_{F=0}$ and T_{MAX}. These spawning potential ratios should be selected by calculating the median rebuilding times under the most conservative rebuilding strategy (i.e., $T_{F=0}$) and the most liberal, allowable rebuilding strategy (i.e. T_{MAX}) and then selecting intermediate time intervals in even quartile increments. That is, if $T_{F=0}$ is 20 years and T_{MAX} = 60 years, then the intermediate alternatives would have rebuilding times of 30, 40 and 50 years, respectively.

For all of these strategies, except for number 8, the median catch streams from each of these runs should be used as the harvest strategy in a follow-up run to evaluate the result of following the actual catch advice from the harvest policies above.

These polices should be implemented within the projection calculations in the year for which the Council is making a decision. For example, for assessments conducted in 2011 (using data up to 2010), the harvest decisions pertain to OYs for 2013 and 2014. In this case, the catches for 2011 and 2012 should be set to the OYs established by the Council for those years.

Many other harvest policies could be implemented by the Council, based on whatever circumstances may mitigate against a constant harvest rate approach. Consequently, analysts

[6] The Spawning Potential Ratio (SPR) is a measure of the expected spawning output-per-recruit, given a particular fishing mortality rate and the stock's biological characteristics, i.e., there is a direct mapping of SPR to *F* (and *vice versa*). SPR can therefore be converted into a specific fishing mortality rate in order to calculate OYs.

should be prepared to respond to requests by the Council for stock-specific projections on an individual case-by-case basis.

7. Evaluating Progress Towards Rebuilding

There are no agreed criteria for assessing the adequacy of the progress towards rebuilding for species that are designated to be in an overfished state and are under a Rebuilding Plan. The SSC currently reviews each stock on a case-by-case basis, considering the following two questions: (1) have cumulative catches during the period of rebuilding exceeded the cumulative OY that was available, and (2) what is the difference between the year in which recovery is predicted to occur under the current SPR (T_{REBUILD}) and the current adopted T_{TARGET}? If the difference between T_{REBUILD} and T_{TARGEST} is minor, progress towards rebuilding will be considered to be adequate. In contrast, if the difference between T_{REBUILD} and T_{TARGET} is major, it will be necessary to define a new T_{TARGET}. As an initial step in this direction, a new maximum time to rebuild T_{MAX}^{N} will be computed based on the specifications outlined in Section 5. Analysts will be asked to assess whether the currently adopted SPR will readily rebuild the stock before T_{MAX}^{N}.

Adequacy of progress will be evaluated when the SSC groundfish subcommittee reviews the draft rebuilding plans. Analysts should provide the information needed to address the two questions listed above. If the SSC agrees that progress is not sufficient, the draft rebuilding analysis documents will need to be updated to include T_{MAX}^{N} and the probability that the currently adopted harvest rate (SPR) will rebuild the stock before T_{MAX}^{N}.

8. Decision Analyses / Considering Uncertainty

The calculation of T_{MIN} and the evaluation of alternative harvest strategies involve projecting the population ahead taking account of uncertainty about future recruitment. There are several reasons for considering model and parameter uncertainty when conducting a rebuilding analysis. For example, if several assessment model scenarios were considered equally plausible by the assessment authors or, alternatively, one model was preferred by the assessment authors and another was preferred by the STAR Panel.

The uncertainty associated other parameters, such as the rate of natural mortality and the current age-structure of the population, can also be taken into account. This can be achieved in a variety of ways. For example, if the uncertainty relates to the parameters within one structural model, this uncertainty can be reflected by basing projections on a number of samples from a distribution which reflects this uncertainty (such as a Bayesian posterior distribution or bootstrap samples). Alternatively, projections can be conducted for each model and the results appropriately weighted when producing the final combined results if the uncertainty pertains to alternative structural models.

A decision table is an appropriate means to express the implications of uncertainty in model structure when an “integrated” approach, as outlined in the previous paragraph, is not adopted. Construction of decision tables when projections are based on a constant harvest rate policy is, however, not entirely straightforward. One way to achieve this is to conduct projections for each alternative model in turn and record the median (or mean) time-trajectory of catches. The decision table is then based on projections with a set of pre-specified time-series of catches. If probabilities were assigned to each alternative model by the assessment authors and STAR Panel, these must be reported with the decision table.

9. Documentation

It is important for analysts to document their work so that any rebuilding analysis can be repeated by an independent investigator at some point in the future. Therefore, all stock assessments and rebuilding analyses should include tables containing the specific data elements that are needed to adequately document the analysis. Clear specification of the exact assessment scenario(s) used as the basis for the rebuilding analysis is essential. Therefore, linkages with the most recent stock assessment document should be clearly delineated (e.g., through references to tables or figures). This is important because assessments often include multiple scenarios that usually have important implications with respect to stock rebuilding.

The minimum information that should be presented in a rebuilding analysis is:

- Date on which the analysis was conducted, and specifications for the software used for the analysis (including the version number), along with an example of the program's input file, ideally for the base (most likely) case. Documentation and basis for the number of simulations on which the analyses are based should also be provided. The software and data files on which the rebuilding analyses are based should archived with the stock assessment coordinator.
- Rebuilding parameters. For each alternative model, a table (see Table 1 for an example based on canary rockfish) should be produced which lists: (a) the year in which the rebuilding plan commenced, (b) the present year, (c) the first year that the evaluated harvest policy calculates OY, (d) T_{MIN}, (e) mean generation time, (f) T_{MAX}, (g) $T_{\mathrm{F=0}}$, (h) the estimate of B_0 and the target recovery level, (i) the current SPR, (j) the current $\mathrm{T}_{\mathrm{TARGET}}$ and (k) the estimate of current stock size.
- Results of harvest policy projections (see, for examples, Tables 2-5; Figures 1-3). The following information should be provided for each harvest policy evaluated: (a) the year in which recovery to the target level occurs with 0.5 probability, (b) the SPR for the first year of the projection period, (c) the probably of recovery by the current $T_{\mathrm{TARGET},}$ (d) the probably of recovery by the current T_{MAX}, (e) tables of median time-trajectories (from the present year to T_{MAX}) of: (i) spawning output relative to the target level, (ii) probability of being at or above the target level, (iii) OFL, and (iv) ABC. Median time-trajectories of SPR should be provided for the projection based on the 40:10 rule (as applied to the ABC) and any phase-in harvest policies that have been specified.
- The information needed to assess progress towards rebuilding (e.g. catches and OYs during the rebuilding period) and any additional information based on the review of adequacy of progress by the SSC (e.g. T_{MAX}^{N}).
- Median and 95% intervals for: (a) summary / exploitable biomass, (b) spawning output (in absolute terms and relative to the target level), (c) recruitment, (d) catch, (e) landings (if different from catch), (f) OFL, (g) ABC, and (h) SPR for the actual harvest strategy selected by the Council.

- The rationale for the approach used to estimate B_0 and to generate future recruitment.
- The biological information on which the projections are based (show results for each alternative model):
  - Natural mortality rate by age and sex.
  - Individual weight by age and sex.
  - Maturity by age.
  - Fecundity by age.
  - Selectivity-at-age by sex (and fleet).
  - Population numbers (by age and sex) for the year the rebuilding plan commenced.
  - Population numbers (by age and sex) for the present year.
  - How fishing mortality was allocated to fleet for rebuilding analyses based on multiple fleets.

Notes:

- Much of the biological information will be stored in the input file for the projection software and doesn't need to be repeated unless there is good reason to do so.
- For cases in which the projections take account of uncertainty about the values for the biological parameters (e.g., using the results from bootstrapping or samples from a Bayesian posterior distribution), some measure of the central tendency of the values (e.g., the mode or median) should be provided and the individual parameter values should be archived with the stock assessment coordinator.
- Rebuilding analyses may be based on selectivity-at-age vectors constructed by combining estimates over fleets. If this is the case, the rebuilding analysis needs to document how the composite selectivity-at-age vector was constructed.

10. Literature Cited

Ainley, DG, RH Parrish, WH Lenarz, and WJ Sydeman. 1993. Oceanic factors influencing distribution of young rockfish (*Sebastes*) in central California: a predator's perspective. CalCOFI Rept. 34:133-139.

Brodziak, JKT, WJ Overholtz, and PJ Rago. 2001. Does spawning stock affect recruitment of New England groundfish? Can. J. Fish. Aquat. Sci. 58:306-318.

Clark, WG. 1991. Groundfish exploitation rates based on life history parameters. Can. J. Fish. Aquat. Sci. 48:734-750.

Clark, WG. 2002. $F_{35\%}$ revisited ten year later. N. Am. J. Fish. Manage. 22:251-257.

Dorn, MW. 2002. Advice on west coast rockfish harvest rates from Bayesian meta-analysis of stock-recruit relationships. N. Am. J. Fish. Manag. 22:280-300.

Francis, RC, SR Hare, AB Hollowed, and WS Wooster. 1998. Effects of interdecadal climate variability on the oceanic ecosystems of the NE Pacific. Fish. Oceanogr. 7(1):1-21.

Hare, SR, NJ Mantua, and RC Francis. 1999. Inverse production regimes: Alaska and west coast salmon. Fisheries 24(1):6-14.

He, X, A Punt, AD MacCall, and S Ralston. 2003. Rebuilding analysis for widow rockfish in 2003. Pacific Fishery Management Council, 7700 NE Ambassador Palce, Suite 200, Portland, Oregon, 97220.

Jacobson, LD, and AD MacCall. 1995. Stock-recruitment models for Pacific sardine (*Sardinops sagax*). Can. J. Fish. Aquat. Sci. 52:566-577.

MacCall, AD. 1996. Patterns of low-frequency variability in fish populations of the California Current. CalCOFI Rept. 37:100-110.

MacCall, AD. 1999. Bocaccio rebuilding. Pacific Fishery Management Council. Portland OR, Unpublished report.

MacCall, AD and S Ralston. 2002. Is logarithmic transformation really the best procedure for estimating stock-recruitment relationship? N. Am. J. Fish. Manage. 22:339-350.

Methot, R. 2005. Technical description of the stock synthesis II assessment program. Version 1.17-March 2005.

Methot, R. 2007. User manual for the Integrated analysis program stock synthesis 2 (SS2). Model version 2.00c. March 2007.

Marshall, CT, OS Kjesbu, NA Yaragina, P Solemdal, and Ø Ulltang. 1998. Is spawner biomass a sensitive measure of the reproductive and recruitment potential of northeast arctic cod? Can. J. Fish. Aquat. Sci. 55:1766-1783.

Myers, RA, and NJ Barrowman. 1996. Is fish recruitment related to spawner abundance? Fish. Bull., US 94:707-724.

PICES. 2005. Report of the Study Group on "Fisheries and Ecosystem Response to Recent Regime Shifts". http://www.pices.int/publications/scientific_reports/Report28/Rep_28_default.aspx.

Ralston, S, and DF Howard. 1995. On the development of year-class strength and cohort variability in two northern California rockfishes. Fish. Bull, US 93:710-720.

Roemmich, D, and J McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326.

Rothschild, BJ, and MJ Fogarty. 1989. Spawning stock biomass as a source of error in stock-recruitment relationships. J. Cons. Int. Explor. Mer. 45:131-135.

Stewart, IJ. 2007. Rebuilding analysis for canary rockfish based on 2007 stock assessment. Pacific Fishery Management Council, 7700 NE Ambassador Palce, Suite 200, Portland, Oregon, 97220.

Trenberth, KE, and JW Hurrell. 1994. Decadal atmosphere-ocean variations in the Pacific. Clim. Dyn. 9:303-319.

Walters, CJ. 1985. Bias in the estimation of functional relationships from time series data. Can. J. Fish. Aquat. Sci. 42:147-149.

Walters, CJ, and D. Ludwig. 1981. Effects of measurement errors on the assessment of stock-recruitment relationships. Can. J. Fish. Aquat. Sci. 38:704-710.

Williams, EH. 2002. The effects of unaccounted discards and misspecified natural mortality on harvest policies based on estimates of spawners per recruit. N. Am. J. Fish. Manage. 22:311-325.

Table 1. Summary of rebuilding reference points for canary rockfish (based on Stewart (2007)).

Parameter	Values
Year declared overfished	2000
Current year	2007
First OY year	2009
T_{MIN}	2019
Mean generation time	22
T_{MAX}	2041
$T_{F=0}$ (beginning in 2009)	2019
B_0	32,561
Rebuilding target ($B_{40\%}$)	13,024
Current SPR	0.887
Current T_{TARGET}	2063
SB_{2007}	10,544

Table 2. Results of rebuilding alternatives for canary rockfish (based on Stewart (2007)). (This table now should include OFL, ABC and ACL).

	Run #			
	1	2	3	4
50% prob. recovery by:	2019	2021	2035	2041
SPR_{TARGET}	100%	88.7%	62.0%	59.2%
2009 OY (mt)	0.0	155.2	636.9	700.0
2009 ABC (mt)	936.9	936.9	936.9	936.9
2010 OY (mt)	0.0	155.0	623.1	683.1
2010 ABC (mt)	941.4	935.4	916.7	914.2
Probability of recovery				
2071 (T_{MAX})	97.1%	84.6%	73.5%	70.0%
2048 (T_{MIN})	76.4%	75.0%	64.8%	56.9%
2053 ($T_{F=0}$ from 2007)	79.4%	75.3%	67.9%	61.3%
2063 (T_{TARGET})	91.4%	78.8%	72.0%	66.8%

Table 3. Probability of recovery for four rebuilding alternatives for canary rockfish (based on Stewart (2007)). Note that after 25 years the table is compressed.

	Run #			
	1	2	3	4
2007	0.250	0.250	0.250	0.250
2008	0.250	0.250	0.250	0.250
2009	0.250	0.250	0.250	0.250
2010	0.250	0.250	0.250	0.250
2011	0.250	0.250	0.250	0.250
2012	0.250	0.250	0.250	0.250
2013	0.250	0.250	0.250	0.250
2014	0.250	0.250	0.250	0.250
2015	0.250	0.250	0.250	0.250
2016	0.251	0.250	0.250	0.250
2017	0.284	0.257	0.250	0.250
2018	0.407	0.288	0.250	0.250
2019	0.550	0.366	0.250	0.250
2020	0.660	0.473	0.256	0.251
2021	0.702	0.561	0.260	0.256
2022	0.732	0.633	0.267	0.261
2023	0.742	0.681	0.279	0.267
2024	0.746	0.707	0.290	0.275
2025	0.749	0.725	0.309	0.281
2026	0.749	0.735	0.321	0.293
2027	0.749	0.742	0.341	0.300
2028	0.750	0.746	0.358	0.313
2029	0.750	0.746	0.376	0.324
2030	0.750	0.747	0.402	0.336
2031	0.750	0.749	0.424	0.348
2041	0.750	0.750	0.586	0.500
2051	0.781	0.751	0.671	0.601
2061	0.895	0.776	0.714	0.660
2071	0.971	0.846	0.735	0.700

Table 4. Median spawning biomass (mt) for four rebuilding alternatives for canary rockfish (based on Stewart (2007)). Note that after 25 years the table is compressed.

	Run #			
	1	2	3	4
2007	10,544	10,544	10,544	10,544
2008	10,841	10,841	10,841	10,841
2009	11,073	11,073	11,073	11,073
2010	11,258	11,197	11,010	10,985
2011	11,383	11,260	10,880	10,831
2012	11,463	11,274	10,701	10,627
2013	11,524	11,268	10,501	10,403
2014	11,607	11,280	10,318	10,197
2015	11,751	11,351	10,186	10,041
2016	11,987	11,508	10,133	9,964
2017	12,328	11,765	10,163	9,969
2018	12,738	12,089	10,251	10,029
2019	13,181	12,432	10,357	10,113
2020	13,685	12,838	10,520	10,247
2021	14,236	13,293	10,721	10,419
2022	14,773	13,731	10,909	10,583
2023	15,350	14,210	11,130	10,775
2024	15,941	14,674	11,345	10,966
2025	16,500	15,133	11,515	11,105
2026	17,015	15,536	11,679	11,251
2027	17,517	15,959	11,852	11,391
2028	18,045	16,348	11,999	11,515
2029	18,600	16,811	12,211	11,699
2030	19,093	17,183	12,329	11,799
2031	19,528	17,519	12,432	11,877
2041	23,511	20,635	13,491	12,751
2051	26,282	22,743	14,238	13,357
2061	27,862	24,058	14,655	13,689
2071	28,903	24,832	15,097	14,073

Table 5. Median catches (mt) for four rebuilding alternatives for canary rockfish (based on Stewart (2007)). Note that after 25 years the table is compressed.

	Run #			
	1	2	3	4
2007	0.0	44.0	44.0	44.0
2008	0.0	44.0	44.0	44.0
2009	0.0	155.2	636.9	700.0
2010	0.0	155.0	623.1	683.1
2011	0.0	157.5	621.9	680.2
2012	0.0	163.7	635.4	693.4
2013	0.0	171.5	654.9	713.1
2014	0.0	179.7	675.9	734.4
2015	0.0	186.9	691.6	750.1
2016	0.0	193.4	705.3	763.1
2017	0.0	198.7	713.8	770.8
2018	0.0	205.1	724.3	780.5
2019	0.0	210.6	733.9	789.5
2020	0.0	216.8	744.3	798.9
2021	0.0	222.0	753.8	807.8
2022	0.0	228.3	765.2	818.8
2023	0.0	234.0	769.3	821.3
2024	0.0	239.0	778.8	830.7
2025	0.0	245.3	786.9	837.4
2026	0.0	250.0	795.2	845.3
2027	0.0	257.0	807.6	856.9
2028	0.0	261.7	814.0	862.9
2029	0.0	267.3	821.5	868.6
2030	0.0	272.3	830.5	877.2
2031	0.0	276.5	836.3	882.5
2041	0.0	318.0	897.1	938.2
2051	0.0	346.9	937.3	972.9
2061	0.0	365.2	967.1	1,002.9
2071	0.0	377.7	985.9	1,019.3

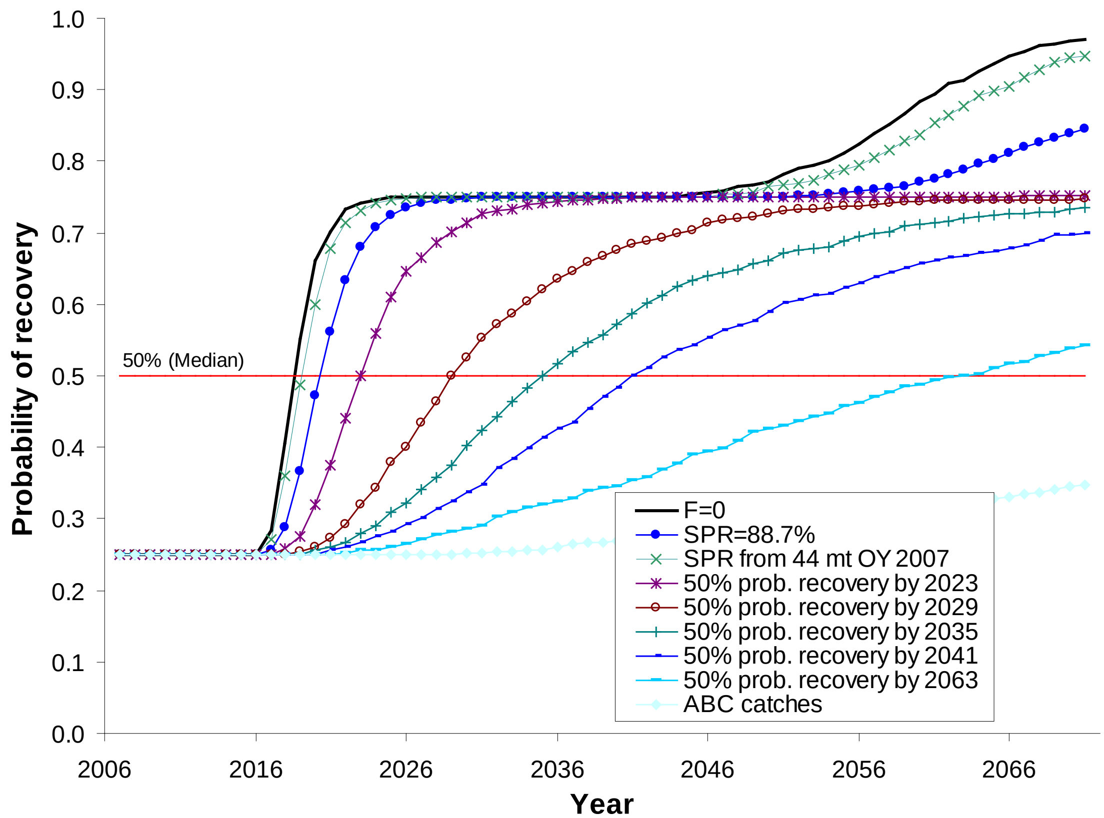

Figure 1. Probability of recovery for nine rebuilding alternatives for canary rockfish.

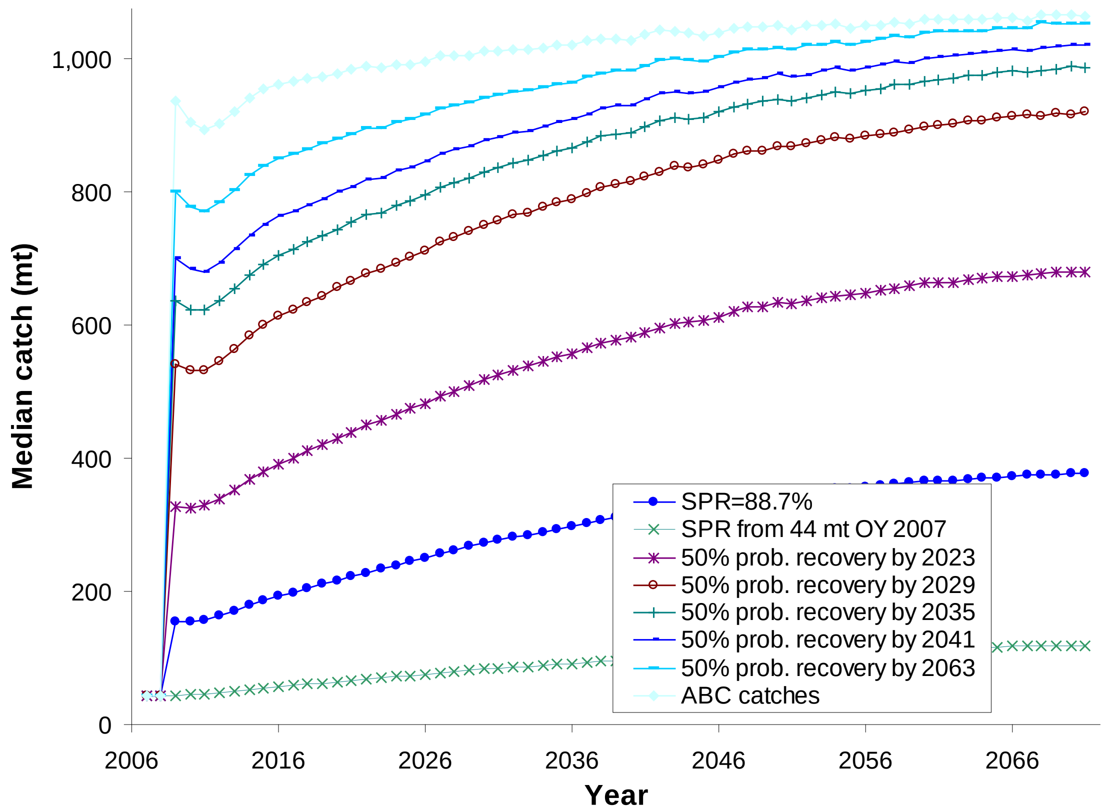

Figure 2. Projected median catch (mt) for nine rebuilding alternatives for canary rockfish.

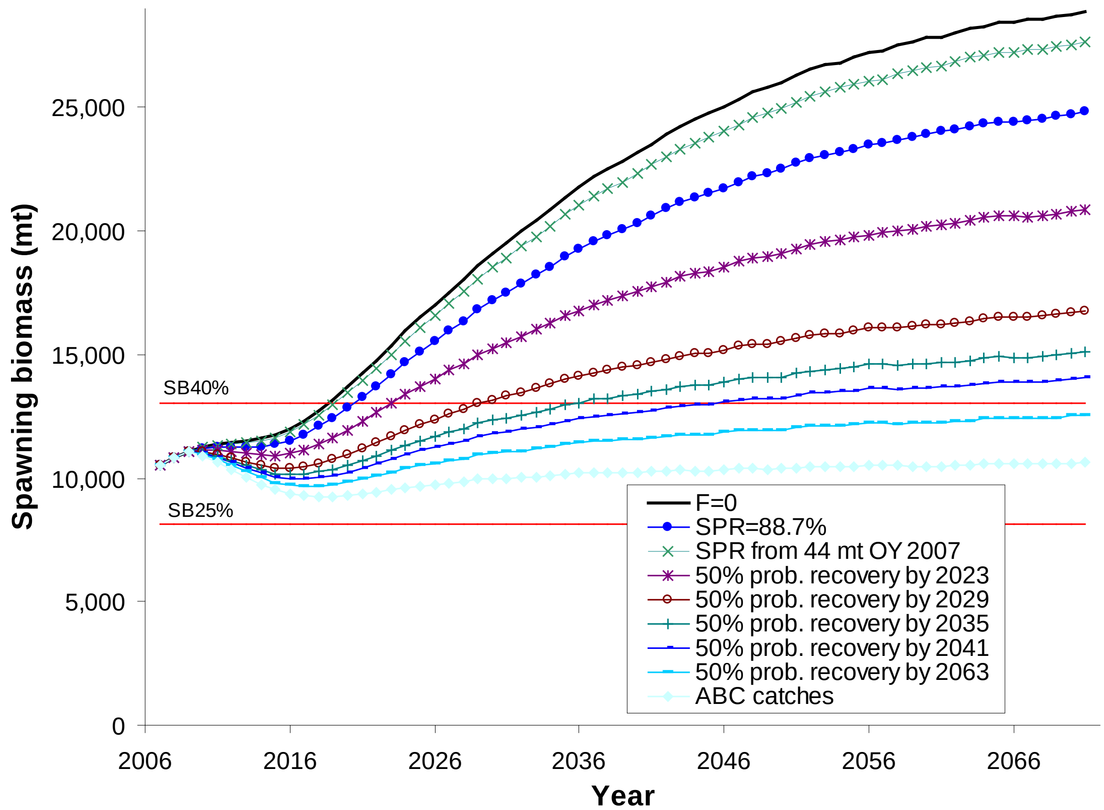

Figure 3. Projected median spawning biomass (mt) for nine rebuilding alternatives for canary rockfish.

Agenda Item F.5.a
Attachment 3
March 2012

TERMS OF REFERENCE

FOR THE

METHODOLOGY REVIEW PROCESS FOR GROUNDFISH AND COASTAL PELAGIC SPECIES

DRAFT

JANUARY 20, 2012

Published by the Pacific Fishery Management Council

Introduction

This document lays out general procedures for methodology and data reviews related to the assessment and management of coastal pelagic species (CPS) and groundfish by the Pacific Fishery Management Council (Council). It clarifies the responsibilities of the proponents of new methods or data sets proposed for use in CPS or groundfish stock assessments and the responsibilities of participants in the review process. Each review is likely to have additional requirements that will be defined in a set of Specific Terms of Reference (TOR), which should conform to the general terms defined in this document. Although these General Terms of Reference focus on methodology and data reviews for CPS and groundfish stock assessments, they may be applied to methods in other areas, including economic analyses and ecosystem-based fishery management. In the text below the term "methodology review" should be understood to mean "methodology and data review."

The methodology review process provides for peer review as referenced in the 2006 Reauthorization of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA), which states that "the Secretary and each Regional Fishery Management Council may establish a peer review process for that Regional Fishery Management Council for scientific information used to advise the Regional Fishery Management Council about the conservation and management of the fishery" (MSRA section 302(g)(1)(E)). The peer review process is not a substitute for the Council's Scientific and Statistical Committee (SSC), and should work in conjunction with the SSC. This document will be included in the Council's Statement of Organization, Practices and Procedures as documentation of part of the review process that underpins the SSC's scientific advice.

Parties involved in implementing the peer review process described here are the Council; Council staff; members of Council Advisory Bodies, including the SSC; the relevant Management Team and Advisory Panel (CPSMT and CPSAS for CPS, and GMT and GAP for groundfish); the National Marine Fisheries Service (NMFS); state agencies; and interested persons (including external reviewers).

Unlike Stock Assessment Review (STAR) Panels, methodology review panels do not occur on a regular timetable but are instead established by the Council to provide peer and in-depth review of major changes to the methodology on which stock assessments are based. Consequently, the outcomes from a methodology review are recommendations regarding whether a particular methodology should be applied in future stock assessments, and on recommended (or required) improvements and modifications. Existing methodologies could be reviewed, particularly if they are key to stock assessments and have not been reviewed for many years or if incremental changes in how the methodology is applied have occurred.

Methodology reviews may be appropriate when a major new data source is introduced or when a major change in the stock assessment modeling is contemplated. In both cases, a methodology review is needed when the change(s) from how assessments have been conducted in the past are deemed to be more than what a STAR Panel can reasonably be expected to handle. The introduction of a new survey will generally require a methodology review, as will a change to a new stock assessment modeling platform. However, changes to the structure of a previously reviewed assessment model (e.g., changes in selectivity year-blocking) fall within the scope of a standard STAR Panel review.

No explicit guidelines for what topics can be covered in a methodology review are provided here, but typical examples would be evaluation of: (a) proposed major new data types which if included in an assessment could change its outcomes markedly (e.g., the aerial survey for Pacific sardine), (b) proposed changes to the design of existing surveys, (c) existing data inputs to assessments which have not been reviewed in depth by a Council-sponsored peer-review panel for many years (e.g., the egg production method for Pacific sardine), (d) data or model results that contribute to ecosystem-based management of CPS and groundfish stocks, and (e) proposed major changes to stock assessment methods that fall outside the scope of a normal STAR Panel review (for example, a change to the stock assessment modeling platform).

Changes to harvest control rules could also be considered by a methodological review. Care must be taken to separate the scientific analysis supporting the change (e.g. the structure and technical aspects of simulation studies used to compare a revised control rule against the *status quo*) and the management objectives used to measure performance (e.g. minimize year-to-year catch variance, maximize long-term average catch, etc.). The former are amenable to methodological review (provided adequate background analyses have been completed), but the latter are management decisions – not well suited to a methodological review.

These TOR reflect how previous methodology reviews have been undertaken. Nevertheless, no set of guidelines can be expected to deal with every contingency, and all participants should anticipate the need to be flexible and address new issues as they arise.

Methodology Review Goals and Objectives

The general goals and objectives for the methodology review process are to:

1. Ensure that research surveys, data collection, data analyses and other scientific techniques in support of CPS and groundfish stock assessments are the best available scientific information and facilitate the use of information by the Council.
2. Provide recommendations regarding whether, and if so, how a particular methodology can be applied in future stock assessments.
3. Meet the MSRA and other legal requirements.
4. Follow a detailed calendar and fulfil explicit responsibilities for all participants to produce required outcomes and reports.
5. Provide an independent external review of survey and analytical methods used to develop data to inform CPS and groundfish stock assessments.
6. Increase understanding and acceptance of CPS and groundfish research methodologies and review by all members of the Council family.
7. Identify research needed to improve assessments, reviews, surveys, analyses, and fishery management in the future.

Responsibilities of Methodology Review Participants

Shared Responsibilities

All parties have a stake in ensuring adequate technical review of stock assessments and the information on which they are based. The National Marine Fisheries Service (NMFS), as the designee of the Secretary of Commerce, must determine that the best scientific advice has been used when it approves fishery management recommendations made by the Council. The Council uses statements from the SSC to determine whether the information on which it will base its recommendation represents the "best available" science. Fishery managers and scientists providing technical documents to the Council for use in management need to ensure their work is technically correct.

The Council, NMFS, and the Secretary of Commerce share primary responsibility to create and foster a successful peer review process. The Council will oversee the process and involve its standing advisory committees, especially the SSC. The SSC will designate a member to coordinate, oversee, and facilitate each methodology review. Together, NMFS and the Council will consult with all interested parties to plan, prepare terms of reference, and develop a calendar of events for each methodology review and a list of deliverables for final approval by the Council. NMFS and the Council will share fiscal and logistical responsibilities and both should ensure that there are no conflicts of interest in the process[1].

The peer-review process is sponsored by the Council, because the Federal Advisory Committee Act (FACA) limits the ability of NMFS to establish advisory committees. FACA specifies a procedure for convening advisory committees that provide consensus recommendations to the federal government. The intent of FACA was to limit the number of advisory committees; ensure that advisory committees fairly represent affected parties; and ensure that advisory committee meetings, discussions, and reports are carried out and prepared in full public view. Under FACA, advisory committees must be chartered by the Department of Commerce through a rather cumbersome process. However, the Sustainable Fisheries Act exempts the Council from FACA per se, but requires public notice and open meetings similar to those under FACA.

Management Team Responsibilities

The Management Team (MT) is responsible for identifying and evaluating potential management actions based on the best available scientific information. In particular, the MT makes Annual Catch Limit (ACL) and Annual Catch Target (ACT) recommendations to the Council.

A representative of the relevant MT may be appointed by the MT Chair and, if appointed, will serve as a liaison to the methodology review meeting and will participate in discussions. The MT representative will not serve as a member of the Panel. The MT representative should be prepared to advise the Panel on fishing regulations or practices that may influence data used in assessments and the nature of the fishery in the future (this will be more relevant for some of the topics which are considered by methodology reviews than others).

Advisory Panel Responsibilities

It is the responsibility of the AP representative to ensure that AP concerns regarding the issue being reviewed are conveyed to the Panel. The Chair of the AP may appoint a representative

[1]The proposed NS2 guidelines state: "Peer reviewers who are federal employees must comply with all applicable federal ethics requirements. Peer reviewers who are not federal employees must comply with the following provisions. Peer reviewers must not have any real or perceived conflicts of interest with the scientific information, subject matter, or work product under review, or any aspect of the statement of work for the peer review. For purposes of this section, a conflict of interest is any financial or other interest which conflicts with the service of the individual on a review Panel because it: (A) Could significantly impair the reviewer's objectivity; or (B) Could create an unfair competitive advantage for a person or organization. (C) Except for those situations in which a conflict of interest is unavoidable, and the conflict is promptly and publicly disclosed, no individual can be appointed to a review Panel if that individual has a conflict of interest that is relevant to the functions to be performed. Conflicts of interest include, but are not limited to, the personal financial interests and investments, employer affiliations, and consulting arrangements, grants, or contracts of the individual and of others with whom the individual has substantial common financial interests, if these interests are relevant to the functions to be performed. Potential reviewers must be screened for conflicts of interest in accordance with the procedures set forth in the NOAA Policy on Conflicts of Interest for Peer Review subject to OMB's Peer Review Bulletin."

to participate in a methodology review. If appointed, the AP representative will serve as an advisor to the review meeting. The AP representative will participate in review discussions as an advisor to the Panel, in the same capacity as the MT advisor. The AP representative may provide appropriate data and advice to the review meeting and will report to the AP on the meeting.

Scientific and Statistical Committee Responsibilities

The SSC will assign at least one member to each methodology review. This member will chair the review meeting, and present the report of the meeting to the SSC and the Council. The SSC will review any additional analytical work arising from the review meeting, will serve as arbitrator to resolve disagreements that arose during the review meeting, and will make recommendations to the Council (e.g. whether the reviewed methodology provides the “best available science”, and hence could be used for stock assessment and developing conservation and management measures).

Council Staff Responsibilities

Council staff will be assigned to coordinate, monitor and document the review process. Council staff will be responsible for timely issuance of meeting notices and distribution of appropriate documents. Council staff will coordinate with the Panel Chair and NMFS to assure that all documents are received on time, and are complete. Council staff will coordinate materials and presentations for Council meetings relevant to Council decision making. Council staff will also collect and maintain file copies of reports from each methodology review, the documents considered during the review, SSC, Management Team, and Advisory Panel comments and reports, letters from the public, and any other relevant information.

A primary role for Council staff assigned to each methodology review will be to monitor review meetings and SSC activities to ensure compliance with these TOR. Council staff will identify inconsistencies with the TOR that occur during review meetings and work with the Panel Chair to develop solutions and to correct them. Council staff will work with the Panel Chair to finalize the Panel report and provide it to the Council.

National Marine Fisheries Service Responsibilities

NMFS will assign a coordinator to work with the Council, other agencies, groups, or interested persons that carry out assessment work to assist in organizing methodology reviews. The NMFS coordinator will identify independent panelists following criteria for reviewer qualifications. The costs associated with these reviewers will be borne by NMFS. The NMFS coordinator will work with methodology proponents to facilitate delivery of materials by scheduled deadlines and in compliance with other requirements of these terms of reference, to the extent possible and with the assistance of the assigned Council staff officer and the Panel Chair.

General Review Panel Responsibilities

The objective of a methodology review panel is to complete a detailed evaluation of a topic selected by the Council which could have a major impact on stock assessments or the provision of scientific advice and to make a recommendation regarding whether the methodology represents the best available scientific information for the Council. The general responsibilities of the Panel are to:

1. review documents pertinent to the topic under consideration;

2. evaluate the technical merits and deficiencies of the proposed method(s) during the panel meeting and work with the proponents to correct deficiencies;
3. provide recommendations for alternative methods or modifications to proposed methods, or both, as appropriate during the panel meeting;
4. provide recommendations on application of the methods to the stock assessment and/or management process;
5. document meeting discussions;
6. provide complete panel reports.

The Panel Chair has, in addition, the responsibility to:

7. review revised documents and panel reports before they are forwarded to the SSC.

Review panels may have additional responsibilities that are defined in the Specific Terms of Reference for the review.

Panel Composition

Methodology review panels normally include a Chair, at least one "external" member (i.e., who is outside the Council family and not involved in management or assessment of West Coast fisheries, often designated by the Center for Independent Experts [CIE]), and at least two additional members. Selection of the external and independent panelists should aim for balance between outside expertise of the topic being reviewed and in-depth knowledge of West Coast fisheries, data sets available for those fisheries, and relevant modeling approaches. Reviewers should not have financial or personal conflicts of interest, either current to the meeting, within the previous year (at minimum), or anticipated. Panelists should be knowledgeable about the specific approaches being reviewed. In addition to panel members, methodology review meetings will include Council staff to help advise the Panel and assist in recording meeting discussions and results, and may include MT and AP representatives with responsibilities as laid out above. The length of a methodology review meeting will be selected by the SSC and could range one to five days.

The Panel Chair is responsible for: 1) developing an agenda, 2) ensuring that the Panel follows the TOR, 3) guiding the participants in the review (proponents and Panel) to mutually agreeable solutions, 4) coordinating review of documents, and 5) providing Council staff with a camera ready and suitable electronic version of the Panel report. The Panel, those proposing the methodology, the MT and AP representatives, and the public are legitimate meeting participants that should be accommodated during discussions. It is the Panel Chair’s responsibility to manage discussions and public comment so that work can be completed.

Conduct of a Review

The Panel’s review solely concern technical aspects of the method. It is therefore important that the Panel strive for a risk neutral perspective in its reports and deliberations. Methods or results that have a flawed technical basis, or are questionable on other grounds, should be identified by the Panel and a recommendation made that they should excluded from consideration in developing management advice. The Panel should comment on the degree to which the uncertainty associated with the method being reviewed is quantified (e.g. through confidence or prediction intervals) because uncertainty is taken into account during the management process.

Recommendations and requests to the proponents for additional or revised analyses must be clear, explicit, and in writing. Panel recommendations and requests to the proponents should reflect the consensus opinion of the entire Panel and not the minority view of a single individual or individuals on the Panel. A written summary of discussion on significant technical points and lists of all Panel requests and recommendations and requests to the proponents are required in the Panel report, which should be completed (at least in draft form) prior to the end of the review meeting. It is the Chair and Panel's responsibility to carry out any follow-up review of work that is required.

The Panel's primary duty is to conduct a peer review of the proposed methodology. Methodology panel meetings are not workshops, although the involvement of the Panel in shaping the methodology is greater during methodology reviews than during STAR Panels. This is particularly the case when the outside reviewers have considerably more experience with a given methodology than the proponents and the reviewers from within the Council family. In the course of this review, the Panel may ask for a reasonable number of additional analyses, as well as for additional details of the proposed methodology. It would not be unusual for this evaluation to result in a change to the initial methodology, provided both the Panel and the proponents agree. Panels are expected to be judicious in their requests of the proponents, recognizing that some issues uncovered during a review are best flagged as research priorities (and use of the methodology possibly deferred until those issues are resolved). The Panel should not impose as a requirement their preferred methodologies when such is a matter of professional opinion. Rather, if the Panel finds that a method is inadequate, it should document and report that opinion.

Panels and proponents are required to make an honest attempt to resolve any areas of disagreement during the review meeting. Occasionally, fundamental differences of opinion remain between the Panel and the proponents that cannot be resolved by discussion. In such cases, the Panel must document the areas of disagreement in its report. In exceptional circumstances, the proponents may choose to submit a supplemental report supporting its view, but in the event that such a step is taken, an opportunity must be given to the Panel to prepare a rebuttal. These documents will then be appended to the Panel report as part of the record of the review meeting. Panel members may have fundamental disagreements that cannot be resolved during the meeting. In such cases, Panel members may prepare a minority report that will become part of the record of the review meeting. The SSC will then review all information pertaining to Panel or Panel/proponent disputes, and issue a recommendation.

Additional analyses required by the Panel should be completed by the proponents during the review meeting. It is the obligation of the Panel Chair, in consultation with other Panel members, to prioritize requests for additional analyses. If follow-up work by the proponents is required after the review meeting, then it is the Panel's responsibility to track progress. In particular, the Chair is responsible for communicating with proponents (by phone, e-mail, or any other convenient means) to determine if the revised analyses and documents are complete and ready to be presented to the SSC.

Review Panel Report

The Panel Chair is responsible for preparing the final draft of the Panel report, obtaining the Panel's approval, and providing the report to the Council for inclusion in the Briefing Book. The Chair will appoint members of the Panel (the "external" members and other members) to act as rapporteurs who will draft the report according to guidance by the Panel Chair on format and level of detail. The aim of the report is to provide information to the SSC on whether it should recommend the methodology for use in Council assessments and, if necessary, what additional work must be completed before the methodology can be used. The report is not meant as a detailed summary of the methodology, nor is it meant to be the minutes of the meeting. The report may include Appendices which summarize work presented to the Panel in response to requests. The Chair will solicit comment on the draft report from the proponents and the MT and AP advisors. The purpose of this review is limited to ensuring that the report is technically accurate, and reflects the discussion that occurred at the meeting, and should not be viewed as an opportunity to reopen debate on issues. The Chair will be the final arbiter on wording changes suggested by proponents and the MT and AP advisors—i.e., the report is the Panel's report of the meeting. Any detailed commentary by MT and AP advisors should be drafted separately, reviewed by full advisory body, and included in the Briefing Book.

Suggested Template for Methodology Review Panel Report

- Summary of the Methodology Review Panel meeting, containing:
    - names and affiliations of Panel members;
    - topic(s) being reviewed; and
    - list of analyses requested by the Panel, the rationale for each request, and a brief summary the responses to each request.
- Comments on the technical merits and/or deficiencies of the methodology and recommendations for remedies. Comments should address each of the following issues:
    - What are the data requirements of the methodology?
    - What are the situations/stocks for which the methodology is applicable?
    - What are the assumptions of the methodology?
    - Is the methodology correct from a technical perspective?
    - How robust are results to departures from the assumptions of the methodology?
    - Does the methodology provide estimates of uncertainty? How comprehensive are those estimates?
    - Will the new methodology or data set result in improved stock assessments or management advice?
- Areas of disagreement regarding Panel recommendations:
    - among Panel members (including concerns raised by the MT and AP representatives); and
    - between the Panel and proponents.
- Unresolved problems and major uncertainties, e.g., any issues that could preclude use of the methodology.
- Management, data or fishery issues raised by the public and MT and AP representatives during the Panel review.
- Prioritized recommendations for future research and data collection.

General Responsibilities of Proponents of New Methodology or Data Sets

New methods or data sets will be used in producing CPS or groundfish stock assessments (or in providing management advice) if there is a reasonable expectation that doing so will result in an improved assessment relative to a status quo assessment that did not use the new method or data set.

Proposing a New Methodology for Review

The proponents of new methods or data sets for use in CPS or groundfish stock assessments will submit a 1-2 page proposal for consideration by the SSC and the Council. The proposal should be submitted by the briefing book deadline of the appropriate Council meeting, and should address the following:

- Title
- Name of proposers (including the researchers who will participate at the methodology review and will be expected to conduct analyses during that review).
- How the proposed methodology will improve assessment and management for the stock(s) in question.
- Outline of methods (field and analytical).

Proponents of methods to be reviewed should be prepared to present their proposal to the SSC, the relevant MT, and the full Council. Proponents should also include a description of the funding, logistics, or other factors that would indicate the likelihood of success of the proposed methodology

The proposed methodology should be field tested, and preferably there will be available data for one or more years. Untested or experimental methods are typically not appropriate for this type of review.

Methodology reviews are intended for methods or data sets that apply to a range of stocks. A STAR Panel would be more appropriate for reviewing methods or data sets that apply to only one or to a small number of related stocks.

Responsibilities of Methodology Proponents

If the Council recommends review of the methodology, the proponents will appoint a representative to coordinate work with the Panel and attend the Panel meeting. A representative of the proponents should attend the SSC meeting at which the outcomes from the Panel review are discussed.

The proponents are responsible for preparing two versions of the methodology review document:

1) a "draft", including an executive summary, for discussion during the review meeting; and
2) a "final" version for presentation to the SSC, the Council, and the relevant Management Team and Advisory Panel.

The proponents will distribute "draft" documents fully describing the methodology to the Panel, Council staff, and the MT and AP representatives at least two weeks prior to the review meeting. The proponents are responsible for bringing analysis methods and relevant data (in digital format) to the review meeting so that data can be analyzed on site and sensitivity analyses conducted. In most cases, the proponents should produce a revised document outlining the methodology (and preliminary results / responses to the Panel recommendations) three weeks after the end of the Panel meeting (including any internal agency review).

The proponents and the Panel may disagree on technical issues, but “final” documents must include a point-by-point response by the proponents to each of the Panel recommendations.

The draft and final reports on the methodology should include information that addresses the following:

- Data requirements of a new methodology or documentation of how information in a new data set was collected.
- The situations/stocks for which the methodology or data are applicable.
- The assumptions of the methodology and whether those assumptions are likely to be satisfied by data sets to which the method would be applied.
- An evaluation of robustness of the methodology to departures from the underlying assumptions.
- An application of a new methodology to real or simulated data, including an evaluation of the bias and accuracy of the results.
- An evaluation of how the new method(s) or data set(s) would improve stock assessments or the provision of management advice.

Agenda Item F.5.b
NMFS Report
March 2012

Considerations for Selecting Species for Assessment in 2013

This year's planning for upcoming assessments is currently marked by greater uncertainty than has usually been the case, due to the upcoming review of enhanced data-limited methods and their possible inclusion in this cycle. We are hopeful that at least one method will be endorsed for moving forward with this approach, and that one STAR Panel will be set aside for initial review of several such assessments. Accordingly, we recommend that the Council allow itself the flexibility to delay finalizing the 2013 schedule until its September 2012 meeting, in order to accommodate the development of Terms of Reference and a list of species for which enhanced data-limited assessments would be conducted, should this spring's review of methods result in the Council's endorsement of at least one such approach. Based on this expectation, the suggestions and discussion presented here assume that 8 benchmark (full) assessments will be conducted in 2013. One reason for this, as discussed below, is that it is not clear that sufficient personnel will be available to lead 10 full assessments in 2013.

Over the past 6 years, stock assessment teams lead by those not employed by NMFS have declined steadily, from 7 in 2005 to one co-lead in 2009 to none in 2011. Additionally, over that period, expectations regarding the comprehensiveness of benchmark assessment documents have increased. That factor and the demands for additional model exploration during review meetings have meant that it is no longer possible to have only one person assigned to each assessment. The NW and SW Fishery Science Centers believe that it would be very challenging for them to lead more than 9 full assessments in 2013, and that 8 is a more realistic total for maintaining assessment quality.

Because of these limitations, both Centers believe that it is more important than ever to optimize the use of the resources which we devote to the development and review of assessments. Since the 2005 cycle, most of the non-hake assessments conducted for this Council have involved rebuilding species, and these have been accompanied by an equal number of additional rebuilding analyses.

Because of the limited availability of new data for cowcod, however, the Council elected to move forward with status reports for that species, which summarize ACLs, catch data, and any other relevant information from the preceding two years. We believe it is time for the Council to consider the appropriateness of skipping assessments for rebuilding species during some cycles, in favor of status reports, where conditions merit.

The rebuilding situations of yelloweye and canary rockfish resemble cowcod in several respects: they are not expected to reach their target biomasses for decades, they are very long-lived fish characterized by low productivity, they have not demonstrated the capability of producing large, sporadic recruitments, as has bocaccio, and the indices of abundance included in their assessment models are not highly informative. Under these circumstances, we believe that intermittent status reports, which focus on reporting fishing mortality, ACLs, and changes in indices and other data, would comply with the requirement to assess the status of rebuilding stocks every two years.

There are numerous factors which the Council and its advisors should consider in prioritizing species for assessment. Included among these are:

- Availability/adequacy of data; including new data series that have become available since last assessment, or major changes to existing time series
- The species' PSA Vulnerability Score
- The species' importance to the fishery, including cumulative and recent fishing mortality
- The species' importance to the ecosystem
- The number of years since the last assessment, if it has ever been assessed
- The importance of and ability to address unresolved issues/problems in the most recent assessment
- The survey trend for the species, (if available)
- Whether the species is tracked in the Agency's Fishery Stock Sustainability Index

An overview of recommendations from the NW and SW Fishery Science Centers is provided in Table 1. Recommendations which we support strongly are indicated by capital 'X's, while other choices which we regard as more discretionary are indicated by small 'x's. As discussed above, we propose that status reports be conducted for cowcod, canary rockfish and yelloweye rockfish in 2013. Based on the agreed plan to review the 2011 survey data for bocaccio this spring, to resolve uncertainty regarding the size of the 2010 year class, we also suggest a bocaccio update in 2013, unless serious concern persists following this spring's review. We suggest that the Council plan for 8 full assessments in 2013. We recommend full assessments for petrale sole, darkblotched rockfish, shortspine and longspine thornyheads, which have not been assessed since 2005, and bank rockfish, which has a high vulnerability score and has never been assessed in a manner consistent with current protocols.

Beyond those 5, there are several possibilities for the remaining 3 slots. If the Council prefers that a canary assessment be conducted, it would need to be be a full assessment. If an assessment is felt to be necessary for the recently rebuilt widow rockfish stock, that would also need to be a full assessment. Black rockfish is a highly important species to northern nearshore fisheries and has not been assessed since 2007. However, as assessments for other nearshore species, which have traditionally relied upon CPUE indices for trend information, catch limits in those fisheries may limit the ability to reliably discern changes in status since the last assessments. Black rockfish has also been assessed in separate models for northern and southern areas, and might require an entire review meeting to address the full range of the stock.

Other species which have been discussed in recent years include yellowtail rockfish, which was last updated in 2005 and not fully assessed since 2000, rex sole, and sanddabs. These flatfish have lower vulnerability scores, but they have never been assessed and have more data than many of the alternatives. Additionally, there may be a few unassessed species, such as rougheye, aurora, redbanded, or rosethorn rockfish, that have high vulnerability scores and may have sufficient data for a successful benchmark assessment. Other species with high vulnerability scores, particular nearshore species, are unlikely to have informative indices over the past decade and commonly have had limited sampling of biological information.

As noted above, we suggest that the bocaccio assessment be an update, and that a status report, rather than an update, be developed for yelloweye rockfish. Pacific ocean perch is the other species for which an update is required. If the Council determines that a new sablefish assessment is a high priority, we propose that it be an update. This list represents a minimum of 2 and a maximum of 4 updates. We note that, from a workload perspective, developing 8 full assessments, 4 updates, and 6-10 data-limited assessments may not be realistic.

There are several species for which enhanced data-limited assessment approaches may be informative as to stock status and allowable harvest, as well as whether potential depletion concerns merit future examination through full assessments. These include several species already mentioned--rex sole, Pacific sanddabs, yellowtail, rougheye, aurora, redbanded, and rosethorn rockfishes—as well as others, such as stripetail and halfbanded rockfishes, spotted ratfish, grenadiers, and Pacific cod, which have never been assessed. Additionally, there are some species whose assessments are no longer current, which were last assessed to be well above target levels, whose status could be updated using enhanced data-limited methods relying on updated survey data. These would include: arrowtooth flounder, English sole, and chilipepper rockfish.

Table 1. Possible schedule for west coast groundfish assessments in 2013.

Species	Last Assessment prior to 2011			2011			2013 (current)			Adequate Through	PSA Vul. Score	on FSSI list
	Year	Full / Update	Model	Full	Update	Affliation	Full	Update	Affliation			
Number of assessments				*8*	*4*		*8*	*2-3*				
Blackgill rockfish	**2011**	**Full**	**SS v3**	**X**		**SWFSC**				**2016**	**2.08**	**Y**
Bocaccio rockfish	**2011**	***Hybrid***	**SS v3**		**X**	**SWFSC**		**X**	**SWFSC**	**2016**	**1.93**	**Y**
Canary rockfish	**2011**	**Update**	**SS v3**		**X**	**NWFSC**	**x or *stat rept**		**NWFSC**	**2016**	**2.01**	**Y**
Cowcod	**2009**	**Update**	**SS v2**		*** stat rept**	**SWFSC**		*** stat rept**	**swfsc**	**2016**	**2.13**	**Y**
Darkblotched rockfish	**2011**	***Hybrid***	**SS v3**		**X**	**NWFSC**	**X**		**NWFSC**	**2016**	**1.92**	**Y**
Dover sole	**2011**	**Full**	**SS v3**	**X**		**NWFSC**				**2016**	**1.54**	**Y**
Greenspotted rockfish		**Full**	**SS v3**	**X**		**SWFSC**				**2016**	**1.98**	
Pacific ocean perch	**2011**	**Update**	**SS v3**	**X**		**NWFSC**		**X**	**NWFSC**	**2016**	**1.69**	**Y**
Petrale sole	**2011**	**Full**	**SS v3**	**X**		**NWFSC**	**X**		**NWFSC**	**2016**	**1.94**	**Y**
Sablefish	**2011**	**Full**	**SS v3**	**X**		**NWFSC**		**x**	**nwfsc**	**2016**	**2.13**	**Y**
Spiny Dogfish		**Full**	**SS v3**	**X**		**NWFSC**				**2016**	**2.13**	**Y**
Widow rockfish	**2011**	**Full**	**SS v3**	**X**		**SWFSC**	**x**		**SWFSC**	**2016**	**2.05**	**Y**
Yelloweye rockfish	**2011**	**Full**	**SS v3**		**X**	**NWFSC**		**x/*stat rep**	**NWFSC**	**2016**	**2.00**	**Y**
Cabezon	**2009**	**Full**	**SS v3**							**2014**	**1.68**	**Y**
Greenstriped rockfish	**2009**	**Full**	**SS v3**							**2014**	**1.88**	
Lingcod	**2009**	**Full**	**SS v3**							**2014**	**1.55**	**Y**
Splitnose rockfish	**2009**	**Full**	**SS v3**							**2014**	**1.82**	**Y**
Arrowtooth	**2007**	**Full**	**SS v2**							**2012**	**1.21**	**Y**
Black rockfish - N	**2007**	**Full**	**SS v2**				**x**		**?**	**2012**	**1.94**	**Y**
Black rockfish - S	**2007**	**Full**	**SS v2**				**x**		**?**	**2012**	**1.94**	**Y**

Species	Last Assessment prior to 2011			2011			2013 (current)			Adequate Through	PSA Vul. Score	on FSSI list
	Year	Full / Update	Model	Full	Update	Affliation	Full	Update	Affliation			
Blue rockfish	2007	Full	SS v2							2012	2.01	Y
Chilipepper rockfish	2007	Full	SS v2							2012	1.35	Y
English sole	2007	Update	SS v2							2012	1.19	Y
Longnose skate	2007	Full	SS v2							2012	1.68	Y
Cal. Scorpionfish	2005	Full	SS v2							2010	1.41	Y
Gopher rockfish	2005	Full	SS v2							2010	1.76	Y
Kelp greenling	2005	Full	SS v2							2010	1.56	Y
Longspine thornyhead	2005	Full	SS v2				X		SW or NW	2010	1.54	Y
Shortspine thornyhead	2005	Full	SS v2				X		NWFSC	2010	1.80	Y
Starry flounder	2005	Full	SS v2							2010	1.04	Y
Yellowtail rockfish	2005	Update	SS v1				x		nwfsc	2010	1.88	Y
Bank rockfish	2000	"Simple -Full"	SS v1				X		SWFSC	2005	2.02	Y
Bronzespotted rockfish					[#] tech memo	SWFSC					2.12	
Rougheye rockfish							x		nwfsc		2.27	Y
Aurora rockfish							x		nwfsc		2.10	
Redbanded rockfish							x		nwfsc		2.02	
Rosethorn rockfish							x		nwfsc		2.09	
Rex sole							x		nwfsc		1.28	Y
Pacific sanddab							x		nwfsc		1.25	Y

* status report would compare total mortality with the projections form the rebuilding analysis

COASTAL PELAGIC SPECIES ADVISORY SUBPANEL REPORT ON STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

The Coastal Pelagic Species Advisory Subpanel (CPSAS) and the Coastal Pelagic Species Management Team (CPSMT) held a joint teleconference on February 28, 2012 to review the draft terms of reference (TOR) documents for both the Stock Assessment Review (STAR) and Methodology Review processes. Previous TORs dealt with coastal pelagic species (CPS) and groundfish separately. The two TOR documents now incorporate the CPS and groundfish review processes together.

The CPSAS suggests no specific changes for either of the draft TORs, but supports the terminology and description corrections for the STAR TOR, as referenced by the CPSMT in its report (Agenda Item F.5.b, Supplemental CPSMT Report).

Finally, the CPSAS notes that the West Coast Vancouver Island Trawl Survey index of abundance will be considered by a Methodology Review Panel in May, 2012. This index would not be included in the sardine biomass estimate until the next full assessment, tentatively scheduled for 2014. Assuming a positive review of the methodology, it may make sense to move the next full assessment up a year, to 2013.

PFMC
03/04/12

Agenda Item F.5.b
Supplemental CPSMT Report
March 2012

COASTAL PELAGIC SPECIES MANAGEMENT TEAM REPORT ON STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

The Coastal Pelagic Species Management Team (CPSMT) and the Coastal Pelagic Species Advisory Subpanel (CPSAS) held a joint teleconference on February 28, 2012 to review the draft Terms of Reference (TOR) documents for both the Stock Assessment Review (STAR) and Methodology Review processes. Previous TORs dealt with CPS and groundfish separately. The two TOR documents now incorporate the CPS and groundfish review processes together. The CPSMT suggests no changes for the draft Methodology TOR. However, the CPSMT recommends that some changes need to be incorporated into the draft STAR TOR before final Council Approval.

The CPSMT found that the draft Stock Assessment Review TOR had some inconsistencies and inaccurate characterizations of CPS terminology and descriptions, in particular Amendment 13 terms and the management of CPS. The CPSMT recommends that the Scientific and Statistical Committee work with the appropriate entities (i.e. CPSMT, NMFS, and Council Staff) to correct the document, before final consideration and approval by the Council in June, 2012.

PFMC
03/04/12

GROUNDFISH ADVISORY SUBPANEL REPORT ON STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

The Groundfish Advisory Subpanel (GAP) received a presentation from Dr. Jim Hastie and Mr. John DeVore on Stock Assessment Planning for Management Specifications in the 2015-2016 Fisheries. The GAP has no comments at this time on the three Terms of Reference under review. The GAP focused their discussion on stock assessment priorities and offers the following comments and recommendations.

The GAP recommends full, benchmark assessments be conducted next year for petrale sole, cowcod, darkblotched rockfish, longspine thornyheads, shortspine thornyheads, yellowtail rockfish, Pacific sanddabs, and aurora rockfish. The GAP may later prioritize a bocaccio assessment be conducted as a full assessment, pending the evaluation of recent recruitment this spring. The GAP provides the following rationale for this recommended prioritization.

Petrale sole is an important driver stock for the trawl individual fishing quota (IFQ) fishery and on the verge of reaching the B_{MSY} target (the 2011 assessment estimates the stock would be rebuilt by 2013). Since the SSC recommends this change in stock status be confirmed with a full assessment, the GAP recommends a full petrale sole assessment. The Southwest Fisheries Science Center (SWFSC) is proposing new methods that can be applied to assess cowcod. Given the lack of information informing the status of cowcod and how the low harvestable surplus of the stock reduces access to healthy stocks south of 40º10’ N. latitude, the GAP is recommending a new full cowcod assessment. The uncertainty associated with the darkblotched assessment and the importance of that stock to the trawl fishery, the GAP recommends a full assessment be conducted. The GAP would specifically like a robust exploration of the interannual variation in the trawl survey and methods that might be used to better survey this patchily distributed stock. The GAP recommends full assessments of the thornyhead species since the 2005 assessments are now considered out of date and these stocks are important targets in deepwater commercial fisheries. The GAP recommends a full assessment of yellowtail rockfish since this stock is an important target stock in both trawl and non-trawl fisheries. Trawl targeting of yellowtail increased in 2011 under the IFQ program and that targeting will likely increase now that widow rockfish is rebuilt. Further, the yellowtail rockfish stock has not had a full assessment since 2000 and is therefore grossly out of date. The GAP recommends a full assessment of Pacific sanddabs. This is a targeted stock, has never been assessed, and there is apparently a lot of data available to assess this stock. Lastly, the GAP recommends an assessment of aurora rockfish. This is one of our most vulnerable stocks and, of those most vulnerable stocks identified, apparently has the most data to inform an assessment. This stock could potentially serve as an indicator stock for managing the most vulnerable slope rockfish stocks (i.e., aurora, rougheye, and shortraker rockfish).

The GAP recommends update assessments for sablefish, Pacific ocean perch (POP), and bocaccio if the evaluation of strong recent recruitment does not compel consideration of a full assessment. Sablefish is one of the most important commercial groundfish stocks on the west coast. The Scientific and Statistical Committee (SSC) recommends the next sablefish assessment be an update, and the GAP recommends an update in 2013 to confirm the uncertain estimate of strong recent recruitment that was identified in the 2011 assessment. Updated survey and fisheries data should provide a greater certainty of higher recent recruitment since many of the fishermen on the GAP report encounters with a significant amount of smaller sablefish. The GAP recommends an update of the 2011 POP assessment to track rebuilding performance. The SSC has recommended the next POP assessment should be an update.

PFMC
03/05/12

GROUNDFISH MANAGEMENT TEAM REPORT ON STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

The Groundfish Management Team (GMT) reviewed the items under Agenda Item F.5 and were briefed by Dr. Jim Hastie of the Northwest Fisheries Science Center (NWFSC) on National Marine Fisheries Service's (NMFS) stock assessment priorities (Agenda Item F.5.b, NMFS Report, March 2012) and offer the following comments.

Benchmark Species

The NMFS Report (Table 1) provides a list of benchmark species, along with categories that can be used for prioritizing potential stock assessments in 2013. The NMFS Science Centers have stated that they will be able to conduct eight full assessments during this cycle and suggested five as priorities: darkblotched rockfish, petrale sole, cowcod, and longspine and shortspine thornyheads. The GMT also suggests that NMFS look at data availability from other fishery-independent surveys (e.g., AFSC Triennial Survey) between now and June. Dr. Hastie informed us time was not available to do so for this meeting.

The GMT supports NMFS' intent to set prioritization criteria, as shown in Table 1 in the NMFS report. However, the GMT supports efforts to continue progress on this front and consider other metrics such as the probability of recent removals exceeding DB-SRA overfishing limits (OFLs), and whether or not the species has been of high bycatch concern. Dr. Hastie informed us there is an effort to do so at the national level within NMFS.

Additional Potential Full Assessments

For the remaining three stock assessments that the Science Centers may be capable of completing in 2013, the GMT recommends that aurora rockfish be considered for a full assessment. Of the unassessed slope rockfish species put forward by NMFS, this species has the most available data, is regularly landed in the trawl fisheries, and has a high vulnerability score. In addition, there may be some recent and historical otolith data available to inform this assessment. If enhanced data-poor methods become available, aurora could also be considered for those applications instead of a full assessment.

Update Assessments

The Science Centers may be able to accommodate 2-3 updated assessments and recommend Pacific ocean perch (mandatory) and bocaccio rockfish as candidate species (Table 1, NMFS Report). The GMT agrees with these selections. The GMT also recommends sablefish be considered for inclusion as an update in 2013, because it is a highly valuable commercial species, may be slow to recover if it becomes overfished, and recent stock assessments have shown a recent downward trend and an uncertain forecast of stock's trajectory.

Data Poor Stock Assessments

The GMT recommends that a high priority be placed on developing enhanced data poor methods and identifying sources of abundance indices (whether fishery independent or fishery dependent) to be used in applying these methods. While use of the correlation between data, PSA scores, and depletion for assessed stocks may improve the accuracy of DB-SRA and DCAC methods, actual trends in abundance indices provide a more reliable direct indication of a stock's relative depletion level. Application of such abundance indices with enhanced data poor methods could raise a species from category 3 to category 2, resulting in a lower reduction in the OFL. Enhanced data poor assessments may also be the appropriate approach for re-visiting assessments with limited data.

Status Reports

The NMFS report recommends that for some of the rebuilding species, assessments (full or updates) could be skipped and data or status reports be completed instead, in certain conditions. The GMT agrees that this may be appropriate for species such as canary and yelloweye rockfish that are very long-lived, have low productivity, have not shown high recruitment events, are not expected to be rebuilt for decades, and have little new information to inform stock assessments every two years. The SSC can still advise the Council on whether stocks are making adequate progress on rebuilding using a data report, as they did with cowcod this cycle.

Fish Stock Sustainability Index (FSSI)

One of the criteria listed in Table 1, NMFS Report is “on the FSSI list”. This index (http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm) has a role in the Federal program evaluation and budget process and can affect decisions made at those levels. This list does not include many of the species in the groundfish FMP (e.g., aurora rockfish), The GMT did not have time to research the origin of the FSSI list of stocks and so does not know why stocks were included or excluded. The list was created before the most recent vulnerability analysis of stocks in the Groundfish FMP using the productivity and susceptibility approach. We do not know the process for or willingness to update the FSSI list. For now, we point out that there might be a mismatch between the FSSI list and the Council’s priorities.

Review of the Terms of Reference (TOR)

The GMT did not have time for a thorough discussion on the TORs included under this Agenda Item. We will continue our review and communicate with the Council and the SSC between now and June if necessary.

Schedule

The GMT supports finalizing the list of full and update stock assessments in June 2012 to facilitate data preparation. The GMT also supports the NMFS Report’s recommendation that the Council allow itself the flexibility to delay finalizing the 2013 schedule until its September 2012 meeting, in order to accommodate the development of Terms of Reference and a list of species for which enhanced data-limited assessments would be conducted.

PFMC
03/05/12

Science, Service, Stewardship

Considerations for Selecting Groundfish Species for Assessment in 2013

NOAA
FISHERIES
SERVICE

Species Factors to Consider

- Data: availability/adequacy; or new data series?
- Species Vulnerability score
- Species importance to the fishery and ecosystem
- Time since last assessment, if ever
- Can existing issues/problems be resolved?
- Recent direction of survey trend, (if available)
- Is it tracked in the FSSI

Overview of Recent Survey Data

	Vulner-ability Score	2007-2011 NWFSC Survey Average annual number of:		
		lengths	otoliths	hauls > 0
copper rockfish	2.27	**23**	**23**	**7**
rougheye rockfish	2.27	110	104	31
redstripe rockfish	2.16	351	173	12
cowcod	2.13	31	31	16
aurora rockfish	**2.10**	**1,692**	**694**	**96**
rosethorn rockfish	**2.09**	**1,159**	**478**	**54**
sharpchin rockfish	**2.05**	**943**	**465**	**38**
bank rockfish	2.02	100	61	14
redbanded rockfish	2.02	169	167	49
silvergray rockfish	2.02	48	41	8
California skate	2.12	370	-	70
big skate	1.99	303	113	89
Swordspine Rockfish	1.94	271	64	6
yellowtail rockfish	1.88	805	471	43
squarespot rockfish	1.86	283	76	12
Pacific grenadier	**1.82**	**2,531**	**589**	**135**
shortspine thornyhead	**1.80**	**4,600**	**1,272**	**356**
stripetail rockfish	**1.80**	**2,183**	**691**	**147**
spotted ratfish	**1.72**	**2,642**	**-**	**337**
longspine thornyhead	**1.54**	**4,250**	**992**	**255**
Pacific cod	1.34	219	74	29
rex sole	**1.28**	**6,145**	**817**	**418**
flathead sole	1.26	289	41	39
halfbanded rockfish	**1.26**	**1,070**	**227**	**56**
Pacific sanddab	**1.25**	**3,620**	**872**	**221**
curlfin sole	1.23	323	114	68

	Vulner-ability Score	2007-2011 NWFSC Survey Average annual number of:		
		lengths	otoliths	hauls > 0
spiny dogfish	**2.13**	**23**	**7**	**222**
blackgill rockfish	2.08	104	31	40
widow rockfish	2.05	173	12	27
canary rockfish	2.01	31	16	43
yelloweye rockfish	2.00	694	96	13
greenspotted rockfish	1.98	478	54	41
petrale sole	**1.94**	**465**	**38**	**289**
bocaccio	1.93	61	14	28
darkblotched rockfish	**1.92**	**167**	**49**	**119**
greenstriped rockfish	**1.88**	**41**	**8**	**171**
splitnose rockfish	**1.82**	**-**	**70**	**145**
Pacific ocean perch	1.69	113	89	48
longnose skate	**1.68**	**64**	**6**	**401**
sablefish	**1.64**	**471**	**43**	**435**
lingcod	**1.55**	**76**	**12**	**217**
Dover sole	**1.54**	**589**	**135**	**569**
chilipepper	**1.35**	**1,272**	**356**	**83**
arrowtooth flounder	**1.21**	**691**	**147**	**244**
English sole	**1.19**	**-**	**337**	**262**

Additional Considerations

- **Possible Enhanced *Data-Limited* assessments**
  - Draft TOR in September, after Methods Review
  - Propose 1st 2013 STAR panel for species reviews
- **Workload / Capacity**
  - NMFS can likely lead only 8 full assessments
- **Streamlined assessment products**
  - Data report -- Canary and Yelloweye rockfishes
  - Update -- Bocaccio (subject to spring 2012 review of survey)

Proposed Assessments

- **Benchmark**
  - **petrale sole, darkblotched rockfish, cowcod, shortspine and longspine thornyheads**
  - Other choices
    - aurora and yellowtail rockfish, rex sole, sanddabs, widow, canary, bocaccio, and black (N+S) rockfishes
- **Update or data report**
  - **POP**, bocaccio, sablefish, canary, yelloweye rockfish

Possible Species for Enhanced Data-Limited Assessments

- **Previously assessed**
  - yellowtail rockfish, English sole, arrowtooth fl.
- **Other species where creation of a trawl survey index of abundance may be possible**
  - aurora, halfbanded, redbanded, rosethorn, rougheye, sharpchin, stripetail rockfishes, Pacific cod, Pacific grenadier, curlfin, flathead, and rex soles, sanddabs, spotted ratfish

Assessment Timeline

2012

June	Council selects Benchmark species, if possible, so age-reading can proceed
	SSC conducts Methods Review of Enhanced Data Limited (EDL) approaches
July-Aug.	If Review endorses an EDL approach, SSC creates draft TOR for EDL methods
Sept.	Council considers EDL recommendation and TOR; finalizes planning for 2013 assessments
Nov.	Adopts EDL TOR (if needed)

2013

Jan.-May	Assessment development ramps up
May	EDL review of 5-10 species, based on Council preferences and modeling success
	STAR for first two Benchmark assessments
June	SSC & Council consider EDL, Update, and 2 Benchmark assessments
July-Aug.	3 STAR Panels conducted, with 6 Benchmark assessments
Sept.	SSC & Council consider 6 Benchmark assessments
	Mop-up / Review of Rebuilding Analyses
Nov.	SSC & Council consider Rebuilding Analyses and any assessments review in Mop-up

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON STOCK ASSESSMENT PLANNING FOR MANAGEMENT SPECIFICATIONS IN THE 2015-2016 FISHERIES

Preliminary List of Assessment Species

Dr. Jim Hastie briefed the Scientific and Statistical Committee (SSC) on the criteria used to select species for assessment during the 2015-16 management cycle. The SSC notes that the Council has previously adopted a set of criteria for selecting such species (Agenda Item F.5.a Attachment 1, Page 6). A more rigorous procedure for selecting species for assessment would be to develop quantitative metrics for each criterion, and use a procedure for weighing each criterion. While the SSC recommended in November 2011 that the next assessment of boccacio should be a full assessment, final decisions will be made after the Southwest Fisheries Science Center (SWFSC) add the new survey data into the current assessment and provide a summary of the impact of this to the Council.

The SSC has endorsed a methodology panel to review methods for assessing data-limited stocks. This panel will take place in late June 2012, so its report will be available at the September 2012 Council meeting. The SSC notes that yelloweye and canary rockfish are proposed for data reports. Historical catch data for Washington will be reviewed and perhaps revised. However, the SSC was advised that the data for 1930-69 will not be digitized before March 2013, so a revised Washington catch history will not be available in time for the updates to be performed in 2013. The SSC therefore supports yelloweye and canary rockfish for data reports. These are stable assessments, and their times to rebuild are very long so there is little justification for doing updates every cycle.

Under current practice, the overfishing limits (OFLs) for 2015-16 for stocks for which assessments have recently been adopted, but will be not be updates nor full assessments in the 2015-16 cycle, will based on projections in which catches between the last year and 2014 are assumed to equal the OFL. The SSC supports updating catch projections for stocks where the catches since the last assessment are set to the actual catches. However, conducting such projections for pre-2005 assessments may not be possible because the input files may no longer be available. OFLs resulting from projections will be reviewed when the SSC reviews all OFLs.

Draft Terms of Reference (TOR) for Assessments and Methodology Review

The SSC considered drafts of three Terms of Reference. Members of the SSC have worked on updating two of these documents since the November 2011 Council meeting.

TOR for stock assessment

The TOR for stock assessments (Agenda Item F.5.a. Attachment 1) have been updated based on experiences gained during the most recent round of assessments and during the post-mortem workshop. The revised TOR can be used with both groundfish and CPS. They provide additional guidelines related to update assessments, including how update assessments are reviewed and what to do if an update assessment does not satisfy the requirements for an update. In addition to editorial revisions, the revised TOR provide a general framework for the incorporation of ecosystem considerations in stock assessments. The SSC does not recommend precise requirements for this section of a stock assessment document at present. The expectations regarding ecosystem considerations are evolving, and more detailed requirements will be reflected in a future version of the TOR.

In relation to the draft TOR, the SSC notes that terms “status report” and “data report” pertain to the same concept and recommends that all references to “status report” be replaced by “data report.” It also recommends that the TOR be updated to include a separate section on data reports, which would clearly differentiate data reports from update assessments, and specify what is expected for a data report. Data reports should provide updated catch projections based on replacing predicted OFLs by the actual catches where possible.

The SSC also recommends that language be added to the TOR providing additional guidelines regarding when new methods or data should be reviewed by a methodology panel, and when this review can be part of a Stock Assessment Review (STAR) Panel review. In particular, inclusion of new data sources which could be used in many assessments or are likely contentious should ideally be reviewed by a methodology panel. Stock assessment teams should identify whether such new data sources will be proposed for inclusion in assessments as early as feasible so that it is possible to hold a methodology panel if one is needed. Irrespective of whether a methodology panel takes place, the STAR Panel should be provided with model runs with and without the new data sources so that the Panel can evaluate the sensitivity of model outputs to these data sources.

The TOR should be updated to encourage stock assessment authors to revise projections for historical assessments in which predicted catches are replaced by actual catches whenever possible. In addition, the SSC recommends that OFL calculations should be based on the assumption that future catches equal acceptable biological catch and not OFLs, as is past practice.

The SSC recommends that the time committed to review update assessments for groundfish should be not be pre-specified, but rather whether the meeting is one or two days should determined by the SSC once the draft update assessments become available.

The TOR will be revised based on comments received and can then be made available for public review.

TOR for rebuilding analyses

The TOR for rebuilding analyses (Agenda Item F.5.a. Attachment 2) have not been updated since 2010. The SSC will update these TOR to remove descriptions of approaches for conducting rebuilding analyses that are no longer considered standard, to revise text on standard catch streams, and to include a revised list of requirements for rebuilding analysis reports. A revised TOR will be available for the April 2012 Council meeting, when the SSC and Groundfish Management Team (GMT) are scheduled to discuss aspects of rebuilding analyses. The SSC has not yet evaluated the list of questions provided by the GMT regarding rebuilding analyses in terms of which questions are scientific rather than policy decisions. This evaluation will take place during the joint meeting with the GMT in April.

TOR for methodology reviews

The TOR for methodology reviews (Agenda Item F.5.a. Attachment 3) were originally written for coastal pelagic species (CPS) and have been updated to cover both groundfish and CPS, and could be used for highly migratory species or ecosystem issues. Major changes to the earlier document include the composition of methodology panels, as well as the role of the technical team and the representatives of the advisory panel and management team. The SSC recommends that the items to be addressed and the meeting agenda be developed by the chair in conjunction with the proposers of the methodology. The TOR for methodology reviews will be revised based on comments received, and can then be made available for public review.

PFMC
03/04/12

CONSIDERATION OF INSEASON ADJUSTMENTS

Management measures for groundfish are set by the Council with the general understanding these measures will likely need to be adjusted within the biennium to attain, but not exceed, the total catch limits. This agenda item will consider inseason adjustments to ongoing 2012 fisheries. Potential inseason adjustments include adjustments to rockfish conservation area boundaries and adjustments to commercial and recreational fishery catch limits. Adjustments are, in part, based on catch estimate updates and the latest information from the West Coast Groundfish Observer Program.

At the March and June 2011 Council meetings, the Groundfish Management Team identified issues in the Pacific Coast Fisheries Information Network with regard to tracking landings of sablefish north of 36° N. latitude against the daily trip limit fishery and the primary tiers. At the June meeting, the Council requested that the Pacific Coast Fisheries Data Committee (PCFDC) investigate the issues further and explore potential solutions. The PCFDC met in November 2011 in Portland, Oregon and identified options for Council consideration (Agenda Item F.6.b, PCFDC Report). Under this agenda item, the Council should provide guidance on the preferred solution. Additionally, a public comment letter requests increases to nearshore trip limits in California (Agenda Item F.6.c, Public Comment).

Council Action:

1. **Consider information on the status of 2012 fisheries and adopt final inseason adjustments as necessary.**
2. **Consider recommendations of the PCFDC and provide guidance as necessary.**

Reference Materials:

1. Agenda Item F.6.b, PCFDC Report: Pacific Coast Fisheries Data Committee Report on Tracking Landings of Sablefish North of 36° N. Latitude.
2. Agenda Item F.6.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary or Final Recommendations for Adjustments to 2012 Groundfish Fisheries

PFMC
02/09/12

Agenda Item F.6.b
PCFDC Report
March 2012

PACIFIC COAST FISHERIES DATA COMMITTEE REPORT ON TRACKING LANDINGS OF SABLEFISH NORTH OF 36° N. LATITUDE

Background

The Groundfish Management Team (GMT) identified issues with tracking landings of sablefish north of 36° N. latitude against the daily trip limit (DTL) fishery and the primary tiers within the Pacific Fisheries Information Network (PacFIN). These issues were raised at the March[1] and June[2] Council meetings and the Council requested that the Pacific Coast Fisheries Data Committee (hereinafter Data Committee) explore potential solutions. In summary, PacFIN tracks fixed gear sablefish landings inseason, and apportions catch to the tier fishery or the DTL fishery, and supplies those data estimates to the GMT to model accurate trip limits for the DTL fishery necessary to attain the allocation. Although the GMT does not monitor the tier fishery inseason, there may be interest from the Northwest Region (NWR) as well as state and federal enforcement to ensure tiers are not exceeded. Generally, GMT attention to the tier fishery has been minimal since management concerns have not been identified (i.e., the total tier allocation has not been exceeded). However, since the tier fishery allocation is approximately five times as large as the DTL harvest guideline, error in the estimated apportionment between the two of them within PacFIN, has large proportional implications to model predictions of attainment of the DTL harvest guideline, and for resultant inseason management measures.

The Data Committee met November 29-30 in Portland, Oregon and identified the following options for resolving this issue:

1) **Increase Compliance with Existing State Regulations:** State laws currently require permits be assigned to fish tickets. There are no federal regulations requiring permit numbers on fish tickets, yet the pre-amble to the proposed and final rule that implemented the sablefish permit stacking program in 2005-2006 requested state compliance (see 70FR59296 and 71FR10614). In the event multiple permits are assigned to one vessel and landing (as in the case of fishing multiple tiers on one vessel), separate fish tickets are completed and each ticket identifies the permit to which the catch is attributed. Data from PacFIN indicates that none of the fish tickets in Oregon have permit numbers (Table 1). In Washington between 58 and 67 percent of fish tickets contain permit numbers. The amount of sablefish landed on fish tickets in Washington without permits is less than 20 percent of the total weight landed in Washington annually (Table

[1] See Agenda Item H4b, Supplemental GMT Report, starting on page 4 at http://www.pcouncil.org/wp-content/uploads/H4b_SUP_GMT_RPT1_MAR2011BB.pdf
[2] See Agenda Item E.5.b, Supplemental GMT Report, starting on page 15 http://www.pcouncil.org/wp-content/uploads/E5b_SUP_GMT_JUN2011BB.pdf

2). **The Data Committee identified increasing compliance with existing regulations as one solution for tracking primary vs. DTL landings.** This solution appears to satisfy the desires of the GMT, NWFSC, NWR, and enforcement.

Oregon noted they do not upload the permit number to PacFIN, even though the numbers sometimes are reported on the paper fish tickets, due to liability issues. The states are unable to access NWR permit data through their data systems so any verification of permit is done by accessing a list on the NWR website. This list provides a current snap shot of which vessels have what permits and the tier limits of each. The states use this information to try and manually link landings to permits, however the fisher can transfer these permits inseason creating problems with identifying what vessel is associated with the permit. Also, dealers provide permit numbers on tickets but do not always change permit numbers when a tier is filled. Throughout the season the same number is submitted to the state. The state requests verification from either the fisher or the dealer or both on what permit should be associated with the landing but does not always get a response so this makes it difficult at the state level to assign a permit to a landing without the fishers consent, since it eventually leads to the assignment of catch history against a permit.

In California, groundfish permit numbers are sometimes listed on the fish ticket by the dealer. Permits are not edited by the state, however, CDFG staff plan to add a groundfish permit table to edit permits on tickets, sometime later this year. Presently, every semi-monthly PacFIN ticket update from the CDFG PacFIN coordinator uses data from the PacFIN permit tables and an algorithm to edit the CDFG ticket permit or assign a permit to limited entry tickets without permits. Therefore, 100 percent of the fish tickets in PacFIN have a permit number (Table 1).

Placing the permit numbers on all of the sablefish landings would allow primary landings to be accounted directly to tier permits, throughout the season, and alleviate the need to use an estimation procedure through the extra layer of vessel-day, which adds error to the estimates of primary and DTL landings within the PacFIN database (compared with direct accounting).

Option 1 would eliminate the need for using a proxy of landings distribution among permits when stacked on a vessel, and should enable accurate tracking of the landings against the permit when transferred.

Tracking landings directly to each individual permit number recorded on the fish ticket would remove the estimation error currently inherent in calculating the split between sablefish primary and DTL, and produce the most accurate estimates of DTL landings for trip limit management.

Table 1. Count of non-trawl fish tickets with sablefish landings that include permit numbers by year and state.

State	Year	Count of Tickets with Permits	Total Count of Tickets	% With Permit Number
Washington	2010	207	358	58%
	2011	194	288	67%
Oregon	2010	0	894	0%
	2011	0	722	0%
California a/	2010	745	745	100%
	2011	639	639	100%

a/ North of 36° only

Table 2. Count of non-trawl fish tickets with sablefish landings without permit numbers by year and state. Landings, in metric tons, are also provided.

State	Year	Count of Tickets Without Permits	Landings (mt) on Tickets Without Permits	Total Landings (mt)	% by Weight of Tickets Without Permits
Washington	2010	151	90	547	17%
	2011	94	44	327	14%
Oregon	2010	894	860	860	100%
	2011	722	753	753	100%
California a/	2010	0	0	506	0%
	2011	0	0	434	0%

a/ North of 36° only

2) **Track Primary Season Poundage for the Tiered Permits.** Another approach discussed by the data committee was the possibility of determining whether landing was part of the tier or DTL fishery based on whether the tier permit had caught all of its available quota (taking into account whether the tier fisheries open and whether or not more than a threshold amount is left on the permit). The primary concern with this approach was the possibility that permits would be transferred midseason. Tracking under such circumstances might present an obstacle particularly when the permits are stacked and there may be some uncertainty as to the permits against which particular landings were made. In regard to addressing this concern, there is a requirement that the poundage already caught when such transfers occur be reported to the limited entry office, however at present this information is not transmitted to the PacFIN system. At the time the data committee discussed this issue information was not available on the frequency of occurrence of midseason transfers and associated burden with providing that data to the PacFIN program. Since that time information on midseason permit transfers has been

provided by the Limited Entry Permit Office and is presented in Table 3. The number of midseason permit transfers per year has run between 2 and 18, escalating to 18 in 2011. The increase in transfers in 2011 might be associated with the new IFQ program for the trawl fishery, in which exterior vessels which acquire trawl permits are allowed to participate. For 2007 through 2009 and in 2011, half or fewer of the transfers involve permits on which some landings had occurred prior to the transfer. Each year there are a few missing landing reports for midseason permit transfers, up to four in 2010 and in 2011. Because several of the transfers for which landing reports were missing involve the same vessels (i.e. involve stacked permits) the maximum number of vessels involved was only two.

This approach is similar to the current process that keeps track of primary catch on a permit-day basis, and after catch on a permit reaches the tier limit (or when less than a threshold amount is left on the permit) the catch is considered DTL. When stacked permits exist for a landing the catch is apportioned to the stacked permits, and when permits are transferred PacFIN incorporates those data through the NWR permit database. The only difference between this option and the status quo methodology is the suggestion to use the "poundage already caught when such transfers occur", which may be difficult to incorporate because it involves trying to combine actual data ("poundage already caught") with estimated data (catch apportioned due to stacked permits).

Table 3. Number of midseason transfers of fixed gear sablefish tiered permits and whether permits were used prior to transfer (zero pounds or more than zero pounds at time of transfer).

	2007	2008	2009	2010	2011
Total Permit Transfers	9	2	6	13	18
Zero Pounds at Time of Transfer	5	2	3	4	11
Possibly More Than Zero at Time of Transfer [a/]	4	2	3	9	7
Poundage Report Missing for Permit Transfer	2	1	1	4	4
Vessels With Missing Poundage Reports [b/]	1	1	1	2	2

a/ Reported pounds and those for which a pound report was missing.
b/ Vessels with missing poundage reports are fewer than number of missing poundage reports because multiple permits were transferred between the same two vessels.

3) Add a fish ticket field which would indicate whether landing is DTL or tier. The Data Committee recognized that the heart of the problem lies with identifying DTL landings for accurate trip limit modeling. Therefore, another solution would be a fish ticket field to identify DTL or tier landings. The Committee noted it is difficult to modify state fish tickets and the associated state databases; therefore, this solution may not be the most expedient. In the event electronic fish ticket reporting expands from the IFQ fisheries into other sectors, these data would be easily accommodated.

The Committee notes that this additional field would satisfy GMT inseason tracking of the DTL fishery, but would not resolve NWR, NWFSC, or enforcement desires for tracking tiers against permits. That is, if the permit numbers are not recorded, it is still difficult to track tiers with permits. If this solution was implemented, it should require that fishers check one of two boxes ("tier" versus "DTL"), to eliminate the possibility of errors by omission.

4) Restrict Transfer of Permits. The Data Committee briefly explored regulatory solutions to this issue. One potential solution would be to restrict the transfer of limited entry permits once tier fishing has occurred on a given permit. The Committee believes this is likely an undesirable approach, since it would greatly limit flexibility and efficiency for limited entry tier fishermen. Including this option would likely highlight the importance of the issue to fishers, and reduce the probability of the issue being ignored. This solution would resolve tracking concerns for all parties.

Agenda Item F.6.b
Supplemental GAP Report
March 2012

GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS

The Groundfish Advisory Subpanel (GAP) and the Groundfish Management Team (GMT) engaged in a joint discussion regarding potential inseason actions for 2012. The GMT discussion was led by Dr. Sean Matson. Having completed this meeting, the GAP wishes to recommend for inseason consideration the following:

Trawl RCA north of 40°10’ to 48°10’ N

The GAP and the GMT discussed modifying the shoreward boundaries of the trawl RCA under trawl rationalization. The GAP is concerned the current shoreward RCA configuration is too restrictive for fishermen north of 40° 10’ N to effectively prosecute their intended fishing strategies. The GAP believes behavior of individual trawl fishermen under rationalization will ensure risk-averse fishing since no fisherman wants to risk exceeding their individual quota for any quota species. Trawlers know the areas in which they can fish and avoid bycatch of overfished species. With that said, the GAP recommends the following for inseason consideration:

Adopt a 100-fathom shoreward boundary line north of 40° 10’ N to 48° 10’ N for fishing periods 3 and 5

10 percent carryover quota

The GAP received a report from Ms. Jamie Goen regarding the current status of the previously approved 10 percent carryover from 2011 to 2012 for the trawl catch share program. The GAP has serious concerns regarding the final outcome of this issue, which will be addressed in a later agenda item. While it is understood that a legal problem exists due to the potential to exceed the annual catch limits (ACLs), the GAP also recognizes that fishing plans, quota pounds (QP) transfer and future quota share sales arrangements already exist based on assurances that the National Marine Fisheries Service (NMFS) has confidence this legal problem will be resolved.

Additionally, we were advised by Ms. Jamie Goen that carryover pounds are not transferrable. This is a new development that surprised the entire GAP and members of the trawl industry. Furthermore, it’s a situation that can result in stranded fish.

It’s the GAP’s understanding that there are going to be restrictions on trading or transferring carryover quota pounds from 2011 and that vessels that participate in risk pools or similar co-ops will be particularly disadvantaged. We think this is a significant problem not just for single vessels but for the formation of risk pools, which the Council has encouraged.

The GAP concerns are as follows:

1. Decisions have been made based on NOAA/NMFS' prior approval of the program, including the 10 percent carryover.

2. The proposed fix for 2012 includes carryover of only those species predetermined, with a 10 percent carryover plus the projected annual landings, to fall below the ACL.

   Those economic and resource critical species such as Pacific whiting, sablefish and petrale, because the ACL is likely to be fully subscribed due to economic and fishing opportunities, can be accurately anticipated to exceed the ACL when the actual landings are combined with a potential 10 percent carryover.

3. The natural progression of this approach accepts that there could be stranded fish in risk pool and co-op holding accounts and in those situations in which the carryover results in more than the annual limit in the vessel account.

   Additionally, non-transferrable carryover QP may be stranded if they are unfished by the vessel to which they are initially carried over and therefore are unavailable to others in the fleet for the purposes of covering deficits.

   Risk pool holding accounts, by design, are the result of commingling quota pounds from several contributors. The carryover from a holding account could be stranded at year end if a participant were to leave the pool because carryover is not anticipated to be transferrable.

Daily trip limit (DTL) open access and fixed-gear sablefish reporting

Background

In 2011, the GMT and GAP reported issues with tracking landings of sablefish north of 36° N. latitude against the (DTL) fishery and the primary tiers within the Pacific Fisheries Information Network (PacFIN). Based on those reports, the Council requested the Pacific Coast Fisheries Data Committee (Data Committee) explore potential solutions.

The GAP recommends a combination of the following alternatives provided by PCFDC under Agenda Item F.6.b.:

> "**Increase Compliance with Existing State Regulations**: State laws currently require permits be assigned to fish tickets. There are no federal regulations requiring permit numbers on fish tickets, yet the preamble to the proposed and final rule that implemented the sablefish permit stacking program in 2005-06

requested state compliance (see 70FR59296 and 71FR10614). In the event multiple permits are assigned to one vessel and landing (as in the case of fishing multiple tiers on one vessel), separate fish tickets are completed and each ticket identifies the permit to which the catch is attributed."

"(From the Data Committee Report, Page 1): The Data Committee identified increasing compliance with existing regulations as one solution for tracking primary vs. DTL landings. This solution appears to satisfy the desires of the GMT, NWFSC, NWR, and enforcement."

"Track Primary Season Poundage for the Tiered Permits (Data Committee Report, pages 3-4): Another approach discussed by the Data Committee was the possibility of determining whether a landing was part of the tier or DTL fishery based on whether the tier permit had caught all of its available quota (taking into account whether the tier fisheries were open and whether more than a threshold amount was left on the permit)."

The GAP reviewed alternatives 3 and 4 from the Data Committee report and rejected both as viable solutions.

THE GROUNDFISH MANAGEMENT TEAM REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS

The Groundfish Management Team (GMT) considered the most recent information on the status of ongoing fisheries, research, and requests from industry, and provides the following information and recommendations for 2012 inseason adjustments.

The GMT also received guidance from National Marine Fisheries Service (NMFS) Northwest Region (NWR) regarding timing of implementation of inseason recommendations from this meeting. NMFS anticipates implementing routine inseason adjustments to fishery management measures before May 1, 2012.

SUMMARY

1) Inseason request

- GAP request: move the shoreward Rockfish Conservation Area (RCA) boundary from 75 fm to 100 fm from 40°10' N. lat. To 48°10' N. lat for greater access to target species on the shelf during the summer months.
- Summary: The 2011 year-end individual fishing quota (IFQ) data, progress of the fishery to date, and historical data indicate a low risk of a "disaster tow" of overfished species as a result implementing such a change, although some increase in rebuilding species catch could result. As usual, consideration is due to individual accountability and risk.
- GMT recommendation: The GMT recommends the Council consider changes to the shoreward boundary of the trawl RCA during periods 3 and 5 (May, June, September and October) of 2012, from the 75 fm line to the 100 fm line (Table 2.) for the area between 40°10' N. lat. and 48°10' N. lat. (Cape Alava).

2) Agenda Item F.6.b, PCFDC Report – tracking of sablefish DTL landings north of 36° N. lat. in PacFIN

- The GMT recommends continuing the dialogue between representatives from different agencies, including state fishery data managers, PacFIN, state and federal enforcement necessary to improve accuracy of sablefish daily-trip-limit (DTL) landings data in PacFIN.

3) Informational items

- 2012 IFQ catch, recreational update, scorecard update.

IFQ FISHERY

The GMT received a request from the Groundfish Advisory Subpanel (GAP) to examine the following possible changes to the trawl RCA during 2012:

- 40°10' - 48°10': Move the shoreward line from 75 fm to 100 fm for periods 3 and 5.

Tables 1 and 2 highlight the changes proposed in this request.

Table 1. Current trawl RCA boundaries for the area north of 40°10' N. lat.

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
North of 48°10' N. lat.	shore - modified 200 fm line	shore - 200 fm line	shore - 150 fm line		shore - 200 fm line	shore - modified 200 fm line
48°10' N. lat. - 45°46' N. lat.	75 fm line - modified 200 fm line	75 fm line – 150 fm line	75 fm line - 150 fm line	100 fm line - 150 fm line	75 fm line - 150 fm line	75 fm line - 150 fm line
45°46' N. lat. - 40°10' N. lat.		75 fm line - 200 fm line	75 fm line - 200 fm line	100 fm line - 200 fm line	75 fm line - 200 fm line	75 fm line - modified 200 fm line

Table 2. Requested trawl RCA boundaries for the area north of 40°10' N. lat. (proposed changes shaded gray, with bold and strikeout font).

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
North of 48°10' N. lat.	shore - modified 200 fm line	shore - 200 fm line	shore - 150 fm line		shore - 200 fm line	shore - modified 200 fm line
48°10' N. lat. - 45°46' N. lat.	75 fm line - modified 200 fm line	75 fm line – 150 fm line	~~75~~ **100 fm line - 150 fm line**	100 fm line - 150 fm line	~~75~~ **100 fm line - 150 fm line**	75 fm line - 150 fm line
45°46' N. lat. - 40°10' N. lat.		75 fm line - 200 fm line	~~75~~ **100 fm line - 200 fm line**	100 fm line - 200 fm line	~~75~~ **fm 100 line - 200 fm line**	75 fm line - modified 200 fm line

Historic bycatch data

We examined time-weighted average bycatch rates from the West Coast Groundfish Observer Program (WCGOP), from 2006 to 2010, (Figure 1, Table 3), which generally show increased bycatch rates of rebuilding species in Periods 3 and 5, in the area shoreward of 100 fm, versus the area shoreward of 75 fm. This indicates that if the shoreward RCA were moved from 75 fm to 100 fm during periods 3 and 5 of 2012, which the probability of encountering canary rockfish, darkblotched rockfish, Pacific ocean perch (POP), widow rockfish and yelloweye rockfish will likely be higher than if status quo shoreward boundaries remained in place.

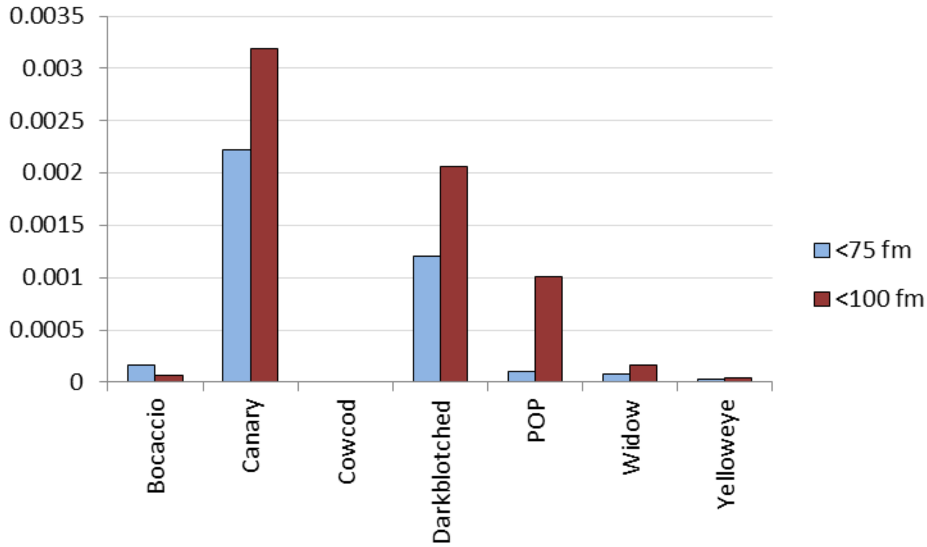

Figure 1. Comparison of historical (2006-2010), time weighted average bycatch rates of rebuilding species, for the area north of 40°10’ N. lat., during periods 3 and 5.

Table 3. Historical (2006-2010), time weighted average bycatch rates of rebuilding species, shoreward of the trawl rockfish conservation area (RCA), for the area north of 40°10’ N. lat. during periods 3 and 5.

Species	**<75 fm**	**<100 fm**	**% change**
Bocaccio rockfish	0.0166%	0.0070%	-58%
Canary rockfish	0.2225%	0.3193%	44%
Cowcod	0.0000%	0.0000%	0%
Darkblotched rockfish	0.1204%	0.2066%	72%
Pacific ocean perch	0.0103%	0.1007%	878%
Widow rockfish	0.0081%	0.0160%	98%
Yelloweye rockfish	0.0036%	0.0039%	8%

Attainment of these rebuilding species was low under IFQ management in 2011 (Agenda Item F.6.b, Supplemental NMFS Report: West Coast Groundfish IFQ Fishery Catch Summary for 2011: First Look), at 14 percent, 36 percent, 39 percent, 40 percent and 10 percent respectively, as of January 30, 2012. Current attainment rates for these same species so far in 2012 are: 0.6 percent, 5.8 percent, 2.9 percent, 0.1 percent and 0.2 percent, respectively. Total catch of rebuilding species under IFQ was lower in 2011than 2010 (except for widow rockfish), although the widow rockfish assessment adopted by the Council for use in the 2013-2014 cycle indicates a rebuilt status.

New observer data

We also examined newly available observer data for those rebuilding species (canary rockfish, darkblotched rockfish, Pacific ocean perch and yelloweye rockfish), and identified target species shoreward of the RCA. Of the target species caught using trawl gear during periods 3 and 5, north of 40°10' N. lat., 96 percent of English sole, 81 percent of lingcod, 70 percent of minor shelf rockfish, 63 percent of other flatfish, 96 percent of petrale sole, 99.8 percent of starry flounder, and 93 percent of yellowtail rockfish were caught shoreward of the RCA.

It is worth noting that 96 percent of the petrale sole which was harvested during periods 3 and 5 of 2011, north of 40°10' N. lat., was taken shoreward of the RCA. Ninety-three percent of the 2011 allocation was attained, and 85 percent of that catch was from north of 40°10' N. lat. As of March 5, 25 percent of the 2012 allocation of petrale sole (582,400 pounds, of 2,324,995 pounds) has been harvested, according to the Vessel Accounts (VA) system of NMFS.

As for rebuilding species during 2011, most of the canary rockfish harvested north of 40°10' N. lat. with trawl gear during periods 3 and 5 was taken shoreward of the RCA, (78 percent by weight), and the vast majority of hauls positive for canary rockfish in this time and area were shoreward of the RCA (94 percent, or 142 of 151). Of those 142 hauls, the mean haul weight was 10.4 pounds, with a maximum of 279.2 pounds (Figure 2). This maximum haul size corresponds to less than 0.5 percent of the fleet allocation of 57,100 pounds in 2011.

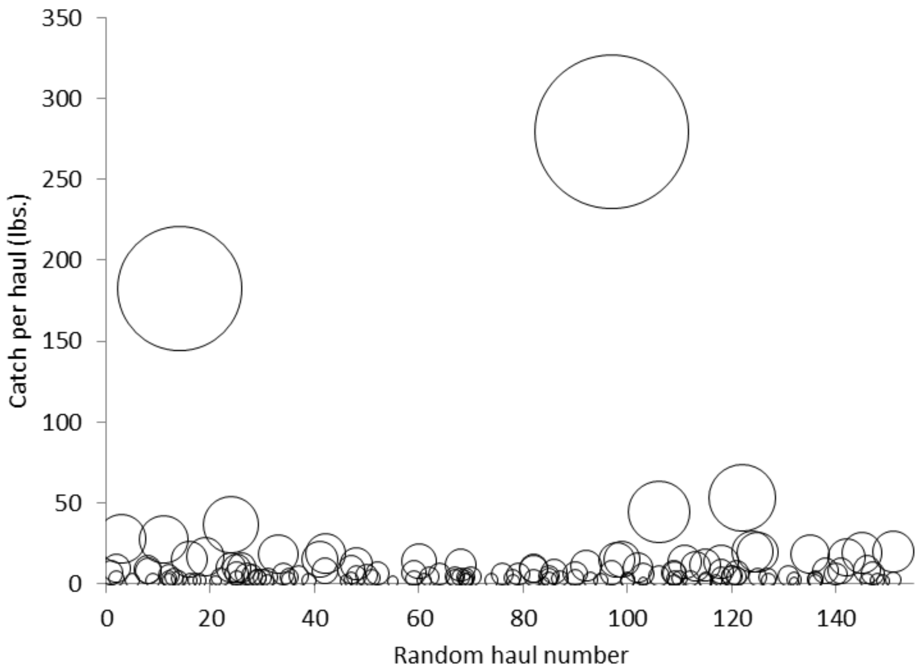

Figure 2. Weights of canary rockfish per haul using trawl gear, north of 40°10' N. lat., shoreward of the RCA, during periods 3 and 5 of 2011 under IFQ. The X axis is a randomly assigned haul number; the Y axis is weight of canary rockfish per haul in pounds, and bubble size also represents weight of canary rockfish per haul.

Only a small portion of the darkblotched rockfish (2.7 percent) taken with trawl gear during these periods, was harvested from shoreward of the RCA. Twenty-four percent of darkblotched-positive hauls in this time and area occurred shoreward of the RCA. The mean weight per haul of this species in the shoreward area was only 6.8 pounds, with a maximum of 125 pounds.

A small minority of the catch of POP harvested north of 40°10’ N. lat. with trawl gear during these periods was taken shoreward of the RCA (0.5 percent). Out of 541 POP-positive hauls in these months and area only 5 were shoreward of the RCA; their maximum weight was 142 pounds; the others were less than 10 pounds.

The majority of yelloweye rockfish (61.9 percent) caught with trawl gear north of 40°10’ N. lat., during periods 3 and 5 of 2011, under IFQ, was taken shoreward of the RCA. Those consisted of five yelloweye-positive hauls, for a total of 33.75 pounds. Only 128 pounds or 9.7 percent of the 1,323 pound allocation was harvested in all areas and periods during 2011. The maximum individual haul size shoreward of the RCA during periods 3 and 5, north of 40°10’ N. lat., was 15.15 pounds, or 1.2 percent of the fleet allocation.

These data, together with low catch of rebuilding species during the first year of IFQ, suggest that the probability of a “disaster tow”, i.e. one tow which would catch enough of a rebuilding species so that it would exceed the IFQ fishery allocation is relatively low, assuming similar behavior as during 2011.

Fishing behavior, and bycatch rates in these areas and time periods, could potentially be different than those observed during pre-IFQ or during 2011, the first year of the program, given the variation in catch among months that was observed for many species during 2011. The Council should consider the potential impact of individual accountability when making this decision.

2012 IFQ CATCH UPDATE

Total catch by species, in the IFQ groundfish fishery through March 5, 2012, with current attainment of the species allocations is shown in Table 4 (available from https://www.webapps.nwfsc.noaa.gov/ifq/).

Currently, the species with the highest attainment is petrale sole, which is reportedly at 25 percent of its allocation.

RECREATIONAL

Recreational fisheries in Washington and Oregon are open; however effort and overfished species impacts in January and February are relatively low. The first California recreational fishery opened on March 1, in the southern management area. Areas north of Pt. Conception will not open until May 1, at the earliest. Therefore, there are currently no recreational updates to the overfished species scorecard.

CATCH ACCOUNTING FOR SABLEFISH DTL; CURRENT EFFORT

In September, 2011, the Council recommended pursuing methods to further increase the accuracy of future sablefish DTL landings data, beyond the 2011 PacFIN software correction (Agenda Item F.6.b, PCFDC Report). One way to accomplish this is through dividing primary and DTL landings based on tallies of primary landings by permit (enabling correct tracking of landings on transferred permits, etc.), which would better identify at when a vessel switches from the primary to DTL fishery.

The GMT would like to reiterate that the sablefish DTL North errors in the past several years were overwhelmingly due to faulty software (also previously referred to as an algorithm) within the PacFIN database, which has been corrected. Specifically, the error was due to incorrectly attributing DTL catch during the primary season to primary, and thus underestimating the catch by DTL.

To achieve further improvements in accuracy of DTL catch data, discussions will be needed among representatives from different agencies, including state fishery data managers, PacFIN, state and federal enforcement. Through these discussions, some agreement may be reached to develop a tractable solution given the capabilities of existing state data systems, capacity of PacFIN, and needs of enforcement.

Table 4. Total catch in the IFQ groundfish fishery through March 5, 2012.

IFQ Species	Allocation	Catch to Date	Remaining	Attainment
Arrowtooth flounder	20,861,131	515,847	20,345,284	2.5%
Bocaccio rockfish South of 40°10' N.	132,277	1,407	130,870	1.1%
Canary rockfish	57,761	358	57,403	0.6%
Chilipepper rockfish South of 40°10' N.	2,934,904	2,687	2,932,217	0.1%
Cowcod South of 40°10' N.	3,968	0	3,968	0.0%
Darkblotched rockfish	548,808	31,621	517,187	5.8%
Dover sole	49,018,682	1,643,220	47,375,462	3.4%
English sole	21,037,611	10,584	21,027,027	0.1%
Lingcod	3,991,800	52,584	3,939,216	1.3%
Longspine thornyheads North of 34°27' N.	4,219,648	151,748	4,067,900	3.6%
Minor shelf rockfish North of 40°10' N.	1,150,813	2,679	1,148,134	0.2%
Minor shelf rockfish South of 40°10' N.	189,598	13	189,585	0.0%
Minor slope rockfish North of 40°10' N.	1,828,779	21,478	1,807,301	1.2%
Minor slope rockfish South of 40°10' N.	831,958	11,800	820,158	1.4%
Other flatfish	9,253,683	73,500	9,180,183	0.8%
Pacific cod	2,502,247	198	2,502,049	0.0%
Pacific halibut (IBQ) North of 40°10' N.	232,856	7,807	225,049	3.4%
Pacific ocean perch North of 40°10' N.	263,441	7,687	255,754	2.9%
Pacific whiting	25,055,977	30,119	25,025,858	0.1%
Petrale sole	2,324,995	582,400	1,742,595	25.0%
Sablefish North of 36° N.	5,438,797	355,530	5,083,267	6.5%
Sablefish South of 36° N.	1,133,352	6,055	1,127,297	0.5%
Shortspine thornyheads North of 34°27' N.	3,120,533	180,659	2,939,874	5.8%
Shortspine thornyheads South of 34°27' N.	110,231	0	110,231	0.0%
Splitnose rockfish South of 40°10' N.	3,206,513	11,871	3,194,642	0.4%
Starry flounder	1,480,404	1,304	1,479,100	0.1%
Widow rockfish	755,352	823	754,529	0.1%
Yelloweye rockfish	1,323	2	1,321	0.2%

SCORECARD UPDATE

In the March 2012 scorecard (Table 5), projected impacts have been updated to reflect petrale research based on Agenda Item E.9.b. from the November 2011 Council meeting. At the start of the year, projected impacts for research are equal to the allocation, and will be updated as we get information.

Recommendations:

- **The GMT recommends the Council consider changes to the shoreward boundary of the trawl RCA during periods 3 and 5 (May, June, September and October) of 2012, from the 75 fm line to the 100 fm line (Table 2.) for the area between 40°10' N. lat. and 48°10' N. lat. (Cape Alava).**

- **The GMT recommends continuing the dialogue between representatives from different agencies, including state fishery data managers, PacFIN, state and federal enforcement necessary to improve accuracy of sablefish DTL landings data in PacFIN.**

PFMC
03/05/12

Table 5. Scorecard for the beginning of 2012. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2012.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Widow		Yelloweye	
***Date*: 5 March 2012**	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts
Off the Top Deductions	13.4	2.4	20.0	18.7	0.3	0.1	18.7	17.2	65.4	87.1	12.8	12.8	61.0	64.9	5.9	5.8
EFPc/	11.0	**0.0**	1.3	**0.0**	0.2	**0.0**	1.5	**0.0**	2.0	0.0	0.1	**0.0**	11.0	**0.0**	0.1	**0.0**
Research d/	1.7	1.7	7.2	7.2	0.1	0.1	2.1	2.1	17.0	17.0	1.8	1.8	1.6	1.6	3.3	3.3
Incidental OA e/	0.7	0.7	2.0	2.0	--	--	15.0	15.0	1.0	0.1	0.0	0.1	3.3	3.3	0.2	0.2
Tribal f/			9.5	9.5			0.1	0.1	45.4	70.0	10.9	10.9	45.0	**60.0**	2.3	2.3
Trawl Allocations	60.0	60.0	**34.8**	34.8	1.8	1.8	**263.0**	263.0	**1,060.0**	1,060.0	137.0	137.0	491.0	491.0	0.6	0.6
---SB Trawl	60.0	60.0	**26.2**	26.2	1.8	1.8	**248.9**	248.9	**1,054.6**	1,054.6	119.6	119.6	342.1	342.1	0.6	0.6
---At-Sea Trawl			**8.6**	8.6			14.5	14.5	5.0	5.0	17.4	17.4	147.9	147.9		
a) At-sea whiting MS			**3.6**	3.4			6.0	6.0			7.2	7.2	61.2	61.2		
b) At-sea whiting CP			**5.0**	4.8			8.5	8.5			10.2	10.2	86.7	86.7		
Non-Trawl Allocation	189.6	55.9	29.8	19.2	0.9	0.2	14.0	5.8	35.0	0.0	7.0	0.4	49.0	10.0	10.5	9.9
Non-Nearshore	57.9		2.3												1.3	
LE FG				1.4				4.8				0.3		0.1		0.8
OA FG				0.2				0.8				0.1		0.0		0.1
Directed OA: Nearshore	0.7	0.5	4.0	3.3		0.0		0.2						0.2	1.1	1.1
Recreational Groundfish																
WA			2.0	**1.0**				--		--		--		--	2.6	2.5
OR			7.0	**4.0**				--		--		--		1.0	2.4	**2.3**
CA	131.0	55.4	14.5	9.3		0.2		--		--		--		8.7	3.1	3.1
TOTAL	**263.0**	**118.3**	**84.6**	**72.7**	**3.0**	**2.1**	**295.7**	**286.0**	**1,160.4**	**1,147.1**	**156.8**	**150.2**	**601.0**	**565.9**	**17.0**	**16.3**
2012 Harvest Specification g/	**274**	**274**	**107**	**107**	**3.0**	**3.0**	**296**	**296**	**1,160**	**1,160**	**157**	**157**	**600**	**600**	**17**	**17**
Difference	11.0	155.7	22.4	34.3	0.0	0.9	0.3	10.0	-0.4	12.9	0.2	6.8	-1.0	34.1	0.0	0.7
Percent of OY	96.0%	43.2%	79.1%	67.9%	100.0%	70.0%	99.9%	96.6%	100.0%	98.9%	99.9%	95.7%	100.2%	94.3%	100.0%	95.9%

Key:

(hatched)	= not applicable
--	= trace, less than 0.1 mt
(black)	= Fixed Values
(light blue)	= off the top deductions

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

g/ The POP ACL is 183 mt, while the HG is 157 mt

Agenda Item F.6.b
Supplemental NMFS Report
March 2012

West Coast Groundfish IFQ Fishery Catch Summary for 2011: First Look

Sean E. Matson, Ph.D.

National Marine Fisheries Service

NWR, Sustainable Fisheries Division

February 26, 2012

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Rebuilding species catch by fleet 27

Purpose

The purpose of this report is to summarize and illustrate preliminary catch data and trends for the 2011 West Coast Groundfish IFQ Fishery, and to compare them with historical catch for the analogous fisheries before IFQ, the Limited Entry Bottom Trawl (LET) fishery and the Shoreside Whiting Fishery (SSW). This is not meant to be an exhaustive report, but to present an early examination of the data, and divide catch estimates among strata which are of interest to many stakeholders.

Summary

Preliminary data show that in 2011 (the first year under IFQ management), overall non-whiting IFQ species landings were down compared with the historical average, revenues were up; and for the directed shoreside whiting fleet, both landings and revenues were up. Retention rates were generally much higher than in the past. Although the fishery got off to a slow start in 2011, it finished with the month of December having the highest monthly landings of 2011, and higher landings than any other December during the baseline period of 2006-2010. Monthly non-whiting fleet revenues for August, September, October and December of 2011 were higher than the highest observed value for the same month in the baseline period.

The 2011 IFQ fishery may have begun slowly, as many harvesters participated in the Dungeness crab fishery (in contrast to this winter's Dungeness crab fishery which was delayed, and offered less distraction from IFQ sector fishing during December). Harvesters apparently made a final push for landings in December, perhaps feeling relatively more secure that their quota pounds for bycatch species were sufficient to last the year. Except for landings in December, which were 71 percent higher than the historical average, and June's which equaled the historical average, landings in the remaining months of 2011 were below the average observed during the 2006-10 baseline period.

Although landings were lower, revenues in 2011 were up by 14 percent in the non-whiting portion of the shoreside IFQ fishery, compared to the historical average. Non-whiting fishery participation decreased slightly, with 10 fewer vessels fishing in 2011 compared to 2010. Astoria, Newport, and Westport were the dominant ports for IFQ landings in 2011, and Astoria was the only port to increase its share of trawl fishery landings compared to 2010. Fixed gear accounted for six percent of non-whiting IFQ landings by weight but 22.6 percent of revenues, mainly driven by the high price for fixed gear caught sablefish (39 percent of sablefish IFQ landings were made using fixed gear). Shoreside whiting landings and revenue both increased dramatically, with landings up by 40 percent and revenues up by 121 percent compared to the historical average.

Retention rates for the non-whiting IFQ fleet were higher for most species examined, in 2011 compared with previous years, and substantially higher for most rebuilding species. Discards accounted for 4.8 percent of nonwhiting IFQ fleet catch. When combined with whiting catch, the overall discard rate was 1.3 percent. Catch of rebuilding species was generally lower than in 2010, with the exception of canary rockfish, which increased by 0.4 mt (to 2.8 mt); however was still well below the fishery's allocation of

25.9 mt. Catch of most other rebuilding species declined by two-thirds or more with the exception of petrale sole, which is managed as a target species under its rebuilding plan. Similar declines in rebuilding species bycatch were recorded in the directed whiting IFQ fishery.

How the data are described in this report

In this report, the West Coast Groundfish Individual Fishing Quota (IFQ) Fishery during 2011 is compared to its analogous predecessors, the Limited Entry Bottom Trawl (LET) Fishery, and the directed shoreside whiting fishery (SSW), both combined and separately, over the baseline period of 2006 through 2010.

Catch data originated from five sources: electronic, IFQ landing receipts from 2011 were provided from the Pacific States Marine Fisheries Commission (PSMFC), along with data from “paper” landing receipts, from 2006 through 2010, which were accessed from tables in the Pacific Fisheries Information Network (PacFIN), one of PSMFC’s databases. Those data included landings, ex-vessel revenue, gear type, vessel, and port information. Landings and discard data for groundfish in IFQ species categories during 2011 was obtained from the National Marine Fisheries Service’s (NMFS) IFQ Vessel Accounts (VA) database. Summarized discarded and retained catch estimates for 2010 were obtained from the annual Groundfish Mortality Report, of the Fisheries Resource Analysis and Monitoring Division (FRAM) of NMFS, and the annual Pacific Whiting Fishery Summary, from the NMFS Northwest Region. Crab and shrimp landings and vessel information were obtained from PacFIN.

Landed and discarded catch is reported in round weight. Revenue is reported as ex-vessel revenue, and is not adjusted for inflation or other factors. Discarded catch was discarded at sea, and dockside discard is not included in this report. Total catch refers simply to the sum of landed and discarded catch. Bycatch refers to fish that were caught along with the intended target species, whether they were landed or discarded. The terms landing receipt, fish ticket, and ticket are synonymous in this report. Non-whiting and shoreside directed whiting fleets were separated by weight of landings by species in each trip. If a trip contained greater than 50 percent Pacific whiting, and was landed by trawl gear, it was considered a directed whiting trip, and those landings and revenue are presented under the shoreside whiting fleet in this report (as within PacFIN). All other landings of groundfish by trawl gear with a valid limited entry permit were considered part of the non-whiting fleet for that period. For 2011, IFQ trips were delineated directly on electronic tickets, and groundfish were landed in the IFQ fishery with fixed gear as well as trawl gear.

Consideration of data sources, timeliness, and accuracy

The results in this report should be considered preliminary due to how recent the data are, and that they originated from many different sources. Electronic landing receipts provide a welcome, nearly real-time look at the progress of the fishery, they provide fields not available in the NMFS IFQ vessel accounts database, such as revenue, gear type, etc., and they are available months before data from paper landing receipts are complete in the PacFIN database. The sums of landings for most strata show extremely close agreement between the electronic tickets the NMFS vessel account system. Other fields, used to divide those landings at finer scale for comparison with previous years, such as port of landing and vessel ID, however, can produce somewhat different results between the two systems. The relative accuracy of estimates will tend to be higher at higher aggregate levels (fishery, fleet, year), and be reduced at finer levels of aggregation (port, vessel, species).

Since this report relies heavily on electronic landing receipt data for 2011, it should not be considered the final word on fishery estimates for that year. Rather, the paper fish ticket data, which has had more opportunity for correction of fields like vessel ID, gear, and port of landing fields, as well as landings themselves would logically be a more accurate, source of long-term information. In addition, some additional discarded catch data may be submitted to the NMFS vessel account system between now and April, which could change results slightly. This report is based on the best currently available scientific and management information.

Annual landings and revenue

Annual landings and revenue from 2006 through 2011 are summarized by fleet in Table 1 and Figures 1 through 3. Preliminary data show that in 2011 (the first year under IFQ management), overall non-whiting IFQ species landings were down compared with the historical average, revenues were up; and for the directed shoreside whiting fleet, both landings and revenues were up. Landings of groundfish in the non-whiting fleet rose from 2006 to 2009, but have been decreasing since then, including 2011 (Figure 1). Revenues from those landings have shown a similar trend until 2011, when they rose to 14 percent above the historical average (baseline period = 2006-2010, Table 1).

For the shoreside directed whiting fleet, both landings and revenue generally decreased from 2006 to 2009, but have both increased in 2010 and 2011. Landings from directed whiting trips were 40 percent higher in 2011 than the historical average, but the revenue from those landings was 121 percent higher (Table 1, Figure 2).

Monthly non-whiting fleet landings

Monthly landings and revenue for the non-whiting fleet are summarized in Table 2 and Figure 4. The pattern of monthly landings in the non-whiting fleet normally takes a dome shape through the year, and January and December are typically the lowest months (Figure 4, Table 2). Landings of groundfish by the non-whiting fleet began lower than usual in January of 2011, likely due to a combination of factors including late opening of the fishery, unfamiliarity with the new system, and accompanying apprehension of whether quotas of bycatch species would be enough to last the year, as well as participation by IFQ vessels in the Dungeness crab fishery (demonstrated in the mid-year IFQ catch report). Monthly landings continued to be lower than average throughout the year, except for June and

December. December landings, instead of being lowest of the year, as was the recent historical norm, (Figure 4), were the highest of any month in 2011, or for any December in the baseline period; they were 71 percent higher than the historical average. Harvesters apparently made a final push for landings in December, perhaps feeling relatively more secure that their quota pounds for bycatch species were sufficient, given the late date. Monthly total catch of each IFQ species category by the non-whiting fleet is shown in Table 3.

There was a strong, negative relationship between counts of IFQ vessels which landed crab (Figure 5, Table 4), which was overwhelmingly composed of Dungeness crab in the winter months (Table 5), and counts of those landing groundfish in 2011 (only vessels which landed more than 1,000 pounds in a management group were counted). This is a logical part of a likely explanation for a slow January start to IFQ fishing. The relationship was shown in the mid-year IFQ report specifically between Dungeness crab specifically, and groundfish IFQ participation; here it is shown between groundfish landings, and landings in the crab management group. The species composition of the crab landings is shown in Table 5, according to PacFIN SPID descriptions. Considering levels of participation in both fisheries, the late start to the Dungeness crab season this winter may have allowed time to catch considerable IFQ pounds and Dungeness crab as well, as 32 IFQ vessels landed crab in December, and 48 landed groundfish, according to fish ticket data from PacFIN, as of February 21, 2012. The vessel counts are larger for groundfish than crab in December, when IFQ catch spiked; in January, the ratio of vessel counts was the opposite, when IFQ catch was lower than average. Catch composition was greater than 99.5 percent Dungeness crab in both January and December. It should also be noted that December 2011 landings were still not considered greater than 90 percent complete when this report was prepared.

There was also a relatively weak negative relationship between monthly counts of IFQ vessels landing more than 1,000 pounds of shrimp species, and those landing more than 1,000 pounds of groundfish throughout 2011 (Figure 5), suggesting shrimp was less of a distraction from IFQ groundfish.

Monthly non-whiting fleet revenue

The typical monthly revenue pattern for the non-whiting fleet assumes a somewhat flatter trajectory than landings, and it normally dips in December (Figure 6, Table 6). Revenues increased in the second half of 2011, as fishermen became more comfortable with the new system and its advantages. October and December of 2011 were particularly good months for fishermen, with revenues about double the five-year average. December revenue was much higher than usual, which accompanied increased landings for many target species, including Dover sole, arrowtooth flounder, yellowtail rockfish (dramatic), lingcod and petrale sole (Table 3), but the September and October revenue spike was accompanied by large increases in sablefish landings especially, when monthly landings of other target species were down. September and October had the highest prices of the year for sablefish landed by the non-whiting fleet (within IFQ); the average price per pound in September was $3.23, and in October it was $3.37, while the annual average was $2.73. The price per pound for sablefish has been steadily rising in this sector since 2006, when it was $1.45, to 2008, when it was $1.89; to 2010 it was $2.05, and in 2011 it was $2.73.

Monthly shoreside directed whiting landings

The pattern of monthly landings in the shoreside, directed whiting fleet for 2011 reveals a protracted, uninterrupted season of fishing under IFQ, in contrast to many recent seasons, including that of 2009, when the fishery allocation was reached in July, and the season ended early (Figure 7, Table 7). Erratic patterns of monthly landings and short season lengths were common within the baseline period.

Average annual vessel landings and revenue

The pattern for annual, average vessel landings and revenue in the non-whiting fleet was similar to that of annual fleet landings (Figure 8, Table 8); average vessel landings were lower in 2011 (95 percent of the historical average), and average vessel revenues were higher (134 percent of historical average). Average vessel landings and revenues assumed similar trajectories across years as annual fleet levels. Fleet participation (vessel counts), estimated from electronic and paper landing receipts (as described earlier), was approximately 85 percent of the historical average for the non-whiting fleet.

The annual landing and revenue patterns for directed whiting fleet also were reflected in the average annual vessel estimates. Average annual vessel landings for 2011 were up dramatically, at 179 percent of their historical average levels, while revenue was estimated at 283 percent of baseline average levels (Figure 9, Table 9).

Landings by port

Distribution of landings among ports for non-whiting and shoreside whiting fleets combined is illustrated in Figure 10 and Table 10. Astoria remained the dominant port, with 45 percent of the landings overall, an increase of 20 percent since the previous year, 2010, when it was 20 percent. Astoria was followed by Newport with 24 percent, and Westport with 18 percent. Newport landings were similar to 2010, although Westport landings dropped by approximately 11 percent in 2011, from 29 percent in 2010. Four ports did not show landings recorded in 2011 which did the previous year, including Blaine and Neah Bay, Washington; Tillamook, Oregon; and Bodega Bay, California, according to electronic landing receipts, while Avila was newly reported as a port of landings in this sector for 2011. Smaller ports were combined with others in Table 10, for confidentiality.

Landings and revenue by gear type

Gear switching under IFQ made a larger impact on revenue distribution by gear than it did landings distribution, as seen in Figure 11 and Table 11, which show that although fixed gear catch made up only about 1 percent of total IFQ landings by weight, the revenue from those landings were worth approximately 13 percent of the annual revenue.

Fixed gear accounted for six percent of non-whiting IFQ landings by weight but 22.6 percent of non-whiting fleet revenues (Figure 12, Table 12), likely driven by the high prices received for fixed gear caught sablefish. Thirty-nine percent of sablefish IFQ landings in 2011 were made using fixed gear. Fixed gear caught sablefish brought an average of $2.95 per pound in 2011, in the non-whiting IFQ fleet, while trawl caught sablefish brought $2.59 per pound. Revenue distribution by gear for sablefish is extremely similar to that of landings, unlike all non-whiting catch combined (Figure 13, Table 13).

Effort by fleet and gear type

The number of trips taken by the non-whiting fleet decreased substantially in 2011 (to 55 percent of the historical average), although the average pounds landed per trip increased substantially (to 146 percent of the historical average, Table 14). For directed shoreside whiting, both the number of trips and average weight per trip increased in 2011 (115 percent and 114 percent of historical average, respectively). Tables 14 and 15 show the annual number of trips, and average pounds landed per trip for each year since 2006, and the historical average. Figure 14 and Table 16 show the distribution of total trips by gear, for IFQ in 2011, where most trips taken were made using non-midwater trawl (47 percent), 39 percent were made using midwater trawl, nine percent were made with pot gear, and five percent with hook and line gear.

Non-whiting fishery participation decreased slightly, with 10 fewer vessels fishing in 2011 compared to 2010 (108 in 2011 versus 118 in 2010, Table 8). For the shoreside directed whiting IFQ fleet, the number of vessels has dropped as well; by seven from 2010, according to vessel ID numbers on electronic fish tickets (from 36 to 29), or by 10, (from 36 to 26) according to the NMFS VA system, using vessel ID numbers or vessel names. The difference in counts between databases could not be resolved at this time, although it could be the result of more than one type of vessel ID being listed for some directed whiting vessels on the original electronic fish tickets, which would later be corrected in the NMFS vessel accounts system. The likely effect of such an error, assuming it is only present in 2011 electronic fish tickets, would be to downwardly bias vessel-level estimates of landings and revenue for the shoreside directed whiting fleet in 2011, under IFQ. If the phenomenon were present in historical fish ticket data as well, it is assumed there would be little or no biasing effect on comparisons between relative pre- and post-IFQ participation. Non-whiting fleet vessel counts for 2011 match between electronic landing receipts and the NMFS vessel account system.

Total catch and attainment by IFQ species categories

Table 17 shows total catch and attainment of IFQ fishery allocations by IFQ species category, as of January 30, taken from the NMFS IFQ vessel accounts system. Amounts for discards and landings for some species are expected to change slightly through April, as the last observer data continues to be reconciled.

In total, 64.6 percent of the IFQ groundfish allocation was reached. For Pacific whiting, 98.3 percent of that species allocation alone was reached, while 24 percent of the total allocation for all other species combined was harvested. Not considering any flatfish, most of which have been historically underutilized, 37% of the sum of the remaining target species allocations was harvested.

Looking at rebuilding species and Pacific halibut, 8.9 percent of the Bocaccio rockfish allocation was taken, 14.2 percent of canary rockfish, one percent of cowcod, 36.2 percent of darkblotched rockfish, 93.2 percent of petrale sole, 40.2 percent of widow rockfish, and 9.7 percent of yelloweye rockfish.

Table 18 shows total catch, separated into landings and discards in pounds, by fleet, within the 2011 IFQ groundfish fishery, while Table 19 displays landings and as percent of total catch, with the same structure.

Retention rates by species

Retention rates for many species, particularly rebuilding species, within the non-whiting IFQ fleet were much higher in 2011 compared with 2010 (Table 20 and Figure 15), according to data taken from the NMFS IFQ vessel accounts system on January 30, 2012. The highest increases in retention rates were seen in Bocaccio rockfish (83 percent; from 17 percent in 2010, to approximately 100 percent in 2011), cowcod (82 percent), widow rockfish (83 percent), and yelloweye rockfish (82 percent), and the target species, yellowtail rockfish (55 percent). Discards accounted for approximately 4.8 percent of nonwhiting IFQ fleet catch overall. When combined with whiting catch, the overall discard rate was approximately 1.3 percent.

Bycatch of rebuilding species

Catch of rebuilding species was generally lower in the non-whiting fleet in 2011 than in 2010, including reductions ranging between 10 and 97 percent of 2010 levels (Table 21). The exception to this for the non-whiting fleet was canary rockfish, which increased by 0.4 mt (20 percent, to 2.8 mt); however was still well below the fishery's allocation of 25.9 mt.

Similar declines in rebuilding species bycatch were recorded in the directed whiting fleet within the IFQ fishery, including a 79 percent reduction in canary rockfish, a 73 percent reduction in darkblotched rockfish, and a 96 percent reduction in Pacific ocean perch (Table 21). Catch of widow rockfish in the shoreside whiting fleet increased in 2011, by 124 percent of its 2010 level. However, total catch of widow rockfish in the IFQ sector remained well within the allocation (40 percent of the allocation). The limited entry, shoreside whiting fishery has been combined under IFQ with what was the non-whiting limited entry trawl fishery. The previous shoreside whiting fishery was conducted under an exempted fishing permit from 1995 to 2010, in which 100 percent retention of catch to port (100 percent landing) was mandatory; thus comparisons of voluntary fishery discard at sea are not possible. However, even though retention is not mandatory after trawl rationalization, discards in the shoreside whiting sector in 2011 were only one percent; 99 percent of the catch was landed. Ninety-eight percent of that one percent which was discarded, was comprised of Pacific whiting, only two percent was other IFQ groundfish species. As mentioned earlier in this report, some data continue to come in through the observer program, and some catch estimates may increase slightly through the spring.

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Table 1. Annual landings and revenue for the West Coast Groundfish IFQ Fishery in 2011, and the LET and SSW fleets in 2006-2010. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

	Non-whiting trips		Directed whiting trips		Both fleets combined	
Year	landings	revenue	landings	revenue	landings	revenue
2006	39,404,780	23,128,507	214,681,696	12,609,826	254,086,476	35,738,333
2007	45,759,542	25,561,475	161,829,734	11,394,728	207,589,276	36,956,203
2008	53,795,497	31,767,767	112,048,616	11,610,034	165,844,113	43,377,801
2009	58,033,985	30,686,871	88,952,163	5,331,684	146,986,148	36,018,555
2010	50,289,281	25,668,012	138,407,048	9,820,517	188,696,329	35,488,530
2011	40,187,042	31,230,936	201,040,491	22,478,210	241,227,533	53,709,146
Hist. ave.	49,456,617	27,362,527	143,183,851	10,153,358	192,640,468	37,515,884
2011/hist.	81%	114%	140%	221%	125%	143%

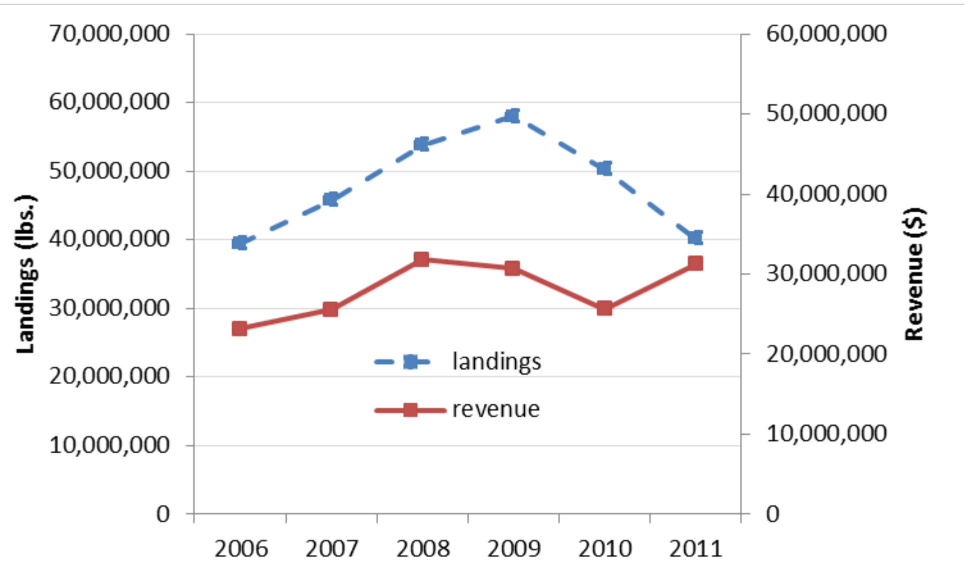


Figure 1. Annual landings and revenue from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the, LET fleet in 2006-2010. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

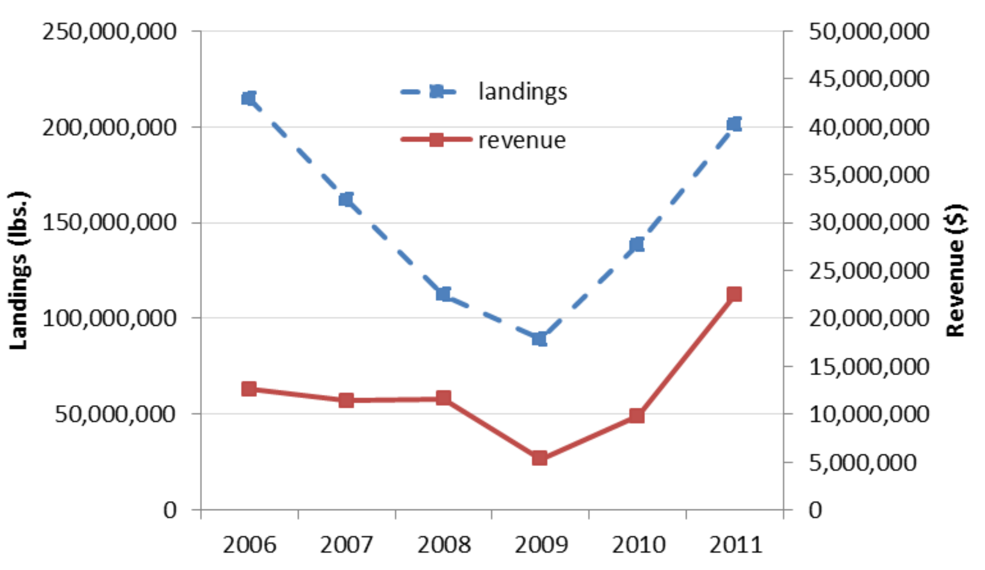


Figure 2. Annual landings and revenue from directed whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the SSW fleet in 2006-2010. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

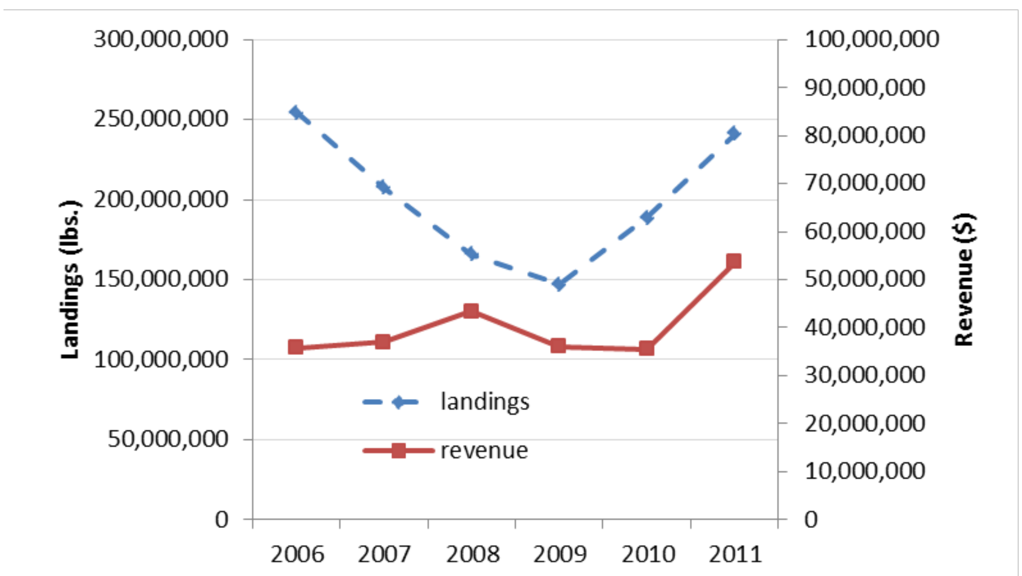


Figure 3. Annual landings and revenue from directed whiting and non-whiting trips combined, in the West Coast Groundfish IFQ Fishery in 2011, and the LET and SSW fleets in 2006-2010. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

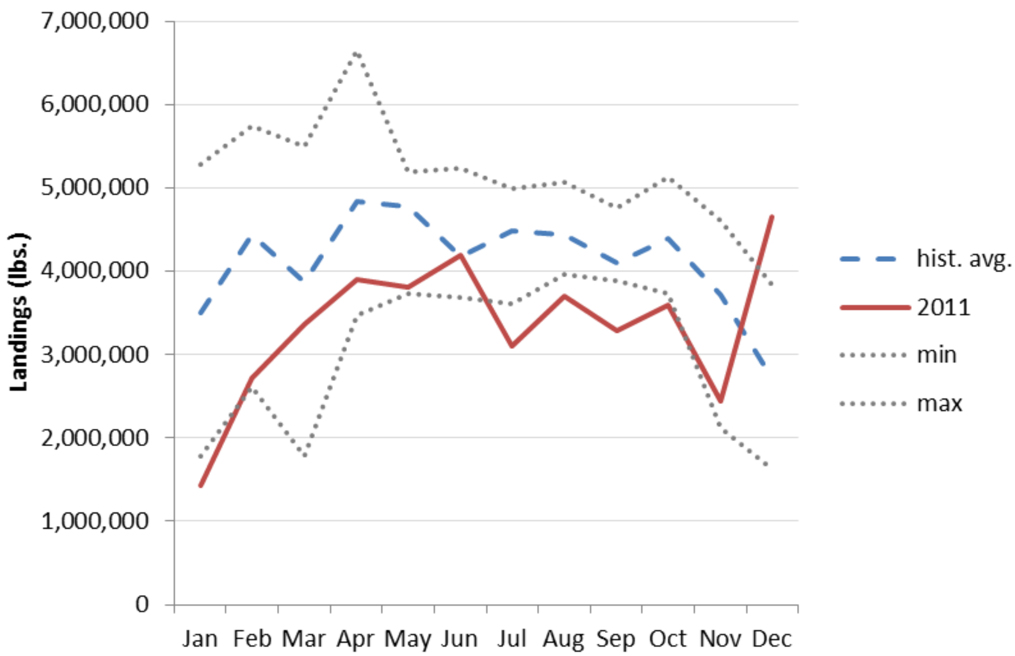


Figure 4. Monthly landings from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Table 2. Monthly landings from non-whiting trips, in the West Coast Groundfish IFQ fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Month	2010	Hist. avg.	2011	2011/hist.
Jan	2,551,153	3,497,340	1,432,686	41%
Feb	5,737,527	4,442,867	2,718,130	61%
Mar	5,095,086	3,877,602	3,359,287	87%
Apr	5,169,514	4,832,963	3,903,807	81%
May	5,188,988	4,783,448	3,802,662	79%
Jun	4,386,217	4,171,979	4,191,228	100%
Jul	4,611,693	4,486,328	3,108,350	69%
Aug	4,288,817	4,434,665	3,693,794	83%
Sep	3,879,623	4,103,968	3,293,110	80%
Oct	3,734,929	4,397,929	3,596,528	82%
Nov	4,020,645	3,712,671	2,435,106	66%
Dec	1,625,089	2,714,856	4,652,354	171%
Total	50,289,281	49,456,617	40,187,042	81%

Table 3. Monthly 2011 total catch of IFQ species categories by the non-whiting fleet. Source: NMFS West Coast Groundfish IFQ Vessel Accounts System.

Row Labels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum
Arrowtooth flounder	145,965	370,570	522,793	561,883	916,127	804,901	528,996	382,944	204,447	278,992	251,394	557,083	5,526,095
Bocaccio rockfish South of 40°10' N.						1,716	946	515	1,741	1,414	899	4,484	11,715
Canary rockfish	4	56	33	38	113	449	2,448	1,113	619	799	44	523	6,239
Chilipepper rockfish South of 40°10' N.	6		51	672	1,393	22,305	121,749	70,453	293,661	115,320	49,511	13,066	688,187
Cowcod South of 40°10' N.				8				9	6	14	2		39
Darkblotched rockfish	2,862	13,662	11,024	8,228	22,018	12,028	5,597	7,230	4,766	10,151	20,036	79,818	197,420
Dover sole	794,070	1,161,616	1,919,382	2,282,658	1,610,362	1,443,232	1,050,453	1,506,781	1,334,505	1,356,609	1,056,199	1,765,288	17,281,155
English sole	2,901	8,263	5,259	12,651	21,760	29,683	58,345	62,342	34,656	29,770	11,252	25,947	302,829
Lingcod	322	79,929	101,044	731	10,789	35,276	87,424	103,059	29,502	35,604	12,394	132,835	628,909
Longspine thornyheads North of 34°27' N.	93,239	191,963	145,258	232,146	205,569	327,454	199,600	141,842	169,609	184,145	93,884	136,253	2,120,962
Minor shelf rockfish North of 40°10' N.	33	602	1,337	575	1,200	7,015	6,605	4,432	1,983	1,339	1,044	5,508	31,673
Minor shelf rockfish South of 40°10' N.			10	362	38	33	690	601	1,807	1,314	493	1,285	6,633
Minor slope rockfish North of 40°10' N.	2,852	11,168	12,640	14,318	66,956	33,225	8,079	10,189	15,796	50,423	28,382	42,088	296,116
Minor slope rockfish South of 40°10' N.	426	72	431	1,674	3,002	11,728	3,799	17,979	27,447	9,884	9,079	28,349	113,870
Other flatfish	21,203	55,312	29,210	82,378	128,161	241,731	265,370	267,249	135,031	139,927	66,434	91,863	1,523,869
Pacific cod	273	564	382	35,705	47,790	129,459	103,992	184,065	16,374	25,491	700	9,368	554,163
Pacific halibut (IBQ) North of 40°10' N.	1,794	4,148	7,257	5,772	7,572	4,434	22,437	11,913	2,836	5,411	2,724	4,689	80,987
Pacific ocean perch North of 40°10' N.	1,632	4,045	6,818	2,271	14,312	8,417	4,002	4,382	1,466	10,667	11,726	31,092	100,830
Pacific whiting	16,835	16,695	16,235	20,890	36,257	50,633	48,729	48,132	50,434	50,105	46,918	80,791	482,654
Petrale sole	91,647	253,484	147,094	23,213	38,902	80,108	136,626	188,315	104,206	149,129	115,946	460,396	1,789,066
Sablefish North of 36° N.	155,107	239,357	293,110	403,487	406,628	451,485	284,421	443,457	694,902	985,713	406,762	456,862	5,221,291
Sablefish South of 36° N.				6,860	6,695	214,817	159,714	89,247	111,723	83,614	132,910	206,608	1,012,188
Shortspine thornyheads North of 34°27' N.	54,853	92,848	97,707	154,097	208,243	196,756	97,508	107,263	100,901	141,205	127,216	191,626	1,570,223
Shortspine thornyheads South of 34°27' N.									7,179	3,555	3,477	4,433	18,644
Splitnose rockfish South of 40°10' N.	1,433	4	1,128	1,255	2,182	5,086	2,661	13,993	9,092	10,009	15,427	25,780	88,050
Starry flounder		933	859	1,176	2,486	7,548	4,353	4,577	1,917	1,773	7	305	25,934
Widow rockfish	65	143	335	305	899	7,656	4,818	1,311	5,489	232	1,512	9,160	31,925
Yelloweye rockfish		10	5		27	1	7	18	3	32		25	128
Yellowtail rockfish North of 40°10' N.	214	103	26,785	1,050	8,443	87,329	94,248	35,062	15,404	6,384	7,653	410,183	692,858
Sum	1,387,736	2,505,547	3,346,187	3,854,403	3,767,924	4,214,505	3,303,617	3,708,473	3,377,502	3,689,025	2,474,025	4,775,708	40,404,652

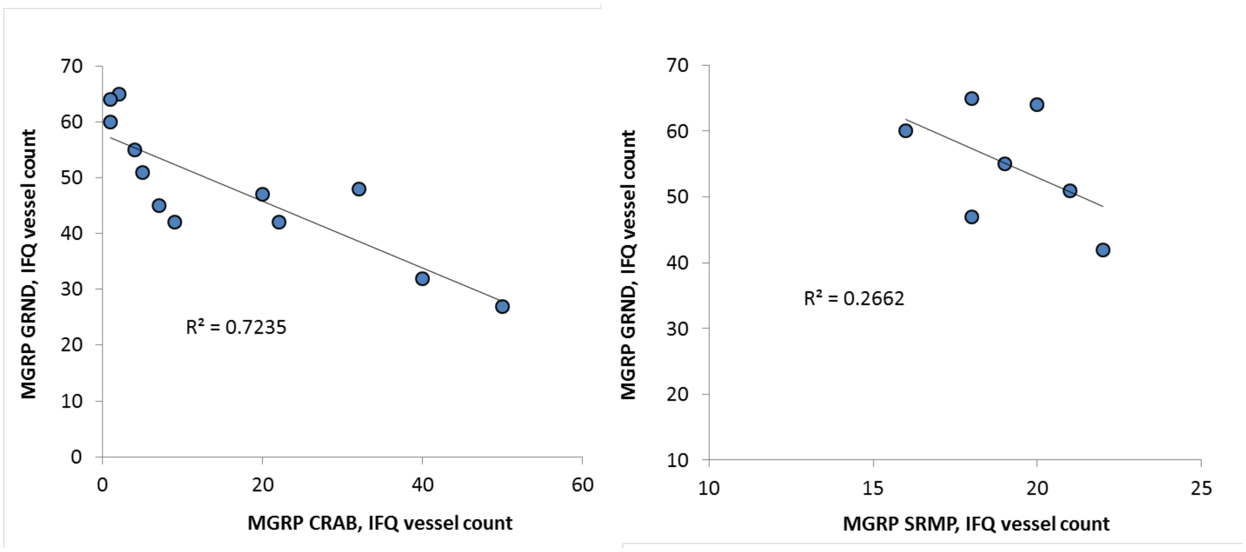


Figure 5. Scatterplots of monthly counts of IFQ vessels which landed either crab or shrimp, versus groundfish in PFMC areas during 2011. No shrimp landings were recorded for IFQ vessels in January, February, March, November, or December of 2011. Source: PacFIN, February 21, 2012. Vessels were only counted if they landed more than 1,000 pounds.

Table 4. Monthly counts of IFQ vessels which landed species within the crab, shrimp groundfish management groups in PFMC areas in 2011. Vessels were only counted if they landed more than 1,000 pounds. No shrimp landings were recorded for IFQ vessels in January, February, March, November, or December of 2011. Source: PacFIN, February 21, 2012. It is important to note that December landings in PacFIN were not considered more than 90 percent complete at the time of this report.

Month	CRAB	GRND	SRMP
Jan	50	27	0
Feb	40	32	0
Mar	22	42	0
Apr	20	47	18
May	9	42	22
Jun	5	51	21
Jul	4	55	19
Aug	2	65	18
Sep	1	64	20
Oct	1	60	16
Nov	7	45	0
Dec	32	48	0

Table 5. Monthly species compositions and total pounds landed, in the crab management group, in PFMC areas, during 2011. It is important to note that December landings in PacFIN were not considered more than 90 percent complete at the time of this report.

SPID description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bairdi tanner	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dungeness	99.5%	98.6%	96.2%	94.0%	87.1%	78.9%	60.6%	57.1%	40.1%	12.0%	86.0%	99.8%
Opilio tanner	0.0%	0.1%	0.2%	0.2%	0.2%	0.6%	1.2%	1.4%	1.3%	4.0%	0.7%	0.0%
Rock	0.4%	1.3%	3.6%	5.7%	12.6%	20.4%	38.2%	41.5%	58.6%	83.6%	13.3%	0.2%
Unspecified	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%
Unsp. king	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unsp. tanner	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sum lbs. (x 1,000)	19,377	6,815	3,153	2,292	1,240	745	406	358	231	106	591	15,721

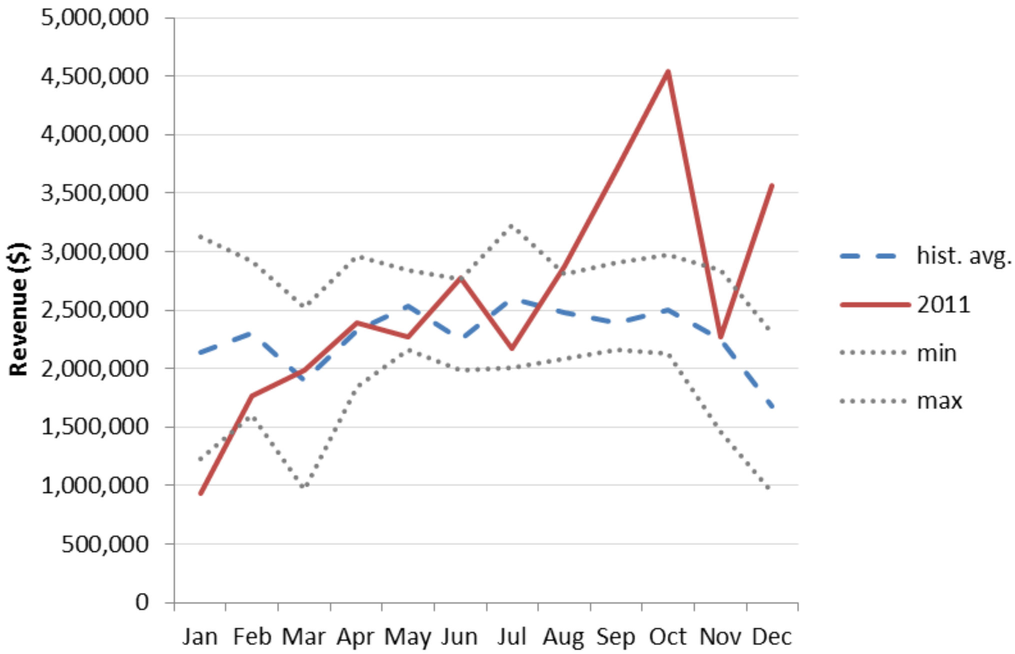


Figure 6. Monthly revenue from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Table 6. Monthly revenue from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Month	2010	Hist. avg.	2011	2011/hist.
Jan	1,465,940	2,139,589	935,310	44%
Feb	2,548,515	2,301,100	1,766,921	77%
Mar	2,327,689	1,892,842	1,981,980	105%
Apr	2,348,443	2,330,254	2,390,985	103%
May	2,581,292	2,534,425	2,272,672	90%
Jun	2,153,959	2,253,992	2,771,733	123%
Jul	2,554,229	2,600,465	2,168,590	83%
Aug	2,085,806	2,484,382	2,869,549	116%
Sep	2,187,365	2,396,678	3,703,198	155%
Oct	2,125,783	2,500,639	4,536,757	181%
Nov	2,340,188	2,253,103	2,270,570	101%
Dec	948,802	1,675,057	3,562,670	213%
Total	25,668,012	27,362,527	31,230,936	114%

Figure 7. Monthly landings by the shoreside, directed whiting fleet, for 2009-2011. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

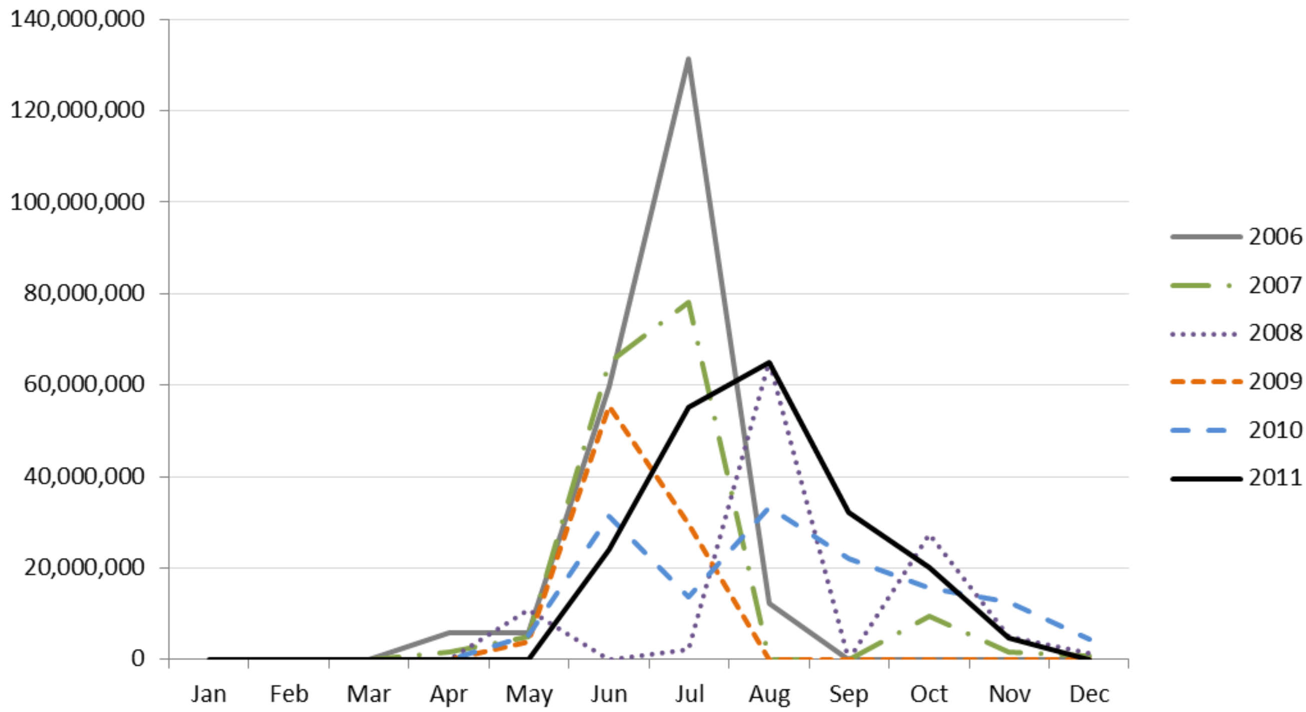


Table 7. Monthly landings by the shoreside, directed whiting fleet, for 2009-2011. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Month	2006	2007	2008	2009	2010	2011
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	5,748,067	1,555,539	0	0	0	0
May	5,750,974	5,034,462	10,799,754	3,963,481	5,400,561	0
Jun	59,588,381	65,034,296	81,160	55,349,911	31,288,665	24,051,963
Jul	131,320,837	78,245,030	2,085,860	29,638,771	13,694,947	55,183,299
Aug	12,273,437	0	65,356,458	0	33,306,949	65,047,304
Sep	0	0	0	0	22,071,296	32,059,087
Oct	0	9,543,111	27,443,038	0	15,748,347	20,065,504
Nov	0	1,550,796	5,052,808	0	12,508,431	4,633,334
Dec	0	866,500	1,229,538	0	4,382,434	0
Sum	214,681,696	161,829,734	112,048,616	88,952,163	138,407,048	201,040,491

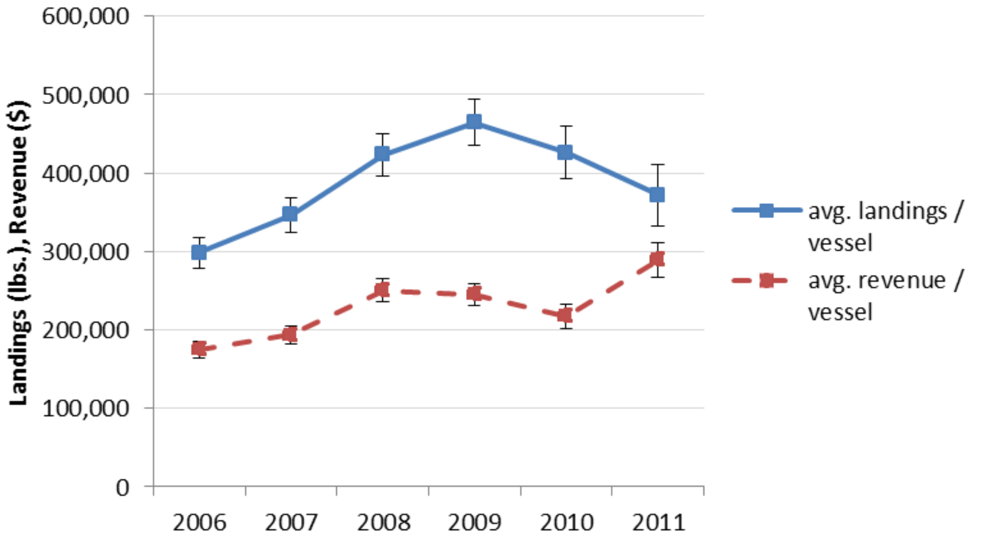


Figure 8. Average annual vessel landings and revenue, from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Whiskers display ±1 standard error. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Table 8. Average annual vessel landings and revenue, from non-whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

	2006	2007	2008	2009	2010	2011	Hist. avg.	2011/hist.
Vessel count	132	132	127	125	118	108	127	85%
Ave. landings	298,521	346,663	423,587	464,272	426,180	371,707	391,845	95%
S.E.	19,338	22,361	26,882	29,153	33,234	38,841	26,193	-
Ave. revenue	175,216	193,648	250,140	245,495	217,526	289,175	216,405	134%
S.E.	10,914	11,665	14,521	13,757	15,780	22,656	13,327	-

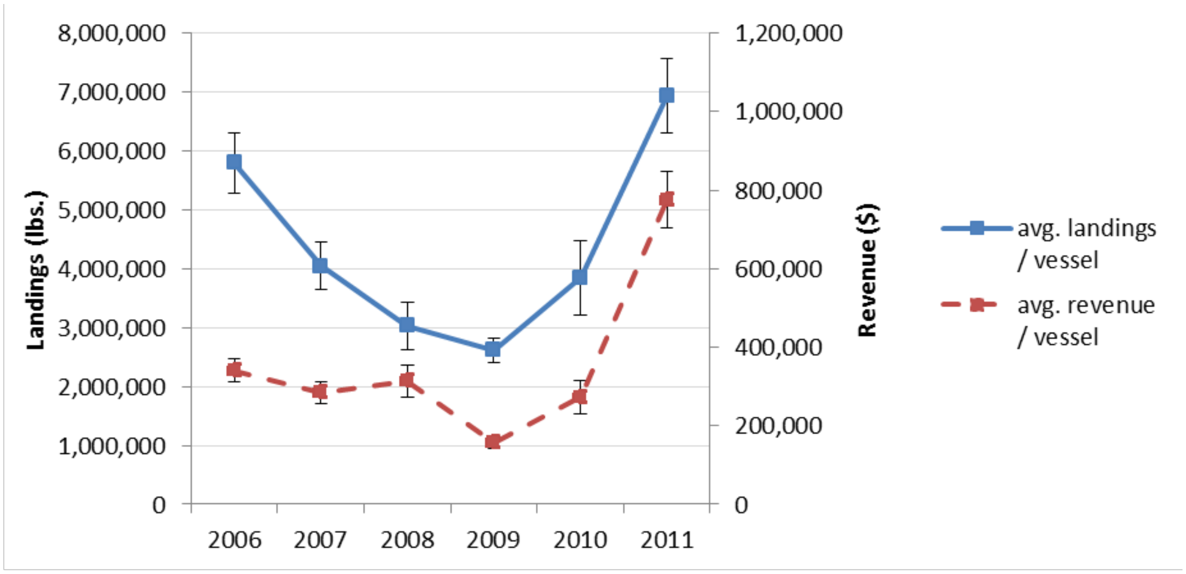


Figure 9. Average annual vessel landings and revenue, from directed shoreside whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Whiskers display ±1 standard error. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Table 9. Average annual vessel landings and revenue, from directed shoreside whiting trips, in the West Coast Groundfish IFQ Fishery in 2011, and the LET fleet in 2006-2010 (historical average). Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

	2006	2007	2008	2009	2010	2011	Hist ave.	2011/hist.
Vessel count	37	40	37	34	36	29	37	79%
Ave. landings	5,802,208	4,045,743	3,028,341	2,616,240	3,844,640	6,932,431	3,867,435	179%
S.E.	511,725	398,738	396,257	207,209	622,707	628,096	427,327	-
Ave. revenue	340,806	284,868	313,785	156,814	272,792	775,111	273,813	283%
S.E.	29,073	28,464	39,876	13,209	43,605	72,688	30,845	-

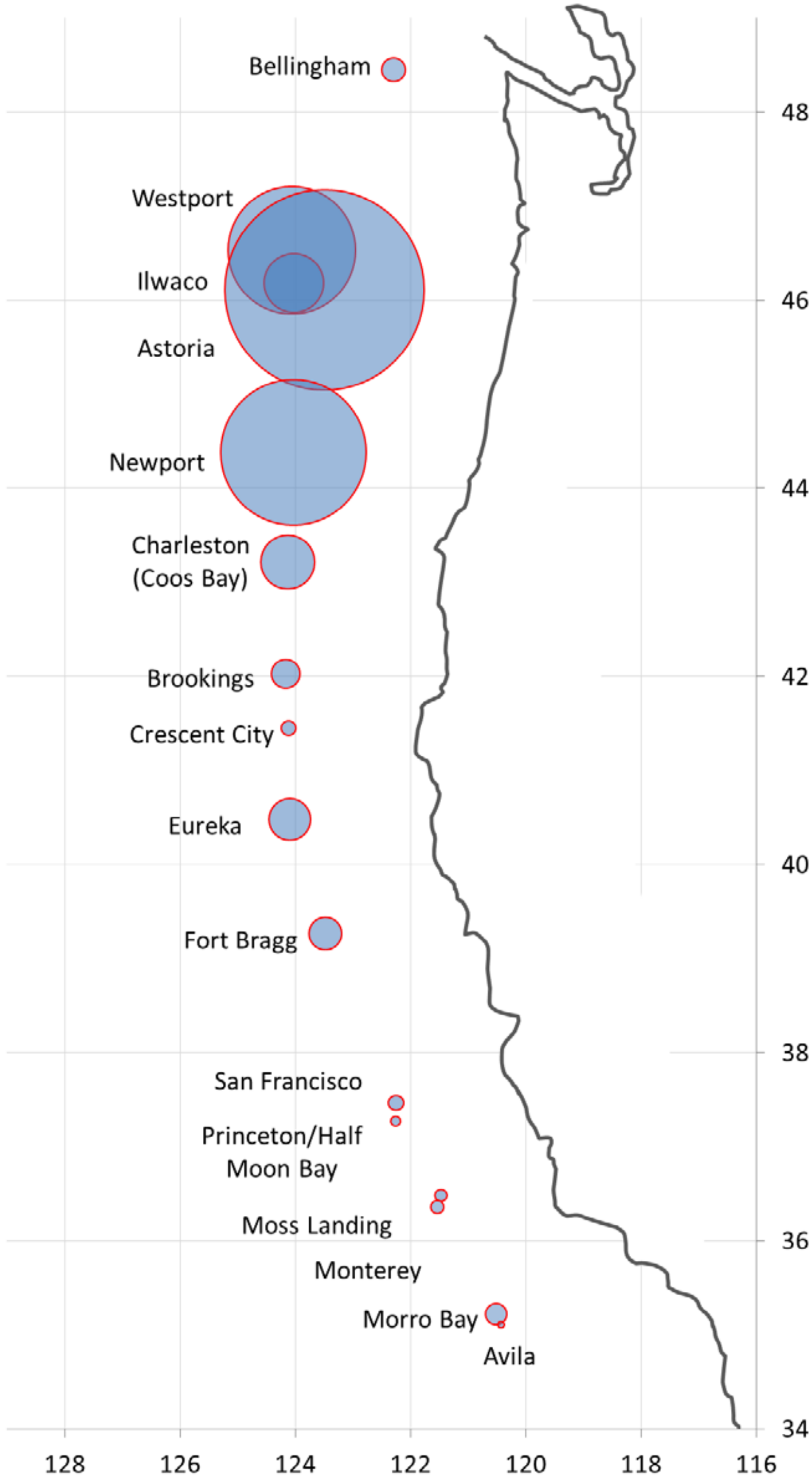
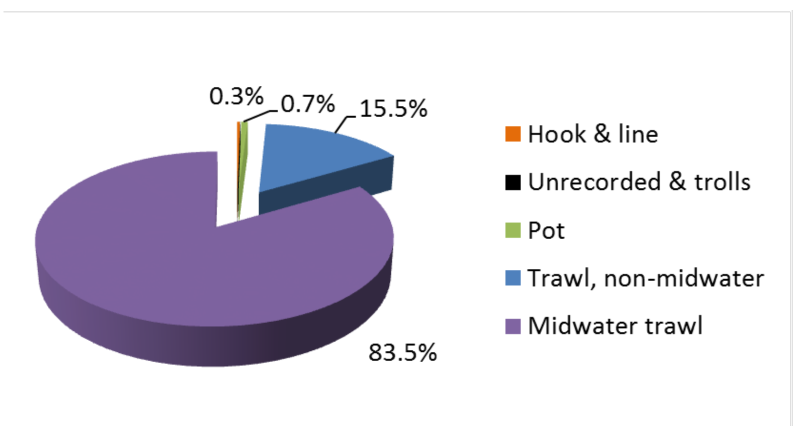


Figure 10. Total IFQ landings for 2011, distributed by port. Some ports shown here are combined in the corresponding table (Table 8) for confidentiality. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2006-2010, PacFIN).

Table 10. Distribution of landings by port, for total IFQ landings in 2011 (right), and LET and shoreside whiting for 2010 (left). Some ports have been combined for confidentiality. Counts equal the number of ports for which landings were reported during 2011. Source: electronic landing receipts (2011, PSMFC) and paper landing receipts (2010, PacFIN).

Port	2010	% of total	2011	% of total	Port
Bellingham, Blaine and Neah Bay	2,839,909	1.5%	1,485,940	0.6%	Bellingham
Westport	55,115,717	29.2%	43,988,336	18.2%	Westport
Ilwaco	10,648,536	5.6%	9,485,995	3.9%	Ilwaco
Astoria	47,457,856	25.2%	107,648,955	44.6%	Astoria
Newport and Tillamook	44,496,181	23.6%	57,299,092	23.8%	Newport
Charleston (Coos Bay)	8,167,223	4.3%	7,953,161	3.3%	Charleston (Coos Bay)
Brookings and Crescent City	8,726,463	4.6%	2,725,441	1.1%	Brookings and Crescent City
Eureka	5,567,653	3.0%	4,719,619	2.0%	Eureka
Fort Bragg	3,454,936	1.8%	2,870,946	1.2%	Fort Bragg
San Francisco, Princeton (Half Moon Bay), and Bodega Bay	1,472,684	0.8%	849,184	0.4%	San Francisco and Princeton (Half Moon Bay)
Moss Landing, Monterey, Morro Bay	749,171	0.4%	2,200,863	0.9%	Moss Landing, Monterey, Morro Bay, Avila
Sum	188,696,329	100.0%	241,227,533	100.0%	Sum
Port count	19		16		Port Count



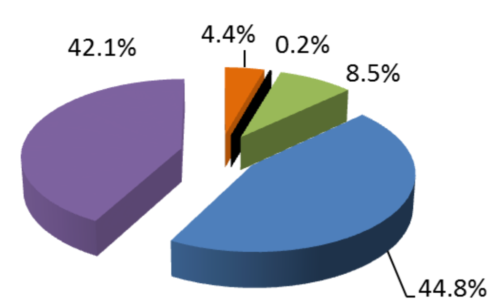


Figure 11. Total 2011 IFQ landings (left) and revenue (right), distributed by gear type.

Table 11. Total 2011 IFQ landings (left) and revenue (right), distributed by gear type.

Gear type	Landings	Percent	Revenue	Percent
Hook & line	678,045	0.3%	2,374,602	4.4%
Unrecorded & trolls	60,643	0.0%	127,838	0.2%
Pot	1,713,069	0.7%	4,541,219	8.5%
Trawl, non-midwater	37,435,009	15.5%	24,041,169	44.8%
Midwater trawl	201,340,767	83.5%	22,624,318	42.1%
Sum	241,227,533	100.0%	53,709,146	100.0%

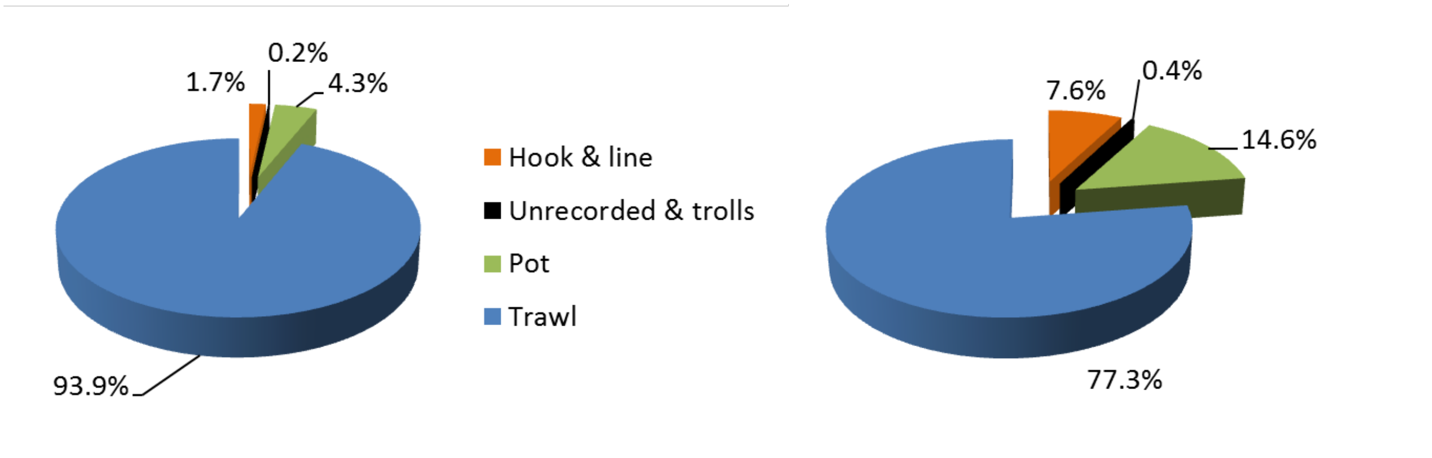


Figure 12. Non-whiting fleet, IFQ landings during 2011 (left) and revenue (right), distributed by gear type.

Table 12. Non-whiting fleet, IFQ landings for 2011 (left) and revenue (right), distributed by gear type.

Gear type	Landings	Percent	Revenue	Percent
Hook & line	678,045	1.7%	2,374,602	7.6%
Unrecorded & trolls	60,643	0.2%	127,838	0.4%
Pot	1,713,069	4.3%	4,541,219	14.6%
Trawl	37,435,009	93.9%	24,041,169	77.3%
Sum	39,886,766	100.0%	31,084,828	100.0%

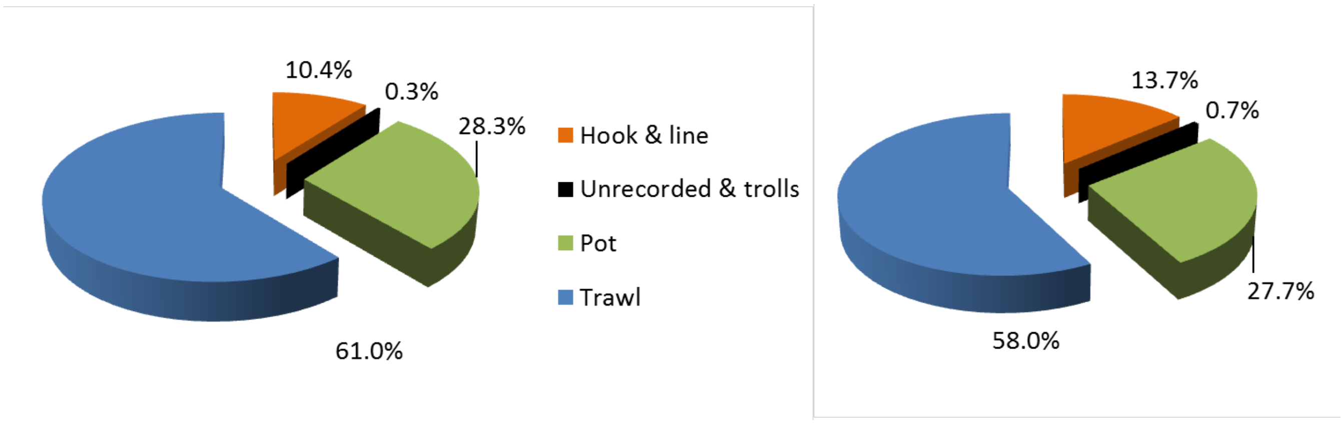


Figure 13. Sablefish IFQ landings during 2011 (left) and revenue (right), distributed by gear type.

Table 13. Sablefish IFQ landings during 2011 (left) and revenue (right), distributed by gear type.

Gear type	Landings	Percent	Revenue	Percent
Hook & line	618,182	10.4%	2,230,293	13.7%
Unrecorded & trolls	18,989	0.3%	106,994	0.7%
Pot	1,689,818	28.3%	4,524,450	27.7%
Trawl	3,641,720	61.0%	9,458,546	58.0%
Grand Total	5,968,709	100.0%	16,320,283	100.0%

Table 14. Counts, average landed weights, and total landed weight, of non-whiting IFQ trips in 2011. Only trips with a landed weight of more than 100 lbs. were counted for non-whiting.

	2006	2007	2008	2009	2010	2011	Hist ave.	2011/hist.
Trips	3,022	2,821	2,811	3,169	2,651	1,604	2,895	55%
Ave. lbs.	13,037	16,217	19,133	18,309	18,966	25,047	17,132	146%
Total (x1,000)	39,405	45,760	53,795	58,034	50,289	40,187		

Table 15. Counts, average landed weights, and total landed weight, of IFQ trips in 2011, for shoreside directed whiting. Only trips with a landed weight of more than 1,000 lbs. were counted for directed whiting.

	2006	2007	2008	2009	2010	2011	Hist. avg.	2011/hist.
Trips	1,172	875	586	471	714	909	788	115%
Ave. lbs.	183,176	184,946	191,209	188,858	193,847	221,167	193,867	114%
Total (x1,000)	214,682	161,830	112,049	88,952	138,407	201,040		

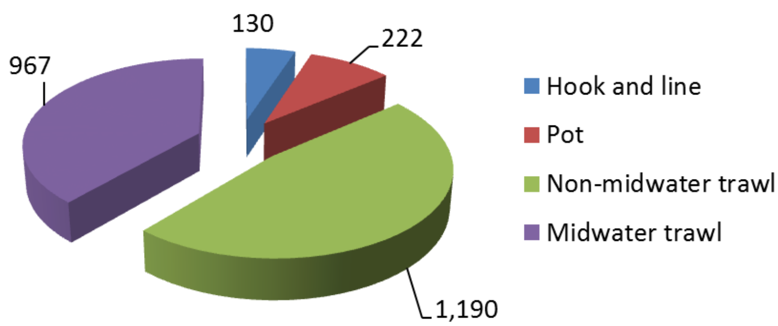


Figure 14. Counts of IFQ trips in 2011, distributed by gear type. Only trips with a landed weight of more than 100 lbs. were counted in this chart. Trips with troll gear were omitted for confidentiality.

Table 16. Counts of IFQ trips in 2011, and percent of total, distributed by gear type. Only trips with a landed weight of more than 100 lbs. were counted in this table. Trips with troll gear were omitted for confidentiality.

Gear type	Trip count	Percent
Hook and line	130	5%
Pot	222	9%
Non-midwater trawl	1,190	47%
Midwater trawl	967	39%
Sum	2,509	100%

Table 17. Total catch of IFQ species for 2011, allocation and attainment, as of January 30, 2012. Source: National Marine Fisheries Service, IFQ Vessel Accounts System, January 30, 2012.

IFQ species category	Total catch	Allocation	Attainment
Arrowtooth flounder	5,554,275	27,406,105	20.3%
Bocaccio rockfish South of 40°10' N.	11,715	132,277	8.9%
Canary rockfish	8,125	57,100	14.2%
Chilipepper rockfish South of 40°10' N.	688,187	3,252,370	21.2%
Cowcod South of 40°10' N.	39	3,968	1.0%
Darkblotched rockfish	200,112	552,997	36.2%
Dover sole	17,281,316	49,018,682	35.3%
English sole	302,830	41,166,808	0.7%
Lingcod	638,978	4,107,873	15.6%
Longspine thornyheads North of 34°27' N.	2,120,963	4,334,839	48.9%
Minor shelf rockfish North of 40°10' N.	32,964	1,150,813	2.9%
Minor shelf rockfish South of 40°10' N.	6,633	189,598	3.5%
Minor slope rockfish North of 40°10' N.	320,493	1,828,779	17.5%
Minor slope rockfish South of 40°10' N.	113,870	831,958	13.7%
Other flatfish	1,525,761	9,253,683	16.5%
Pacific cod	556,691	2,502,247	22.2%
Pacific halibut (IBQ) North of 40°10' N.	81,772	257,524	31.8%
Pacific ocean perch North of 40°10' N.	101,379	263,148	38.5%
Pacific whiting	201,109,988	204,628,442	98.3%
Petrale sole	1,789,067	1,920,226	93.2%
Sablefish North of 36° N.	5,288,465	5,613,719	94.2%
Sablefish South of 36° N.	1,012,188	1,170,390	86.5%
Shortspine thornyheads North of 34°27' N.	1,575,026	3,156,138	49.9%
Shortspine thornyheads South of 34°27' N.	18,644	110,231	16.9%
Splitnose rockfish South of 40°10' N.	88,050	3,045,245	2.9%
Starry flounder	25,934	1,471,586	1.8%
Widow rockfish	303,699	755,348	40.2%
Yelloweye rockfish	128	1,323	9.7%
Yellowtail rockfish North of 40°10' N.	1,629,184	6,821,455	23.9%
Total	242,386,476	375,004,872	64.6%

Table 18. Total catch, separated into landings and discards, in pounds, by fleet, within the 2011 IFQ groundfish fishery.

	Non-whiting			Directed whiting			Total		
IFQ species category	Total catch	Landings	Discards	Total catch	Landings	Discards	Total catch	Landings	Discards
Arrowtooth flounder	5,526,095	5,000,314	525,781	28,180	27,672	508	5,554,275	5,027,986	526,289
Bocaccio rockfish South of 40°10' N.	11,715	11,695	20				11,715	11,695	20
Canary rockfish	6,239	5,923	316	1,886	1,886	0	8,125	7,809	316
Chilipepper rockfish South of 40°10' N.	688,187	633,063	55,124				688,187	633,063	55,124
Cowcod South of 40°10' N.	39	32	7				39	32	7
Darkblotched rockfish	197,420	193,846	3,574	2,692	2,688	4	200,112	196,534	3,578
Dover sole	17,281,155	16,933,477	347,678	161	161	0	17,281,316	16,933,638	347,678
English sole	302,829	238,483	64,346	1	1	0	302,830	238,484	64,346
Lingcod	628,909	539,514	89,395	10,069	9,968	101	638,978	549,482	89,496
Longspine thornyheads North of 34°27' N.	2,120,962	2,007,848	113,114	1	1	0	2,120,963	2,007,849	113,114
Minor shelf rockfish North of 40°10' N.	31,673	26,461	5,212	1,291	1,276	15	32,964	27,737	5,227
Minor shelf rockfish South of 40°10' N.	6,633	361	6,272				6,633	361	6,272
Minor slope rockfish North of 40°10' N.	296,116	263,892	32,224	24,377	24,377	0	320,493	288,269	32,224
Minor slope rockfish South of 40°10' N.	113,870	110,739	3,131				113,870	110,739	3,131
Other flatfish	1,523,869	1,255,450	268,419	1,892	1,891	1	1,525,761	1,257,341	268,420
Pacific cod	554,163	554,135	28	2,512	2,512	0	556,675	556,647	28
Pacific halibut (IBQ) North of 40°10' N.	80,987	40	80,947	776	734	42	81,763	774	80,989
Pacific ocean perch North of 40°10' N.	100,830	99,983	847	549	549	0	101,379	100,532	847
Pacific whiting	482,654	57,857	424,797	200,627,334	199,508,992	1,118,342	201,109,988	199,566,849	1,543,139
Petrale sole	1,789,066	1,753,537	35,529	1	1	0	1,789,067	1,753,538	35,529
Sablefish North of 36° N.	5,221,291	5,172,174	49,117	67,174	66,996	178	5,288,465	5,239,170	49,295
Sablefish South of 36° N.	1,012,188	998,351	13,837				1,012,188	998,351	13,837
Shortspine thornyheads North of 34°27' N.	1,570,223	1,556,172	14,051	4,803	4,803	0	1,575,026	1,560,975	14,051
Shortspine thornyheads South of 34°27' N.	18,644	18,166	478				18,644	18,166	478
Splitnose rockfish South of 40°10' N.	88,050	21,123	66,927				88,050	21,123	66,927
Starry flounder	25,934	24,391	1,543				25,934	24,391	1,543
Widow rockfish	31,925	31,755	170	271,774	245,753	26,021	303,699	277,508	26,191
Yelloweye rockfish	128	117	11				128	117	11
Yellowtail rockfish North of 40°10' N.	692,858	692,794	64	936,326	936,153	173	1,629,184	1,628,947	237
Sum	40,404,652	38,201,693	2,202,959	201,981,799	200,836,414	1,145,385	242,386,451	239,038,107	3,348,344

Table 19. Total catch in pounds, separated into landings and discards, in percent of total catch, by fleet, within the 2011 IFQ groundfish fishery.

	Non-whiting			Directed whiting			Total		
IFQ species category	Total catch	Landings	Discards	Total catch	Landings	Discards	Total catch	Landings	Discards
Arrowtooth flounder	5,526,095	90%	10%	28,180	98%	2%	5,554,275	91%	9%
Bocaccio rockfish South of 40°10' N.	11,715	100%	0%				11,715	100%	0%
Canary rockfish	6,239	95%	5%	1,886	100%	0%	8,125	96%	4%
Chilipepper rockfish South of 40°10' N.	688,187	92%	8%				688,187	92%	8%
Cowcod South of 40°10' N.	39	82%	18%				39	82%	18%
Darkblotched rockfish	197,420	98%	2%	2,692	100%	0%	200,112	98%	2%
Dover sole	17,281,155	98%	2%	161	100%	0%	17,281,316	98%	2%
English sole	302,829	79%	21%				302,830	79%	21%
Lingcod	628,909	86%	14%	10,069	99%	1%	638,978	86%	14%
Longspine thornyheads North of 34°27' N.	2,120,962	95%	5%				2,120,963	95%	5%
Minor shelf rockfish North of 40°10' N.	31,673	84%	16%	1,291	99%	1%	32,964	84%	16%
Minor shelf rockfish South of 40°10' N.	6,633	5%	95%				6,633	5%	95%
Minor slope rockfish North of 40°10' N.	296,116	89%	11%	24,377	100%	0%	320,493	90%	10%
Minor slope rockfish South of 40°10' N.	113,870	97%	3%				113,870	97%	3%
Other flatfish	1,523,869	82%	18%	1,892	100%	0%	1,525,761	82%	18%
Pacific cod	554,163	100%	0%	2,512	100%	0%	556,675	100%	0%
Pacific halibut (IBQ) North of 40°10' N.	80,987	0%	100%	776	95%	5%	81,763	1%	99%
Pacific ocean perch North of 40°10' N.	100,830	99%	1%	549	100%	0%	101,379	99%	1%
Pacific whiting	482,654	12%	88%	200,627,334	99%	1%	201,109,988	99%	1%
Petrale sole	1,789,066	98%	2%				1,789,067	98%	2%
Sablefish North of 36° N.	5,221,291	99%	1%	67,174	100%	0%	5,288,465	99%	1%
Sablefish South of 36° N.	1,012,188	99%	1%				1,012,188	99%	1%
Shortspine thornyheads North of 34°27' N.	1,570,223	99%	1%	4,803	100%	0%	1,575,026	99%	1%
Shortspine thornyheads South of 34°27' N.	18,644	97%	3%				18,644	97%	3%
Splitnose rockfish South of 40°10' N.	88,050	24%	76%				88,050	24%	76%
Starry flounder	25,934	94%	6%				25,934	94%	6%
Widow rockfish	31,925	99%	1%	271,774	90%	10%	303,699	91%	9%
Yelloweye rockfish	128	91%	9%				128	91%	9%
Yellowtail rockfish North of 40°10' N.	692,858	100%	0%	936,326	100%	0%	1,629,184	100%	0%
Sum	40,404,652	95%	5%	201,981,799	99%	1%	242,386,451	99%	1%

Table 20. Annual retention rates and differences for selected species caught by the non-whiting fleet, between 2011 and 2010; for species categories in which sufficient information was available for direct comparison. Source: Groundish Mortality Report, WCGOP and NMFS IFQ Vessel Accounts System.

IFQ Species Category	2011	2010	Difference
Bocaccio rockfish South of 40°10' N.	100%	17%	83%
Canary rockfish	95%	84%	11%
Cowcod South of 40°10' N.	82%	0%	82%
Darkblotched rockfish	98%	55%	44%
Pacific ocean perch North of 40°10' N.	99%	54%	45%
Petrale sole	98%	86%	12%
Widow rockfish	99%	16%	83%
Yelloweye rockfish	91%	9%	82%
Arrowtooth flounder	90%	81%	9%
Chilipepper rockfish South of 40°10' N.	92%	89%	3%
Dover sole	98%	95%	3%
English sole	79%	66%	13%
Lingcod	86%	87%	-1%
Longspine thornyheads North of 34°27' N.	95%	78%	17%
Other flatfish	82%	70%	12%
Pacific cod	100%	100%	0%
Pacific whiting	12%	48%	-36%
Sablefish North of 36° N.	99%	91%	8%
Shortspine thornyheads North of 34°27' N.	99%	93%	6%
Splitnose rockfish South of 40°10' N.	24%	26%	-2%
Starry flounder	94%	96%	-2%
Yellowtail rockfish North of 40°10' N.	100%	45%	55%
Grand Total	95%	-	-

Table 21. Catch of rebuilding species in IFQ by fleet, compared with 2010 (mt). Source: NMFS IFQ vessel accounts system (2011), Groundfish Mortality Report, WCGOP (2010), NWR Whiting Catch Summary (2010).

	Non-whiting				Directed whiting			
IFQ species category	2010	2011	dif.	dif. % 2010	2010	2011	dif.	dif. % 2010
Bocaccio rockfish S. of 40°10'	13.1	5.3	-7.8	-60%	0.0	0.0	0.0	0%
Canary rockfish	2.4	2.8	+0.5	+20%	4.0	0.9	-3.2	-79%
Cowcod S. of 40°10'	0.6	0.0	-0.6	-97%	0.0	0.0	0.0	0%
Darkblotched rockfish	287.3	89.5	-197.8	-69%	4.5	1.2	-3.3	-73%
Pacific ocean perch N. of 40°10'	130.1	45.7	-84.4	-65%	6.4	0.2	-6.2	-96%
Petrale sole	900.3	811.5	-88.8	-10%	0.1	0.0	-0.1	-99%
Widow rockfish	25.5	14.5	-11.0	-43%	55.0	123.3	+68.3	+124%
Yelloweye rockfish	0.1	0.1	0.0	-42%	0.0	0.0	0.0	0%

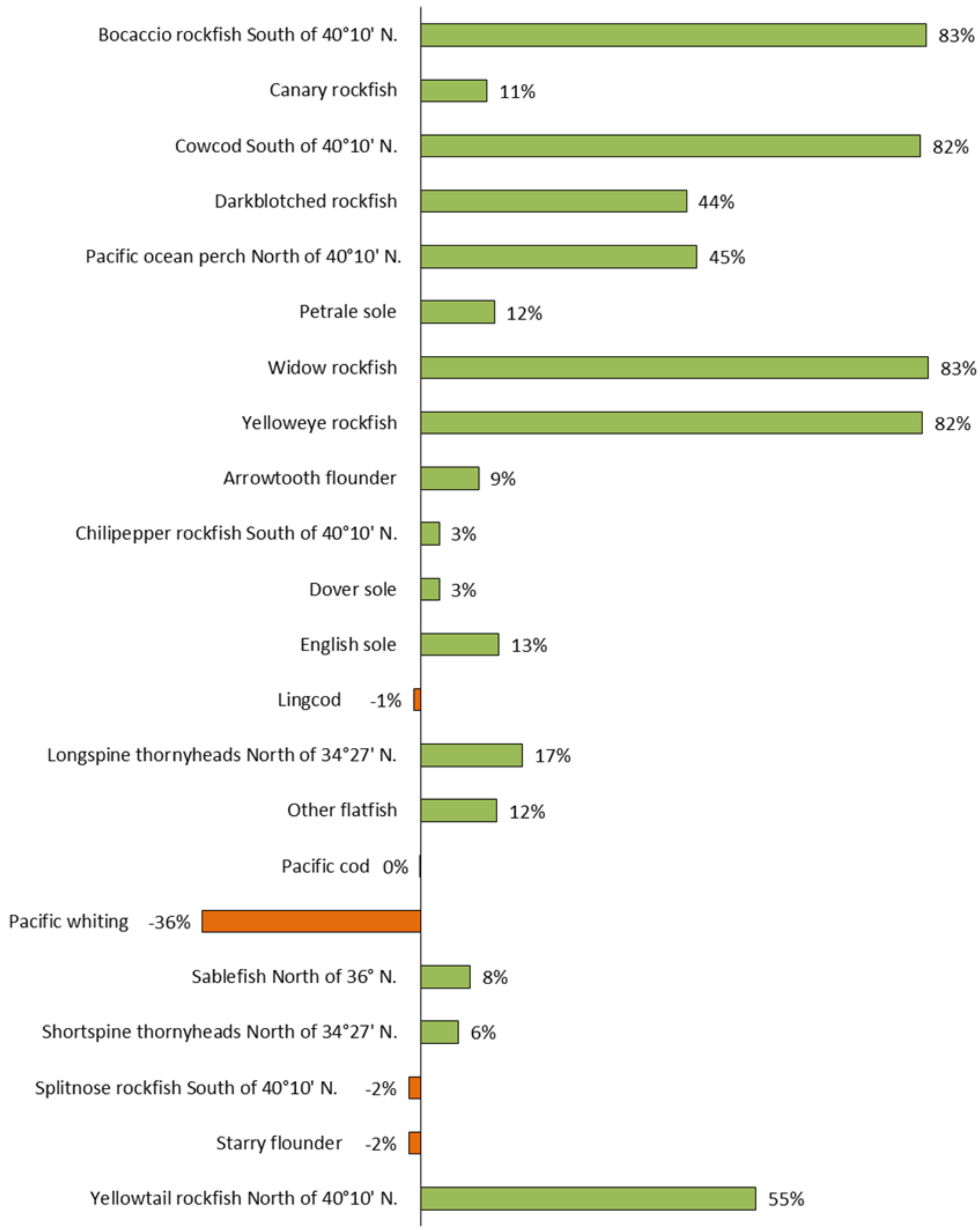


Figure 15. Retention rate comparisons, for the non-whiting fleet, between 2011 and 2010. Source: NMFS IFQ Vessel Accounts System (2011), Groundfish Mortality Report, WCGOP (2010).

OREGON DEPARTMENT OF FISH AND WILDLIFE INFORMATIONAL REPORT ON GROUNDFISH INSEASON ADJUSTMENTS

At its December 2011 meeting, the Oregon Fish and Wildlife Commission (OFWC) took several regulatory actions that affect the 2012 Oregon recreational groundfish fishery. Those actions include adjustments to depth restrictions, implementing a seasonal structure for cabezon retention, and providing additional management lines to facilitate future inseason actions. This report is for informational purposes only; concurrent federal action is not required to allow for flexible inseason management by the State of Oregon.

In three out of the last four years, the Oregon Department of Fish and Wildlife (ODFW) took action inseason to restrict the recreational groundfish fishery to waters shoreward of a line approximating 20 fathoms. This action was necessary to reduce the potential of exceeding the Oregon recreational harvest guideline for yelloweye rockfish. Limiting the fishery to shallower waters reduces the number of encounters with yelloweye (and canary) rockfish and reduces the depth dependent mortality rate applied to those fish that are encountered. Four public meetings were held (Astoria, Newport, Brookings, and Charleston) and an online survey tool was used to obtain public input on proposed actions. Based on feedback from the public and ODFW staff recommendations, the OFWC modified state regulations to limit the recreational groundfish fishery to waters shoreward of 30 fathoms from April 1 through September 30, instead of 40 fathoms as was adopted previously. This action is intended to lessen the potential for inseason action and the associated disruption to the fishery.

Additionally, the Oregon recreational fishery has met its state landing cap for cabezon between mid-July and early September each year since 2004. Via the same public input process mentioned above, ODFW solicited input from the public on how to structure the cabezon component to the groundfish fishery. Based on that feedback and staff recommendations, the OFWC approved allowing retention of cabezon from April 1 through September 30 under a one fish sub-bag limit. Retention of cabezon is prohibited outside of that timeframe. These regulations were designed to keep the cabezon catch within the fishery's state landing cap, while still allowing (limited) retention during the peak fishing season.

Finally, the OFWC added two management lines, at Cape Lookout (45° 20' 30" N lat.) and Cape Blanco (42° 50' 20" N lat.), that may be used inseason, if actions become necessary. Depth restrictions in the recreational groundfish fishery impact some ports, such as Garibaldi and Gold Beach, much more than other ports, such as Newport and Depoe Bay (see Agenda Item H.2.c. ODFW Letter 1, March 2011). These two lines will provide the flexibility to structure inseason actions to lessen differential impacts as much as possible.

ODFW will continue to monitor the Oregon recreational fisheries inseason and take actions if they become necessary.

Agenda Item F.6.c
Public Comment
March 2012

---------- Forwarded message ----------
From: **Bill James** <Halibutbill@live.com>
Date: Fri, Feb 10, 2012 at 12:13 AM
Subject: February 9 F.6 c. In season adjustments
To: "pfmc." <pfmc.comments@noaa.gov>

Dan Wolford, Chairman
Pacific Fishery Management Council
Re: F.6 c. In season Adjustments
Mr. Chairman and Members of the Council

My name is Bill James and I am a commercial fishermen and a fishery consultant for Port San Luis Commercial Fishermen's Association. Today I am representing PSLCFA in respectfully requesting an increase in trip limits in 2012 for 1) Shallow Nearshore species; 2) Deeper Nearshore species 3) Cabezon. For the area from 34:27 (Pt. Conception) to 40:10 (Cape Mendocino).

- **Period 1** Shallow Nearshore 1,200 lbs.; Deeper Nearshore 1400 lbs. Cabezon 700 lbs.
- **Period 2** closed
- **Period 3** Shallow Nearshore 1400 lbs.; Deeper Nearshore 1400 lbs.; Cabezon 700 lbs.;
- **Period 4** Shallow Nearshore 1200 lbs.; Deeper Nearshore 1200 lbs.; Cabezon 500 lbs.
- **Period 5** Shallow Nearshore 1600 lbs.; Deeper Nearshore 1600 lbs.; Cabezon 700 lbs.;
- **Period 6** Shallow Nearshore 1600 lbs.; Deeper Nearshore 1600 lbs.; Cabezon 700 lbs.;

Agenda Item F.7
Situation Summary
March 2012

HARVEST SET-ASIDE FLEXIBILITY

Harvest set-asides are amounts of a species harvestable surplus that are not allocated to fisheries but are instead “set aside” to accommodate impacts resulting from research activities, approved exempted fishing permit (EFP) activities, bycatch in non-groundfish fisheries, and tribal fishery impacts. Set-aside amounts are decided in the Council’s biennial specifications process and are needed to ensure that annual catch limits are not exceeded. The Council has managed set-asides routinely in the past by considering these impacts when making inseason adjustments. However, Federal regulations implementing Amendment 21 are now more stringent disallowing a re-allocation of yields set-aside for these activities back into directed groundfish fisheries.

The Council has addressed this issue in the recent past and stated they preferred the ability to more flexibly manage released set-asides inseason. NMFS is seeking more rationale and guidance from the Council before a preferred alternative can be analyzed. Attachment 1 to this agenda is an excerpted outline for a proposed Environmental Assessment (EA) to analyze impacts associated with flexible management of set-asides. The outline provides a purpose and needs statement for the proposed action and a set of alternatives for Council consideration of a preferred alternative. It is noted that the alternatives only address flexible management of yields set aside for research, EFPs, and bycatch in non-groundfish fisheries; flexible management of yields set aside for tribal fisheries is contemplated in a separate NMFS rulemaking.

The Council task is to select a range of alternatives for analysis and to decide a preliminary preferred alternative. The Council should also discuss the timing of finalizing the action later this year or the possibility of rolling the decision into the 2013-2014 biennial management specifications. Preliminary plans were posited to provide a draft EA in April and make a decision then. However, a draft EA will not be available in time for April action due to competing work load. Unless the action could be rolled in the biennial process, the process will need to be delayed and the implications of a delay should be discussed so a workable plan to complete the action can be developed.

Council Action:

1. **Adopt a range of alternatives for analysis and a preliminary preferred alternative for managing the distribution of unused harvest set-asides.**
2. **Consider how to complete final action on this issue.**

Reference Materials:

1. Agenda Item F.7.a, Attachment 1: Draft outline of the Environmental Assessment for Set-Aside Flexibility.

Agenda Order:

a. Agenda Item Overview John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary Alternatives for Managing the Distribution of Unused Harvest Set-Asides

PFMC
02/13/12

Agenda Item F.7.a
Attachment 1
March 2012

Pacific Coast Groundfish
Intersector Allocation: Set-aside flexibility
Excerpted Draft Environmental Assessment Outline

Table of Contents

CHAPTER 1 Purpose and Need for the Proposed Action
1.1 Introduction
1.2 Purpose and Need for the Proposed Action

The proposed action is to further clarify the management of "off-the-top" yields set aside for research catches, exempted fishing permit (EFP) activities, catches in tribal fisheries, and groundfish mortality in non-groundfish fisheries (i.e., incidental open access (OA) fisheries) when deciding harvest specifications and management measures. The proposed action would allow flexibility in the management of these "off-the-top" set-asides, including the ability to take inseason action to make changes and redistribute the set asides to other sectors. While tribal amounts are part of the "off-the-top" set-asides and are within the scope of set-aside flexibility being considered, tribal reapportionment of Pacific whiting is being addressed through a separate action and rulemaking process.

Currently the regulations at 660.55(j) state:

> (j) *Fishery set-asides*. Annual set-asides are not formal allocations but they are amounts which are not available to the other fisheries during the fishing year. For the catcher/processor and mothership sectors of the at-sea Pacific whiting fishery, set-asides will be deducted from the limited entry trawl fishery allocation. Set-aside amounts will be specified in Tables la through 2d of this subpart and may be adjusted through the biennial harvest specifications and management measures process.

The purpose of the proposed action is to create a formal process to redistribute unused set-asides amounts inseason to other sectors in the groundfish fishery. The need for the proposed action is to provide an opportunity for full attainment of the annual available harvest for the groundfish fishery, also called the annual catch limit (ACL), in accordance with the requirements of the Magnuson Stevens Act.

CHAPTER 2 Description of the Proposed Alternatives and Council Recommendation for a Preferred Alternative

2.1 Description of the Alternatives

2.1.1 Alternative 1: No Action

Set-asides are established to account for management uncertainty relative to the tribal fisheries, research, EFP and non-groundfish fisheries catch. Under this alternative, the specification for "fishery harvest guideline" would be derived by subtracting amounts for the following from the annual catch limit (ACL) or fishery-wide annual catch target (ACT), if specified: projected catch for Pacific Coast treaty Indian Tribes (whiting will be addressed through a separate rulemaking), projected scientific research conducted under letters of authorization and scientific research permits issued by NMFS, projected mortality in EFPs, and projected fishing mortality in non-groundfish fisheries (including but not limited to the incidental OA fishery). Under Alternative 1, unused portions of the set-aside would not be allocated to other fisheries during the calendar year. However, if unused portions of the set-aside are identified inseason, they would reduce the risk of exceeding the ACL and allow management measures to be adjusted so they more closely approach or slightly exceed a fisheries HG.

2.1.2 Alternative 2

For activities that are completed before a Council meeting and where data derived from "accurate catch accounting methodology" was used to estimate the total catch, the unused portion of the set-aside may be reapportioned back to the groundfish fishery. As with the No Action Alternative, set-asides are established to account for projected mortalities relative to the tribal, research, EFP, and bycatch in non-groundfish fisheries. "Accurate catch accounting methodology" means data gathered from sources such as that used by the West Coast Groundfish Observer Program (WCGOP), the Northwest Fisheries Science Center (NWFSC) survey biologists, and tribal co-manager observer programs. When total catch data are available from accurate catch accounting methodologies, the unused portions of the set-asides can be accurately determined shortly after the completion of the activity. When data gathered by using accurate catch accounting methodology are summarized, the uncertainty relative to the total catch from the completed activities no longer exists. The unused proportions of the catch associated with the completed activities would be reapportioned back to the fishery.

The process to reapportion would be structured to be done through an inseason action published in the *Federal Register* following a Council meeting. At a Council meeting, the Council would review set-asides and recommend any adjustments to be reapportioned. The specified amount of groundfish would be reapportioned back to the "fishery harvest guideline" and out to the sectors in proportion to the original allocations for the calendar year. Because the set-aside amount that is getting reapportioned must be completed before reapportionment occurs, reapportionment would likely only occur later in the year after the September or November Council meetings. For sectors that are already closed for the year, or in the case of the Shorebased IFQ Program, after September 1 where QS accounts are no longer open or able to transfer QP, the Council must determine whether to reopen those sectors or, for the Shorebased IFQ Program, whether to reactivate those accounts.

2.1.3 Alternative 3

For activities that are completed before a Council meeting, the "best available information" would be used to estimate the amount of set-asides that would not be used in the calendar year and that amount would be reapportioned back to the groundfish fishery. As with the No Action Alternative, set-asides are established to account for management uncertainty relative to the tribal, research, EFP, and fishing mortality in non-groundfish fisheries. The "best available information" could include data collected using "accurate catch accounting methodologies" as specified under Alternative 2 as well as estimates based on more uncertain information, such as those derived from OA fishery models where no- or limited catch data are available.

The process to reapportion is the same as described under Alternative 2, except that the Council may recommend no reapportionment or a more limited overall amount be reapportioned. Any amount available for reapportionment would be reapportioned to the sectors in proportion to the original allocations for the calendar year, modified to account for Council recommendations with respect to reapportionment to: 1) sectors that are closed; 2) for reapportionments after September 1 in the IFQ sector; and 3) sectors for which catch of the species to be reapportioned would not be projected to be reached.

2.1.4 Alternatives Considered But Not Further Analyzed

Several other alternatives for the process to reapportion were considered but rejected. One alternative considered but rejected was to reapportion back to the "fishery harvest guideline" and out to only the sector(s) specified by the Council (i.e., not proportionally back to all sectors). This alternative was rejected because it would require additional considerations of NEPA and other applicable laws each time sector-specific reapportionment occurs. It would also require full notice and comment rulemaking (i.e., a proposed and final rule) which takes up to 6 months to implement. Because reapportionment would likely occur later in the year, this alternative is not feasible because the fishing year would likely be over before reapportionment could be implemented.

Another alternative for the process to reapportion that was considered but rejected was to reapportion back to the "fishery harvest guideline" and out to the sectors in proportion to the original allocations for the calendar year. However, this process would be done by NMFS outside of the Council process as an automatic action (e.g., similar to reapportionment in the whiting fishery). By a specified date, NMFS would review the available data and make adjustments to the set-asides. NMFS would provide notice via the west coast groundfish email group and post public notice on the NMFS website. This alternative was rejected because it does not comply with the Administrative Procedure Act. This alternative may not provide adequate notice for all sectors of the groundfish fishery.

GROUNDFISH ADVISORY SUBPANEL REPORT ON HARVEST SET-ASIDE FLEXIBILITY

The Groundfish Advisory Subpanel (GAP) received a presentation from Mr. John DeVore and Ms. Jamie Goen on Harvest Set-aside Flexibility and offers the following comments and recommendations.

The GAP reaffirms the desire to establish a flexible system of managing harvest set-asides as a routine inseason adjustment. The GAP understands there are two fundamental differences between alternatives 2 and 3 in Agenda Item F.7.a, Attachment 1. Alternative 2 requires real-time reporting of catch before reallocation can be done. Inseason and reallocations would need to be made based on specified sector allocations decided under Amendment 21 or in the biennial specifications process. Alternative 3 allows the use of catch estimates to make inseason adjustments and a reallocation of yield to sectors different from the prescribed allocation percentages.

The GAP recommends alternative 3, which allows more flexible use of released set-asides and the use of projected catch data. This last point is especially important since real-time catch accounting is only possible in the trawl fishery; projected catches reported in the quota species monitoring and RecFIN data feeds are the only inseason catch accounting mechanisms for non-trawl fisheries. Further, the GAP strongly believes the Council should be able to reallocate released harvest set-asides according to sector needs rather than prescribed sector allocations. When reallocations to sectors are contemplated in future inseason actions, it would not serve West Coast communities and sectors well to reallocate to sectors inseason that cannot use this extra yield. This could potentially disadvantage other sectors that could use that yield to maximize fishery benefits or simply maintain their fishery inseason. Such management flexibility allows optimal use of fishery resources and maximizes potential benefits to West Coast fishing communities.

PFMC
03/05/12

Agenda Item F.7.b
Supplemental GMT Report
March 2012

GROUNDFISH MANAGEMENT TEAM REPORT ON HARVEST SET-ASIDE FLEXIBILITY

The Groundfish Management Team (GMT) received a briefing from Ms. Jamie Goen from the National Marine Fisheries Service (NMFS) Northwest Region (NWR) and Mr. John DeVore, Council staff, on the outline environmental assessment (EA), under this agenda item, regarding increased flexibility in harvest set-asides (i.e., those amounts taken off the top for research or exempted fishing permits (EFPs) prior to allocating between non-trawl and the trawl sectors (i.e. the individual fishing quota [IFQ] and co-op fisheries).

Currently, the Council has the flexibility to allow for more or less harvest in either set-asides or non-trawl allocations without taking specific action to formally reapportion fish in regulations, as long as an annual catch limit (ACL) is not projected to be exceeded. There is not, however, flexibility to reapportion unused set-asides to the IFQ and co-op fisheries.

The action alternatives presented in the Environmental Assessment (EA) vary with respect to a couple of different elements. The first element relates to the flexibility to reapportion set-asides. One option would limit reapportionments to the proportions established by the trawl/non-trawl splits established by Amendment 21 or the biennial specifications (depending on the species). The other option would grant the Council flexibility to deviate from these proportions when reapportioning set-asides.

We understand that the “fair and equitable” allocation provisions of the Magnuson-Stevens Act would be a main consideration for the Council to consider in comparing these alternatives. Given that reapportionment is allocative in nature, the Council would want to explain how the reapportionment scheme meets those fair and equitable standards either in the development of the reapportionment framework or within the circumstances of a specific reapportionment decision.

The second element that differs between the EA’s action alternatives relates to the standard of proof required before making a reapportionment. One would require “accurate catch accounting methodology.” The “accurate catch accounting methodology” standard of proof is a new one for us. Our current inseason management paradigm relies on quota species monitoring (QSM), and other sources of information more properly characterized as the “best available information” approach included in Alternative 3. This standard of proof would allow reapportionment to be based on the model forecasts or other information the GMT uses to inform the Council’s inseason management actions. This “best available information” is often uncertain and leaves the Council with a “risk” or “policy” call on the possible consequences of the action. We note that the status quo approach described above relies on uncertain information and a risk call about whether an ACL will be exceeded or not.

We highlight that this risk is very relevant to the evaluation of whether allocative decisions are consistent with “fair and equitable” standards. Uncertainty about what a particular sector may use within a year, what a sector may “need” now or in the future, etc. is at the center of the Council’s difficult choices on how to divide up allowable catch among the various fishery sectors.

In sum, the scope of options presented in the EA looks fairly complete, but the GMT notes that there is no specific reason that the two elements we discuss above have to be bundled as they are in Alternative 2 and Alternative 3. The Council could mix and match these elements if desired.

PFMC
03/05/12

Agenda Item F.8
Situation Summary
March 2012

TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS AND ACTIONS

There are currently a number of trailing action rules planned and in process. In the immediate timeframe, the Council took final action on some trailing actions at the September, 2011 Council meeting, but final post-meeting processing has yet to occur; for others, preliminary and final action are scheduled for the March and April, 2012 Council meetings. In the intermediate timeframe, some trailing actions are currently on track for final Council action at the June Council meeting. In a longer-term timeframe, the Council has prioritized several trailing actions for next consideration and will consider emerging issues at the September, 2012 Council meeting. National Marine Fisheries Service (NMFS) has provided a tentative schedule for the post-Council meeting regulation adoption process for trawl rationalization-related rules in Agenda Item F.8.b, NMFS Report 1.

At this meeting, the Council is scheduled to select preliminary preferred alternatives for those issues which it set as a priority for Program Improvements and Enhancements (PIE) Rule 2 (including NMFS-identified items), and to provide further guidance on the development of the gear rule. The Council may also wish to provide guidance on priorities to complete these matters, depending on interactions with other ongoing groundfish workload matters.

Immediate Timeframe

Rule	Expected Implementation
Cost Recovery ***(Council action completed)***	January 1, 2013
Program Improvement and Enhancement Rule 2 (PIE 2) ***(Council action completed for Risk Pools; PPA and FPA action needed on the remaining components)***	January 1, 2013
Whiting Season Rule – Move Season Opening Date to May 15 and Southern Allocation (may be part of PIE 2, be separated from PIE 2 as its own rule, or be combined with Gear Rule)	January 1, 2013 or Mid-2013

The following are the issues to be covered in PIE Rule 2 and their current status.

Issues for PIE 2 (Agenda Item F.8.a, Attachment 1 and F.8.b, NMFS Reports 2 & 3)	
Issue	**Status/Action**
QS Control Rule Safe Harbor for Risk Pools	***Council Action Completed*** (September 2011)
QS Control Rule Safe Harbor for Lenders (Agenda Item F.8.a, Attachment 2)	Select Preliminary Preferred Alternative
Lender Registration of QS Interest	“ “ “ “
Develop a process to certify new observer providers	Review materials from NMFS (see Agenda Item F.8.b, NMFS Report 2 for needed action)
Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time	Select Preliminary Preferred Alternative
Change the opt-out requirement for QP deficits	“ “ “ “
Eliminate double filing of co-op reports (Nov and March)	“ “ “ “
Move the whiting season opening date and eliminate southern allocation (may become a standalone item or combined with the gear rule) (Agenda Item F.8.a, Attachment 3)	“ “ “ “
Other Issues Identified by NMFS	Review materials from NMFS (NMFS Reports 2 & 3)

Agenda Item F.8.a, Attachment 1 is a document that contains more detail on each of the above Council priority issues, including issue description, analysis, and status of further action and process needed to achieve the target implementation dates. The NMFS PIE 2 priority lists are provided in NMFS Reports 2 and 3.

Intermediate Timeframe

At its November, 2011 meeting the Council indicated its intent to move ahead on gear issues, but that these issues would generally be taken up as a secondary priority to the above matters. At the same time, some urgency has been expressed with respect to resolution of the chafing gear issue as soon as possible. Over the winter, Council staff worked with a contractor to develop alternatives for consideration (Agenda Item F.8.a, Attachment 4). The alternatives and analysis for the chafing gear issue is more developed than for the other gear issues and final Council action might be possible as part of the March and April, 2012 Council meeting process for trawl trailing actions.

Gear Rule (Agenda Item F.8.a, Attachment 4)	
Issue	**Status/Action**
Carrying Multiple Gears on a Trip	Review options, provide guidance on final action strategy.
Chafing Gear	Review options, possibly combine with PIE 2 schedule.
Gear Efficiencies	Review options, provide guidance on final action strategy.

Longer-Term Timeframe

The Council has identified the following for its longer-term schedule for trawl rationalization trailing actions:

- Reduce observer costs (2014-2015 Implementation)
- Adaptive Management Program quota pound allocation (2015 Implementation)
- Revise the widow rockfish QS allocation (2015 Implementation)

The Council has placed a high priority on identifying program cost efficiencies, particularly in relation to observer costs. The use of cameras or other electronic monitoring technology has been a subject of focus in various forums in addition to the Council. The Cost Recovery Committee (CRC) has been charged with meeting to look at ways to reduce program costs, however, no meetings of the CRC have been yet scheduled, due to workload priorities. An evening presentation including actual video recordings of electronic monitoring is currently scheduled for the April 2012 Council meeting. During the April trawl rationalization trailing action agenda item there may also be discussion of electronic monitoring initiatives underway in other forums.

Last September, the Council recommended full implementation of the surplus quota pounds (QP) carryover provision for the 2011 fishery (carrying QP over to 2012). NMFS is in the process of reviewing and determining its carryover action for carrying over 2011 QP into 2012. The biennial specifications analyzed ability to carryover surplus QP while meeting the conservation requirements of the MSA, as implemented in the FMP. At this time, it is the Council staff's understanding that there will be ongoing uncertainty regarding the annual issuance of carryover QP. The challenge in implementing the carryover provision pertains to potential annual catch limit overages and the annual basis on which management criteria are evaluated. There are several long-term approaches to the carryover issue that could be explored, and which may require an FMP amendment.

Lastly, in September 2011, discard mortality survival credits were discussed as a possible issue for the biennial specifications and were included in Council discussion on trawl rationalization at the November, 2011 Council meeting. At that time, NMFS reported that given current workloads it would not be feasible to develop anything other than a flat average rate survival credit for discards, regardless of their condition at time of discard. At this time that issue has been included in neither the biennial specifications nor trawl trailing actions processes. A related issue, removal of the lingcod minimum size limit, is being considered as part of the biennial specifications.

Council Action:

1. Select preliminary preferred alternatives for trailing action (Agenda Item F.8.a, Attachment 1).
2. Take action as necessary on the NMFS identified trailing actions (Agenda Items F.8.b, NMFS Reports 2 and 3).
3. Provide guidance as needed on moving forward on gear rule, including placement of the chafing gear issue (Agenda Item F.8.a, Attachment 4).

Reference Materials:
1. Agenda Item F.8.a, Attachment 1: Immediate Time Frame Council Priority Trawl Trailing Actions: Descriptions And Next Steps.
2. Agenda Item F.8.a, Attachment 2: Trawl Rationalization Trailing Actions: Lenders, Draft Council Decision Analysis Document.
3. Agenda Item F.8.a, Attachment 3: Trawl Rationalization Trailing Actions: Whiting Season Opening Date and Southern Allocation, Draft Council Decision Analysis Document.
4. Agenda Item F.8.a, Attachment 4: Trawl Rationalization Trailing Actions: Gear Issues, Draft Council Decision Analysis Document.
5. Agenda Item F.8.b, NMFS Report 1: Draft Rulemaking Plan.
6. Agenda Item F.8.b, NMFS Report 2: NMFS Items for PIE 2.
7. Agenda Item F.8.b, NMFS Report 3: NMFS Items for Correction.

Agenda Order:
a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Refine and Adopt Appropriate Actions and Preliminary Preferred Alternatives as needed

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IMMEDIATE TIMEFRAME COUNCIL PRIORITY TRAWL TRAILING ACTIONS:
DESCRIPTIONS AND NEXT STEPS

The table of contents provided below contains a list of the Council-prioritized items to be covered under this agenda item. In the body of the document, at the end of each issue a status summary is provided with an "☼" indicating the need for Council attention. A list of National Marine Fisheries Service (NMFS) proposed trailing actions for Program Improvements and Enhancements (PIE) 2 is provided in Agenda Item F.8.b, NMFS Reports 2 and 3. For actions to be implemented at the start of 2013, final action is required by the April 2012 Council meeting.

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Cost Recovery Rule

1. Cost Recovery (Preliminary NEPA Determination: Categorical Exclusion)

The Council completed work on the structure of the cost recovery program at its September 2011 meeting, specifying that the program start on January 1, 2013 and that the initial amounts to be recovered not exceed more than 3 percent of exvessel revenue for the shorebased sector, 2 percent for the mothership sector and 1 percent for the catcher-processor sector. The exact amounts to be used will be determined based on the best estimates available at the time the rule is ready to move forward. The process of identifying costs will continue, in coordination with the states, using the cost matrix developed by Pacific States Marine Fisheries Commission (PSMFC) for this purpose. National Oceanic and Atmospheric Administration General Counsel (NOAA GC) may report at this meeting on whether or not the states will be eligible to recover some costs through the cost recovery program. The details for some program elements such as the ongoing "role of the Council" and "the concept of accounting and adjustment between years" will be worked out in the regulatory deeming process. A complete description of the Council recommendation on cost recovery is available on the Council website. The Council operating procedures (COP) delegate deeming to the Executive Director, except for those circumstances for which the Council specifically desires that such deeming occur through the full Council process.

The Cost Recovery Committee (CRC) is slated to begin its review of cost estimates and take up the task of looking for ways to reduce program costs after the NMFS Northwest Region and Northwest Fisheries Science Center have their cost tracking methodologies in place.

	Summary: Status and Next Steps
✓	Council action on program structure complete and process for determining fee percentages complete.
→	NOAA GC to report on state eligibility for cost recovery funds.
→	Work to continue on matrix of costs for each agency. Recovery rates as a percent of exvessel value to be determined by NMFS and placed in regulations, (not to exceed specified percentages for each sector, see text)
→	Regulations to be drafted by NMFS.
→	Regulations to be deemed through process outlined in COP 1.[1]
✓	**An FPA has been selected.** No action necessarily required at this time.

PIE Rule 2

2. Quota Share/Quota Pound (QS/QP) Control Rules – Safe Harbors

A. Risk Pools (Preliminary NEPA Determination: Environmental Assessment)

Council final action has been completed. The Council provided risk pools with a limited exception to the control rule, allowing them to operate under contracts which provide that a deficit from one year may be covered with QP issued for a subsequent year. Additionally, such agreements may be renewed for a series of consecutive years without necessarily violating control rules.

	Summary: Status and Next Steps
✓	Council action complete.
→	Council staff to complete analysis.
→	Regulations to be drafted by NMFS.
→	Regulations to be deemed through process outlined in COP 1.
✓	**An FPA has been selected.** No action necessarily required at this time.

[1] COP 1: "Unless otherwise explicitly directed by the Council, after NMFS has prepared the regulatory language, the Council authorizes the Executive Director to review the regulations to verify that they are consistent with the Council action before submitting them, along with his determination, to the Secretary on behalf of the Council."

B. Lenders (Preliminary NEPA Determination: Categorical Exclusion)

When it approved the initial issuance rule implementing the individual fishing quota (IFQ) program, NMFS inserted into the QS control rule an exception for *"banks and other financial institutions that rely on QS or IBQ as collateral for loans."* There has been uncertainty about what types of entities would be considered a financial institution for the purpose of this section and concern over exceptions that seem to be provided for certain activities in some paragraphs but not in other paragraphs. For example, an exception is provided with respect to the use of loan covenants to "restrict, any activity related to QS or IBQ or QP or IBQ pounds" (paragraph E) but not provided with respect to directing, delaying or preventing the transfer of QS or individual bycatch quota (IBQ) or having the right to do so (paragraph C). The following table provides a summary of the activities covered by each section and whether or not exceptions are provided for lenders.

Table 1. Summary of 660.140(d)(4): activities for which lender exemptions are provided and not provided.

No Lender Exeption Provided	Lender Exception Provided
(A) & (B) directs the business of an entity or authority over director, board, partners etc.	(E) Any activity related to quota
(C) Prevents or delays quota transfer (shares or pounds)	(F) Controlling management of the entity or being a controlling factor
(D) Through loan covenants affects day to day business activities	(G) Cause or prevent sale, lease, or other disposition of quota
(H) Any other means of control over shares	

There appear to be possible conflicts in the exceptions granted between the following paragraphs:

- (C) and (E)
- (C) and (G)
- (D) and (E)/(F)
- (A/B) and (F).

Therefore, there are two issues to address with respect to the safe harbor provided to lenders.

- the entities eligible for the safe harbor
- the scope of the exception provided to such entities (i.e. the activities allowed under the safe harbor)

A draft Council decision document on this issue is provided as Appendix A. The following are the alternatives identified for consideration.

Lending Entities Qualifying for an Exception

Status Quo: No change. Retain existing language CFR 660.140(d)(4) (see Agenda Item F.8.a, Attachment 2) which provides exceptions for "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" (no action). Certain exceptions to the control limits are provided for "banks and other financial institutions that rely on QS or IBQ as collateral for loans."

Alternative 1 (recommendation by the GAP endorsed by the Council, November 2011): Retain existing language CFR 660.140(d)(4) which provides exceptions for "*banks and other financial institutions that rely on QS or IBQ as collateral for loans,*" but add an amplification indicating that to qualify as a bank or financial institution for purposes of this paragraph the entity must be regularly or primarily engaged in the business of lending and not engaged in or controlled by entities whose primary business is the harvest processing or distribution of fish or fish products. Additionally, require that any lender that wishes to qualify for the exception and is not state or federally chartered banks or other financial institution disclose the identity and share of interest of any entity with a 2% or more ownership interest in the lender, in a manner similar to what is required for the trawl identification of ownership interest form CFR 660.140(d)(4)(iv).

Alternative 2: In the description of control (CFR 660.140(d)(4)), replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*a state or federally chartered bank or other state or federally chartered financial institution that relies on QS or IBQ as collateral for loans*."

Alternative 3: In the description of control (CFR 660.140(d)(4)), replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*any person that relies on QS or IBQ as collateral for loans.*"

Scope of the Exception Provided

Status Quo: No change (see Agenda Item F.8.a, Attachment 2).

Alternative 1: Add the appropriate language providing an exception for lenders to paragraph (C).

Alternative 2: Same as Alternative 1 but also remove the exceptions provided to lenders in all other paragraphs and add at the end of each of the other paragraphs language to the following effect: "*with the exception of those activities allowed under paragraph (C).*"

Alternative 3 (recommendation by the GAP endorsed by the Council, November 2011): Same as Alternative 2 but further limit the exception under paragraph C so that the lenders exception pertains only to control over the transfer of QS and IBQ and not the affiliated QP or IBQ-pounds. All associated QP will be distributed to the borrower unless the bank or financial institution provides evidence that the borrower is in default on the loan, in which case the related QP will be distributed to the adaptive management program until such time as any the QS/IBQ held by the bank or financial institution is sold, or the QS/IBQ holdings of the bank or financial institution are below the QS control limits (from the April 2011 strawdog option on which the Council requested further discussion).

Alternative 4: Add exceptions for lenders to all paragraphs.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼ ☼	Lending Entities Qualifying: Select a PPA. Scope of the Exception: Select a PPA.

3. Other Lender Issues (Preliminary NEPA Determination: Categorical Exclusion)

During public comment, lenders have requested

(1) third party verification of QS ownership,
(2) a lien registry, and
(3) individually serialized QS, in order to provide the means by which they could secure QS as collateral for loans.

In the Fall of 2011, NMFS made a determination that QS ownership information would be made publicly available, eliminating the need for third party verification of QS ownership. The need for a lien registry and serialized identification might be largely met by the combination of providing a place on QS accounts for lien holders to be listed in the NMFS data system and the state-by-state system of Uniform Commercial Code central lien registries for secured transactions. The alternatives under consideration are as follows.

Status Quo: No change.

Alternative (recommendation by the GAP endorsed by the Council, November 2011): Add a place to list lender on the QS ownership records. A lender name would only be included on the record if the QS owner agrees, but removal would require agreement of both the QS owner and the lender. While a lender is listed, transfer of QS from the account would require authorization from both the owner and the lender. To facilitate commitment of only part of an owner's QS to a particular lender, a single QS owner would be able to establish additional QS accounts.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Select a PPA.

4. Develop a process to certify new observer providers (Preliminary NEPA Determination: Categorical Exclusion)

The current regulations authorize as west coast observer providers those entities certified to provide observers for the North Pacific fisheries. There is no independent means by which an entity can qualify as a West Coast observer provider without also having to qualify under the North Pacific programs. During previous Council deliberations on this issue there was discussion of the possibility that the states might act as observer providers, particularly with respect to shoreside monitoring. Agenda Item F.8.b, NMFS Report 2 contains more information on this issue.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	See Agenda Item F.8.b NMFS Report 2 for language and needed action.

5. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time (Preliminary NEPA Determination: EA)

Originally, the license limitation program allowed a trawl and fixed gear (longline or fishpot) permit to be registered to the same vessel at the same time (additionally, there are a few permits endorsed for both trawl and one of the fixed gears). At a later time, because of enforcement and/or monitoring needs, regulations were modified to prohibit stacking of trawl permits with permits endorsed for other gears. Since then vessel monitoring system (VMS) and declaration systems may have reduced or eliminated the need for this restriction.

The trawl rationalization program was intended to allow vessels to move between the use of trawl and other gears while continuing to operate under the IFQ program (gear switching). Additionally, it allows vessels to participate in the IFQ fishery without ever using trawl gear. However, the flexibility of any vessel that wants to participate in both the IFQ program and the limited entry fixed gear fishery is limited on the number of times a permit may be transferred to a vessel in any year (one time per year).[2]

Status quo: A trawl endorsed permit cannot be on a vessel at the same time together with a limited entry longline of fishpot endorsed permit. A permit may only be transferred to a vessel one time per year.[2]

Alternative 1: Allow a trawl permit and up to three fixed gear permits (longline and/or fishpot) to be registered to the same vessel at the same time. No change to the number of transfers allowed per year.

Alternative 2 (recommendation by the TRREC endorsed by the Council, November 2011): Same as Alternative 1 but additionally specify that the established declaration process would be used to specify for enforcement and monitoring purposes which permit is being used or if fishing is being conducted <u>in the open access fishery.</u> *Note: Staff recommends that "open access fishery" be changed to "open access gear." While vessels with limited entry permits may use open access gears their harvest would generally continue to count against the limited entry allocation or against preseason set-asides (for incidental open access gears). They would not be considered participants in the open access fishery for catch accounting purposes unless the limited entry fishery for a species is closed.*

[2] The transfer of a permit from a vessel to a vessel "unidentified" status does not count against the transfer limit but if the permit is then transferred to a vessel (whether back to the same vessel from which it was transferred or a different vessel) that transfer counts against the limit. Thus a permit can be moved from and back to the same vessel one time per year.

At the November 2011 Council meeting, the GAP endorsed trawl/fixed gear permit stacking, which would be covered by either Alternative 1 or Alternative 2.

Another option which could address this issue would be to increase the number of transfers allowed per year. This would increase a vessel's flexibility to move between the limited entry trawl and fixed gear fishery and it would also allow more flexibility for vessels to move between the limited entry and open access fisheries, reducing the wall between these sectors. Such a provision would also increase administrative costs.

Summary of Impacts

The increased flexibility for vessels in the fixed gear fishery to take part in the trawl fishery, and vice versa, could increase the amount of the trawl allocation taken by vessels using fixed gear.

Degree of Effect: Trawl vessels are already able to use fixed gear to take their trawl allocation, and fixed gear vessels are already allowed to switch into the trawl fishery and use fixed gear to take the trawl fishery through the acquisition of a trawl permit. The proposed action would increase the number of times a year a vessel could switch between participating in the limited entry fixed gear fishery and the trawl IFQ fishery. Under status quo, trawl vessels are able to increase their use of fixed gear to optimize profits, and would be expected to do so to the degree that they generate higher profits. Therefore, the keys in determining the degree of effect of an increase in flexibility to move between fisheries is the degree to which (1) harvesting the trawl allocation with fixed gear yields higher profits than harvesting the allocation with trawl gear, (2) vessels specializing in the use of fixed gear are able to garner higher profits with fixed gear than vessels using both trawl and fixed gear, and (3) the one time per year limit on transferring permits constrains the degree to which a fixed gear vessel would participate in the trawl IFQ fishery. The first two conditions must take into account not only profits with respect to a particular species, but the profits associated with all other species which are caught together with that particular species. For example, a complete switch of the harvest of sablefish from trawl gear to fixed gear would only be expected if the harvest of sablefish by fixed gear generated more profits than generated by all the species that trawlers catch together with sablefish. Quantitative information is not available to assess the degree to which the proposed increase in flexibility would result in a change in gear usage.

Biological Impacts: The ACLs and sector allocations would not be modified. Therefore, the biological impacts are limited to those related to difference between harvesting a portion of the trawl allocation with fixed gear as compared to trawl gear. Those differences likely relate primarily to habitat impacts and differences in gear selectivity. Amendment 20 specifies that vessels with trawl permits using a nontrawl gear are required to comply with the conservation areas applicable to those nontrawl gears (Section A-1.3). In general, the LE fixed gear RCA boundaries are shallower than the trawl RCA boundaries. Therefore, a switch from trawl gear to fixed gear would force activities into shallower waters shoreward of the RCA and allow vessels to fish in shallower areas seaward of the RCA. To the degree that an increased portion of the trawl allocation is taken by fixed gear vessels, the habitats impacted and species harvested may be different than under status quo. In terms of gear selectivity, in addition to size selectivity (e.g. fixed gear may be selective for larger sablefish), fixed gear may also have different selectivity for bycatch species (e.g. fixed gear vessels tend to take more yelloweye as bycatch than trawl vessels. However, while the species selectivities may be different, all harvest of IFQ species will still have to be covered by QP, and harvest of non-IFQ species will be controlled through other applicable management regulations such that harvests will be maintained within the ACLs. Additionally, during the time fixed gear vessels are participating in the IFQ program they would be required to carry observers, increasing the information available about fixed gear bycatch of all species, including marine mammal and bird interactions.

Socio-Economic Impacts: The economic effect will be a possible increase in the net revenues generated by the fishery. Such an increase would be expected to have an upward increase on quota prices. To the degree that a shift occurs, there may be some social effects as the number of trawl vessels (or size of trawl operations) decrease and fixed gear operations increase. These effects would be expected to the degree that there are social differences between members of the trawl and fixed gear communities. Even if the differences are minimal, all shifts in the distribution of harvest generally involve some disruption as some individuals move out of production while others move in. Such shifts are part of the costs associated with a market based management system.

Agency and Data System Impacts: The alternatives to status quo may reduce administrative costs by reducing the need for vessels to transfer their permits on and off a vessel in order to move between limited entry fisheries.

Alternative 2's reliance on the gear declaration system could require an enhancement of the existing data system. Vessels which are dual-endorsed, have limited entry permits for both trawl gear and one of the fixed gears, present some challenges to the current data system. There are a total of 5 dual-endorsed permits. For such permits, managers and enforcement need to be able to determine whether such vessels are fishing in the IFQ fishery or the fixed gear fishery. The current regulations specify that this determination will be made based on the vessel gear declarations. However, gear declarations are sometimes in error. In this regard, at the November 2011 Council meeting the EC stated:

> If this alternative [Alternative 2] is adopted, the EC strongly encourages industry leaders to impress upon their membership the importance of maintaining the proper declaration that accurately reflects their fishing activity. Accuracy with the declaration process is both legally required and vital to the analysis of effort by fishery managers.

A system has not been developed to handle corrections to the gear declarations and the provision of those modifications to managers responsible for tracking harvest. Allowing the stacking of fixed gear and trawl permits will increase the need for resolving this issue. There may be means other than the gear declarations for determining whether or not a trip is an IFQ trip. Alternative 2 would dictate that rather than using an alternative means for classifying a trip (e.g. the filing of an electronic landings record under the IFQ program) that the gear declarations program be used. This alternative may require an enhancement of that system such that corrected declarations are incorporated into the declaration datasets and that information from declaration data system is transmitted to the catch monitoring system (e.g. PacFIN).

Interaction with Other Trailing Actions

This action may interact with the issue of clarifying the sablefish at-sea processing exemption, (Item 1 of Agenda Item F.8.b, NMFS Report 2). Allowing the stacking of a trawl permit on a vessel which has a fixed gear permit with a sablefish at-sea processing exemption (1 vessel) may allow that vessel to process at-sea the sablefish it catches under the IFQ program. Unless the alternative is adjusted to specify otherwise, this may eliminate the need for action on Item 1 of the NMFS PIE list.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Select a PPA.

6. Change the opt-out requirement for QP deficits (Preliminary NEPA Determination: No Further NEPA Required)

The question under this issue is whether to change the opt-out requirement for QP deficits lasting more than 30 days, in order to allow vessels to rejoin the fishery after deficits are cleared.

Under status quo, any vessel with a documented deficit is prohibited from fishing groundfish and is required to cure the deficit within 30 days. If a vessel carries a deficit for more than 30 days and the amount of the deficit is within the carry-over allowance, then the vessel can stay within compliance of the program by opting out of the fishery for the remainder of the year. Vessels which do not opt out, but instead incur a violation, are allowed to rejoin the fishery as soon as the deficit is cured. Deficits greater than the carryover allowance must be brought to within the carryover allowance before the 30-day clock expires, otherwise the vessel will incur a violation.

In the following discussion, all references to a vessel's ability to opt out apply only to situations in which the deficits are less than the carryover allowance, unless otherwise noted.

A variety of circumstances may arise under which a vessel incurs a deficit. When a deficit is incurred early in the year, it may not be possible to acquire QP for certain species at a reasonable price because of uncertainties about bycatch rates and tight QP markets for constraining species. Later in the year QP could become more available. However, current regulations give the vessel two choices, each with potentially substantial adverse consequences: (1) incur a violation, including the penalty and subsequent consequences of a violation record, and preserve the opportunity to participate later in the year, or (2) leave the fishery and forgo all remaining opportunity for the year (unused QP might be sold off to other vessels).

The alternatives under consideration are as follows:

Status Quo: Vessels that have carried a known deficit for more than 30 days may avoid a violation by opting out of the fishery for the remainder of the year (so long as the deficit is less than the carryover allowance).

Alternative (draft alternative endorsed by the Council, November 2011): Vessels that have carried a known deficit for more than 30 days may avoid a violation by opting out of the fishery (so long as the deficit is less than the carryover allowance). Such vessels may opt back in once they have cured their deficit.

The 30-day clock with the provision allowing vessels to opt-out for the remainder of the year was originally intended to encourage vessels to cover their overages sooner rather than later. However, as described above and portrayed in the following table, this provision create a situation in which a vessel which incurs a violation is allowed to continue in the fishery while a vessel which stays in compliance must opt out for the remainder of the year. Some view this situation as inequitable.

Table 2. Implications of the alternatives for vessels incurring a deficit that is within the carryover allowance.

Situation of Vessels Incurring a Deficit	Status Quo	Alternative
Vessel covers deficit within 30 days	Vessel not in violation. Vessel can re-enter the fishery as soon as deficit is covered.	Vessel not in violation. Vessel can re-enter the fishery as soon as deficit is covered.
Vessel opts out by 30 days and covers deficit later	Vessel not in violation. Vessel must stay out of the fishery the entire year.	Vessel not in violation. Vessel can re-enter the fishery as soon as deficit is covered.
Vessel does not opt out and covers deficit later	Vessel in violation. Vessel can re-enter the fishery as soon as deficit is covered.	Vessel in violation. Vessel can re-enter the fishery as soon as deficit is covered.

Vessels with deficits ***greater than the deficit carryover allowance*** may not avoid a violation by opting out by 30 days.

On the one hand the alternative to status quo might be perceived as more equitable. On the other hand changing the opt-out requirement (the alternative) might make the 30-day clock for covering a deficit less meaningful (the 30-day clock would be relevant only for those vessels with deficits greater than the carryover provision). If the vessel chooses to "opt out" there is no cost in doing so. Under the proposed alternative it could opt back in as soon as the deficit is covered, also at no cost. Since the vessel cannot fish while in deficit, the steps of opting out and opting back may not carry much meaning. However, the EC points out that the fleet is more aware of the 30-day requirement than it is aware of the provision prohibiting fishing while in deficit and therefore has recommended that the 30-day requirement be maintained.

With respect to utilization of the opt-out provision the EC provided the following information in their November 2011 report:

> To date there have been three events where a vessel was in deficit and approached the 30-day time period before covering their deficit. In two of these cases the deficit involved target species, and the vessel did not cover the deficit because it was participating in another fishery and chose to wait until the end of the 30-day period before covering their deficit. In the third situation, the deficit involved a large quantity of an overfished species. In all three situations the deficits were larger than the carryover amount (10 percent) and the vessels were not eligible to opt out.

While vessels have not been using the opt-out provision, it is uncertain whether or not they have had to pay higher prices for QP in order to avoid being forced into the opt-out/violation choice. The following table portrays some tradeoffs between the alternatives.

Table 3. Tradeoffs between status quo and alternative for changes to the opt-out provision.

Status quo	Alternative
A potential inequity from being forced to leave the fishery to maintain compliance while vessels that incur a violation are allowed to fish.	Elimination of a potential inequity.
The possibility of being forced to pay higher prices for QP because of the pressure to avoid having to choose between a violation and forgoing fishing for the year.	More time to shop/wait for a better QP price.
Incentive to resolve overages before 30 days.	Little incentive to resolve overages before 30 days.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Select a PPA.

7. Eliminate double filing of co-op reports (November and March) (Preliminary NEPA Determination: No Further NEPA Required)

Currently both mothership and catcher-processor co-ops are required to submit to the Council a preliminary annual report in November and to NMFS a final annual report by March 31 of the following year. Since the fishery is not completed on time for the November meeting and a subsequent final report must be provided by March 31 of the following year, question has been raised about the necessity of providing the preliminary report.

Status Quo: Require that co-ops provide a preliminary annual report to the Council in November and a final annual report to NMFS by March 31 of the following year.

Alternative (draft alternative from November 2011, no Council action on the alternative): Require that co-ops provide only final annual reports for a particular year but require that it be provided to both NMFS and the Council. The annual report must be provided to NMFS by March 31 of the subsequent year. The annual report should be provided to the Council on time for distribution with the April briefing book, i.e. by the briefing book deadline for the April Council meeting (but no earlier than March 10).

The original requirement for filing preliminary and final reports was patterned based on co-op filing requirements for Alaskan fisheries. The purpose of the requirement for filing a preliminary report is not apparent, and the filing of preliminary reports has apparently been eliminated in the Alaska program.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Select a PPA.

Whiting Season Rule (Stand Alone or as Part of PIE 2 or Gear Rule)

8. Whiting season opening date and southern allocation (Preliminary NEPA Determination: EA)

Under a rationalized fishery, the previous rationale for varying start dates among areas and whiting sectors may no longer apply. As a first step, at its November 2011 meeting, the Council adopted for consideration the GAP and Trawl Rationalization Regulatory Evaluation Committee (TRREC) option of moving the whiting season start date for all sectors and areas to May 15, consistent with the start date for the at-sea fishery. The GAP recommendation, adopted as guidance by the Council, also stated:

> The GAP also supports reviewing the overall whiting fishery management regime, including consideration of moving towards a year round fishery. If this adds significant workload, it should remain a priority for the TRREC to address for implementation in the Program Improvements and Enhancements (PIE) 3 rule or beyond.

Only the issue of moving the whiting season date to May 15 is part of the current action. The following are the options for consideration.

Status quo: No Action. The current regulations for the start date and southern allocation are as follows.

660.131(B)(2) Different primary season start dates. North of 40°30’ N. lat., different starting dates may be established for the catcher/processor sector, the mothership sector, and in the Pacific whiting IFQ fishery for vessels delivering to IFQ first receivers north of 42°N. lat. and vessels delivering to IFQ first receivers between 42° through 40°30’ N. lat. . . .

(iii) Primary whiting season start dates and duration. After the start of a primary season for a sector of the whiting fishery, the season remains open for that sector until the sector allocation of whiting or non-whiting groundfish (with allocations) is reached or projected to be reached and the fishery season for that sector is closed by NMFS. The starting dates for the primary seasons for the whiting fishery are as follows:

- (A) Catcher/processor sector—May 15.
- (B) Mothership sector—May 15.
- (C) Shorebased IFQ Program, Pacific whiting IFQ fishery.
  - (1) North of 42°N. lat.—June 15;
  - (2) Between 42°–40°30′N. lat.—April 1; and
  - (3) South of 40°30′N. lat.—April 15.

660.55 (f)(2) . . . No more than 5 percent of the Shore based IFQ Program allocation may be taken and retained south of 42° N. lat. before the start of the primary Pacific whiting season north of 42° N. lat. . . . .

Alternative (recommendation by the GAP endorsed by the Council, November 2011): Use a single May 15 start date for all whiting sectors including California fisheries and eliminate the 5 percent California early season whiting fishery cap, to the extent that a fishery management plan (FMP) amendment is not required. This change would be implemented through the two-meeting process already authorized under the framework of the Pacific Coast Groundfish FMP.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Select a PPA or provide guidance on further development of alternatives and consider the process to be followed.

F.8.d – Council Action Template

Following is a detailed list of action items for potential use in motion making.

Council Action: "1. Select preliminary preferred alternatives for trailing action."

Agenda Item F.8.a, Att 1. (this attachment)	Council Action
Cost Recovery Rule	
1. Cost Recovery (no action anticipated)	

PIE Rule 2	
2. Quota Share/Quota Pound (QS/QP) Control Rules – Safe Harbors	
A. Risk Pools (no action anticipated)	
B. Lenders	
3. Other Lender Issues	
4. Develop a process to certify new observer providers (see NMFS Report 2)	
5. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time	
6. Change the opt-out requirement for QP deficits	
7. Eliminate double filing of co-op reports	

Whiting Season Rule	Council Action
8. Whiting season opening date and southern allocation	

Council Action: 2. "Take action as necessary on the NMFS identified trailing actions."

Agenda Item F.8.b. NMFS Reports	Council Action
1. NMFS Items for PIE 2	
2. NMFS Items for Correction	

Council Action: "3. Provide guidance as needed on moving forward on gear rule, including placement of the chafing gear issue."

Agenda Item F.8.a. Att 4. Gear Rule	Council Action
1. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery	
A. Allowing multiple gears onboard a vessel on the same trip	
B. Allowing use of multiple gears on a single trip	
2. Chafing Gear	
3. Allow trawl gear modifications that increase efficiency and selectivity	

PFMC
02/13/12

Agenda Item F.8.a
Attachment 2
March 2012

TRAWL RATIONALIZATION TRAILING ACTIONS

ISSUE: LENDERS

Draft Council Decision Analysis Document

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CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

This document provides background information about, and analyses for, modifications affecting the ability of the groundfish industry to acquire loans from lenders. The proposed action would require an amendment to the regulations implementing the Pacific Coast Groundfish Fishery Management Plan (FMP). If the regulatory amendment is implemented, the description of the trawl rationalization program contained in Appendix E to the groundfish FMP would automatically be revised to reflect the regulatory modification. The proposed action 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.

1.2 Description of the Proposed Action

1.2.1 Issue: QS Control Limit Safe Harbor for Lenders

The action considered under this issue would amend the shorebased trawl rationalization regulations as they apply to lenders with respect to QS control limits.

1.2.2 Issue: Public Record Of Lender Interest in QS

The action considered under this issue is to amend the shorebased trawl rationalization regulations to provide a means by which lender collateral interest in QS could be included in the information kept on QS accounts, with the concurrence of the QS account holder and the lender.

1.3 Purpose and Need for the Proposed Action

1.3.1 Issue: QS Control Limit Safe Harbor for Lenders

When the control limits policy was established there was substantial concern about opportunity for circumvention of the limits. When it approved the initial issuance rule implementing the IFQ program, NMFS inserted into the QS control rule an exception for banks and financial institutions. There is concern about both whether the entities qualifying for this exemption are sufficiently defined and the scope of the activities for which the exemption was provided. An overly broad class of entities receiving the exception or an overly broad scope of exempted activities could undermine effectiveness of the control limits.

The following is the regulatory text into which NMFS inserted an exception for banks and financial institutions (the insertions are underlined).

660.140(d)(4) *Accumulation limits*—(i) *QS and IBQ control limits.* QS and IBQ control limits are accumulation limits and are the amount of QS and IBQ that a person, individually or collectively, may own or control. QS and IBQ control limits are expressed as a percentage of the Shorebased IFQ Program's allocation. (A) *Control limits for individual species.* No person may own or control, or have a controlling influence over, by any means whatsoever an amount of QS or IBQ for any individual species that exceeds the Shorebased IFQ Program accumulation limits. (B) *Control limit for aggregate . . .* (C) The Shorebased IFQ Program accumulation limits are as follows: [see Table of QS Control Limits] (ii) Ownership—individual and collective *rule.* The QS or IBQ that counts toward a person's accumulation limit will include: (A) The QS or IBQ owned by that person, and (B) That portion of the QS or IBQ owned by an entity in which that person has an economic or financial interest, where the person's share of interest in that entity will determine the portion of that entity's QS or IBQ that counts toward the person's limit.	(iii) *Control.* Control means, but is not limited to, the following: (A) The person has the right to direct, or does direct, in whole or in part, the business of the entity to which the QS or IBQ are registered; (B) The person has the right to limit the actions of or replace, or does limit the actions of or replace, the chief executive officer, a majority of the board of directors, any general partner, or any person serving in a management capacity of the entity to which the QS or IBQ are registered; (C) The person has the right to direct, or does direct, and/or the right to prevent or delay, or does prevent or delay, the transfer of QS or IBQ, or the resulting QP or IBQ pounds; (D) The person, through loan covenants or any other means, has the right to restrict, or does restrict, and/or has a controlling influence over the day to day business activities or management policies of the entity to which the QS or IBQ are registered;	(E) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, through loan covenants or any other means, has the right to restrict, or does restrict, any activity related to QS or IBQ or QP or IBQ pounds, including, but not limited to, use of QS or IBQ, or the resulting QP or IBQ pounds, or disposition of fish harvested under the resulting QP or IBQ pounds; (F) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to control, or does control, the management of, or to be a controlling factor in, the entity to which the QS or IBQ, or the resulting QP or IBQ pounds, are registered; (G) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to cause or prevent, or does cause or prevent, the sale, lease or other disposition of QS or IBQ, or the resulting QP or IBQ pounds; and (H) The person has the ability through any means whatsoever to control or have a controlling influence over the entity to which QS or IBQ is registered.

In the preamble to the final rule, NMFS explained that this change was adopted in response to public comment:

> [Comment:] Proposed § 660.140(d)(4)(iii)(D) and (E) ‘‘could eliminate the ability of a quota share/quota pound owner to obtain necessary financing for fishing operations. Under these sub-clauses, a bank or other financial institution would be unable to provide loans using quota shares/pounds as collateral, a common practice in limited access fisheries. A quota share

> brokerage would be unable to take title or otherwise encumber quota shares/pounds beyond the accumulation limits, even if a fisherman requested the broker do so.''
>
> [Response:] NMFS does not intend that these sections apply to banks or financial institutions, unless the financial documents specify control beyond normal business agreements. NMFS has modified the regulations accordingly. As for quota share brokerages, each transaction must comply with the accumulation or control limits; however, compliance does not prevent brokerage transactions. Compliance would be based on the facts of the transactions.
> [. . .]
> NMFS acknowledges that participants in the fishery may be concerned about whether potential actions would comply with the accumulation limits. It is the responsibility of the participants to comply with the regulations; if participants have questions about potential actions, NMFS encourages those participants to provide the agency with specific facts and questions prior to entering into agreements or taking action in order to understand NMFS's interpretation of the potential facts in relation to the regulation.

Subsequent to the modifications described above, the public has expressed uncertainty about the types of institutions to which the exception is expected to apply. What types of entities might qualify as a "bank or other financial institution?" For example, it is traditional in the fishery for processors to lend harvesters money for capital acquisitions. Do the exceptions for lenders apply to such activities? Adopting language in the control limit regulations with more specificity could provide more clarity as to whether the exclusions applicable to "banks and other financial institutions" should be construed more broadly or more narrowly.

Other concerns with exempting certain activities of lending institutions from the control rule have to do with the scope of the activity for which an exception is provided and with overlaps and conflicts in the various paragraphs of the current regulatory language. The public has requested clarification regarding how the paragraphs might be applied. For example, banks and financial institutions are provided an exception with respect to the use of loan covenants to "restrict, any activity related to QS or IBQ or QP or IBQ pounds" (paragraph E) but are not provided an exception with respect to directing, delaying or preventing the transfer of QS or individual bycatch quota (IBQ) or having the right to do so (paragraph C) (see page 4 for the regulations and Table 2-1 provides a summary of the paragraphs for which lender exceptions are and are not provided. The full regulatory text is provided on page 4.

Table 2-1 for a summary). This concern could be addressed in a number of ways. One would be by adding the lender exemption to paragraph (C). However, there are also other conflicting overlaps between the paragraphs, for example between paragraphs (E) and (D). Again, paragraph (E) provides an exception for certain lenders pertaining to the direction of "any activity related to QS or IBQ or QP or IBQ pounds" while paragraph (D) does not provide those lenders an exception for "day to day business activities or management policies of the entities to which the QS of QP are registered." Paragraphs (G) and (C) also overlap and conflict in a similar fashion. There is also concern as to whether the paragraphs provide a greater exception than banks require in order to achieve the interests necessary to secure their loans. For example, paragraph (E) appears to go beyond what is needed to establish security interest, covering "any activity related to QS or IBQ or QP or IBQ pounds."

Thus, there are two sub-issues to address with respect to the safe harbor provided to lenders. The first is determination of the entities eligible for the safe harbor and the second is the scope of the exception provided to such entities (i.e. the activities allowed under the safe harbor).

1.3.2 Issue: Public Record of Lender Interest in QS

Lenders have expressed concern about their ability to ascertain whether or not QS they have accepted as collateral for a loan have been used as security for other obligations and about their ability to know about and/or prevent the transfer of any QS that has been pledged to them as security for a loan. Ability to secure interest in QS is important to both the lenders and members of the industry seeking loans. Limited ability to provide this security for QS pledged as collateral may make it more difficult and expensive to acquire loans (result in higher risk and hence higher interest rates). While the Section 305(h)(1) of the MSA requires the creation of a central lien registry, this section has never been implemented due to legal, cost, and workload issues.

CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

2.1 QS Control Limit Safe Harbor for Lenders

2.1.1 Lending Entities Qualifying for an Exception

This section deals with specification of the entities which would qualify for an exception for lending activities. Alternatives are as follows.

Status Quo: Retain existing language CFR 660.140(d)(4) which provides exceptions for "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*," (no action). Certain exceptions to the control limits are provided for "banks and other financial institutions that rely on QS or IBQ as collateral for loans" (see page 4).

Alternative 1 (recommendation by the GAP endorsed by the Council, November 2011): Retain existing language CFR 660.140(d)(4) which provides exceptions for "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*," but add an amplification indicating that to qualify as a bank or financial institution for purposes of this paragraph the entity must be regularly or primarily engaged in the business of lending and not engaged in or controlled by entities whose primary business is the harvest processing or distribution of fish or fish products. Additionally, require that any lender that wishes to qualify for the exception and is not state or federally chartered banks or other financial institution disclose the identity and share of interest of any entity with a 2% or more ownership interest in the lender, in a manner similar to what is required for the trawl identification of ownership interest form CFR 660.140(d)(4)(iv).

Alternative 2: In the description of control (CFR 660.140(d)(4)), replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*a state or federally chartered bank or other state or federally chartered financial institution that relies on QS or IBQ as collateral for loans*."

Alternative 3: In the description of control (CFR 660.140(d)(4)), replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*any person that relies on QS or IBQ as collateral for loans.*"

Alternative 1 would clarify that the entities qualifying for this exception include more than traditional banks and financial institutions, i.e. include other types of lenders, so long as those lenders are not otherwise engaged in the fishery. The intent is to ensure that the exception applies for those legitimately engaged in providing lending services to the industry but at the same time does not provide entities with other financial interests in the industry to gain an advantage through an exception to the control limit. To reduce the chance that this exception might be exploited by participants in the fishing industry, a requirement is included for the disclosure of ownership interest in any financial institution for which such disclosures are not already required, i.e. for banks or financial institutions that are not state or federally chartered. As compared to status quo, Alternative 2 would result in a narrower application of control rule safe harbor for lending institutions. While Alternative 2 alternative provides a clear test for whether the lending institution qualifies (i.e., whether it is state or federally chartered), it would also result in some lending institutions not being able to avail themselves of the exemptions from the control rule. For instance, private equity funds may not be state or federally chartered. Alternative 3 would result in a broader application of exemptions for lending institutions from the control rule, because "person" includes not only banks and other financial institutions, but other entities as well (such as processors or harvesting companies) and individuals.

2.1.2 Scope of the Exception Provided

This section deals with the scope of activities for which a lender receives an exception from the control limits. Alternatives are as follows.

Status Quo: No change. (see page 4 for current language and Table 2-1 for a summary).
Alternative 1: Add the appropriate language providing an exception for lenders to paragraph (C).
Alternative 2: Same as Alternative 1 but also remove the exceptions provided to lenders in all other paragraphs and add at the end of each of the other paragraphs language to the following effect: *"with the exception of those activities allowed under paragraph (C)"*
Alternative 3 (recommendation by the GAP endorsed by the Council, November 2011): Same as Alternative 2 but further limit the exception under paragraph C so that the lenders exception pertains only to control over the transfer of QS and IBQ and not the affiliated QP or IBQ-pounds. All associated QP will be distributed to the borrower unless the bank or financial institution provides evidence that the borrower is in default on the loan, in which case the related QP will be distributed to the adaptive management program until such time as any the QS/IBQ held by the bank or financial institution is sold, or the QS/IBQ holdings of the bank or financial institution are below the QS control limits. (from the April 2011 strawdog option on which the Council requested further discussion).
Alternative 4: Add exceptions for lenders to all paragraphs.

Table 2-1 provides a summary of the paragraphs for which lender exceptions are and are not provided. The full regulatory text is provided on page 4.

Table 2-1. Summary of 660.140(d)(4): activities for which lender exceptions are provided and not provided.

No Lender Exception Provided	Lender Exception Provided
(A) & (B) directs the business of an entity or authority over director, board, partners etc.	(E) Any activity related to quota
(C) Prevents or delays quota transfer (shares or pounds)	(F) Controlling management of the entity or being a controlling factor
(D) Through loan covenants affects day to day business activities	(G) Cause or prevent sale, lease, or other disposition of quota
(H) Any other means of control over shares	

There appear to be possible conflicts in the exceptions granted between the following paragraphs:

- (C) and (E)
- (C) and (G)
- (D) and (E)/(F)
- (A/B) and (F).

Alternative 1 would make it clear that lenders could control the transfer of QS, IBQ, QP, and IBQ but leave other possible inconsistencies in place. Alternatives 2, 3, and 4 would eliminate any inconsistencies due to overlap among the paragraphs. Alternative 2 would achieve this end by restricting the exception for lenders to lender influence over the transfer of quota, as specified in paragraph C (exceptions provided in other paragraphs would be eliminated). Alternative 3 would further restrict the paragraph C exception by limiting the exception just to QS and IBQ, not to the QP and IBQ-pounds. Alternative 4 would achieve consistency among all the paragraphs by providing lenders exceptions under all paragraphs.

2.2 Issue: Public Record of Lender Interest in QS

During public comment, lenders have requested (1) third party verification of QS ownership, (2) a lien registry, and (3) individually serialized QS, in order to provide the means by which they could secure QS as collateral for loans. In the fall of 2011, NMFS made a determination that QS ownership information would be made publicly available, eliminating the need for third party verification of QS ownership. Creating unique identifiers for QS would either be very costly or require a modification to the program to reduce the degree of QS divisibility. An alternative to unique identifiers might be to add lender information to QS ownership records. Transfer of QS from the account would then require authorization from both the owner and the lender. The lender would have no other authority with respect to the disposition of the QP from the account. The position of the lender with respect to the QS in the account would be similar to the position of a lender on the title for a car loan. If only some of the QS held by a particular individual were to be pledged as collateral, then the individual would be allowed to establish a separate account for the QS obligated to a lender. The need for a lien registry and serialized identification might be largely met by the combination of providing a place on QS accounts for lien holders to be listed in the NMFS data system and the state-by-state system of Uniform Commercial Code central lien registries for secured transactions. The alternatives under consideration are as follows

> **Status Quo:** No change.
> **Alternative (recommendation by the GAP endorsed by the Council, November 2011):** Add a place to list lender on the QS ownership records. A lender name would only be included on the record if the QS owner agrees but removal would require agreement of both the QS owner and the lender. While a lender is listed, transfer of QS from the account would require authorization from both the owner and the lender. To facilitate commitment of only part of an owners QS to a particular lender, a single QS owner would be able to establish additional QS accounts.

There are a variety of ways this alternative might be implemented. The following is one example.

1. A QS holder wishing to pledge QS as collateral and the lender desiring to use the QS as collateral would sign a form provided by NMFS. If the QS holder was only pledging part of his/her QS as collateral a separate account would be created for those QS subject to the agreement with the lender.
2. The form would state that a separate account would be opened with one field designating the owner and a separate field designating the binding party (lender). The form would also specify the amounts of QS held by the QS owner that would be placed into this account.
3. The only difference between this account and any other account would be that QS in the account could be transferred out of the account only through the filing of a QS transfer form signed by both the QS owner and the lender. The lender's only authority with respect to the account would be the ability to prevent QS transfers from the account.
4. With respect to any disputes that might arise between the QS owner and the lender regarding the terms and conditions on which the QS owner or lender is required to authorize QS transfers, these issues would be settled privately, through the courts if necessary, but not be a matter of concern for NMFS.

While this provision might begin to address the lien registry issue it would not be a complete response in that regard.

CHAPTER 3 IMPACTS

3.1 Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem, and Biological Environment

Modifications to the rules affecting a lenders ability to secure QS as collateral for loans will have no direct or indirect impacts on the physical or biological environment. The effects of this proposal would be to modify the socio-economic impacts of fishery management measures implemented under the West Coast Groundfish FMP to mitigate the physical and biological impacts arising from the activities of west coast groundfish fisheries.

3.2 Direct and Indirect Impacts to the Socioeconomic Environment

3.2.1 Fishery and Business Impacts

The control rule is designed to prevent an entity from accumulating excessive shares and exerting undo influence in the market place for shares and fish. Prevention of such accumulations related to a number of fishery management objectives (MSA National Standard 4(c), 303A(c)(5)(B)(ii) and (c)(5)(D); and FMP Amendment 20 Goals and Objectives, Constraint 6). It is to the benefit of both lenders and businesses that QS be usable as collateral to secure loans. Lenders providing financing to a number of industry participants could find themselves in violation of control limits, if the control they exert to secure collateral is limited by control limits. Therefore an exception to the control limits has been provided to allow for lenders to service the industry. The exception provided is not clear both in terms of who it applies to and the nature of the activities to which the exception applies. Uncertainty has a dampening effect on lending which in turn adversely affect the industry.

The alternatives considered would increase certainty about lender position under the control limits and thereby have a number of positive effects on the industry. Increased certainty would decrease risk, reduce the costs of borrowing, and increase net benefits to the nation. Borrowing costs would be reduced because lenders require lower compensation for placing their money at risk when the lending environment is more certain.

Reducing the costs of borrowing and increasing the acceptance of QS as collateral for loans would decrease the importance wealth for individuals acquiring assets to enter the fishery, decreasing barriers to entry (a consideration of MSA 303A(c)(5)(B)). Often the collateral used for a loan is the purchases made with the loan funds. The ability to use the purchased QS as collateral decreases the amount of wealth (alternative collateral or fiscal assets to use in the purchase of QS) an individual would have to accumulate in order to enter the fishery as a QS owner.

While all of the alternatives increase certainty about the rules that apply to lenders, the alternatives for the control rule safe harbor (Section 2.1) vary in terms of who would qualify as a lender and the scope of the activities for which an exception is provided. Through these variations the alternatives perform differently with respect to objectives related to the prevention of excess control. With respect to the issue of determining which entities qualify as lenders (Section 2.1.1) Alternative 3 would allow the broadest class of entities to qualify as a lender for purposes of the lender safe harbor. It would open the door for an exception for any lender, regardless of the lender's primary business. This would provide greater opportunities for members of the fishing industry to abuse the lender exception and gain excessive control by financing the QS purchases of others. Alternative 2 provides the most restrictive class of entities eligible for the exception: state or federally chartered financial institutions. This could rule out nonprofit and other organizations (e.g. communities) which may desire to make loans to the industry in order to pursue social policies but have no intent to control the markets and industry. Alternative 1 would leave the present language but add an amplification that banks and financial institutions include entities that are regularly or primarily engaged in lending and not engaged in the fishing industry. Additionally, to help ensure that the provisions are not used by members of the industry to circumvent limits on excessive accumulation Alternative 1 includes a provision requiring the divulgence of ownership information by entities that are not Federal or state chartered financial institutions.

All of the alternatives on the scope of the exception (Section 2.1.2) clarify conflicts between paragraphs on the nature of the exception provided, thus contributing to a clearer and less risky regulatory environment, except Alternative 1. Alternative 1 eliminates the most important conflict, making it clear that control limits will not interfere with the lender's right to interfere with the transfer of an asset which has been pledged as collateral, but leaves other conflicts in place. Alternative 2 is the same as Alternative 1 but eliminates all other exceptions for lenders. Elimination of these exceptions could interfere with a lenders ability to take management control of a company in the event of bankruptcy or other actions that go beyond limiting the transfer of quota but are necessary to secure their interest. Alternative 3, narrows the exception for lenders even further by restricting their ability to limit transfers to the QS (the long term asset) and not the QP that are issued annually to QS holders. Alternative 4 would provide a lender exception in every paragraph of the control rule. Because of the broader scope of the activities for which an exception is provided, Alternative 4 would provide the most opportunity for abuse of the exception by an entity desiring to exert excessive control, while Alternative 3 by providing the narrowest scope of exceptions provides the least such opportunity. At the same time, Alternatives 2 and 3 could limit the ability of lenders to secure their assets in a manner similar to the way they could for other types of collateral (e.g. taking control of a bankrupt company during reorganization), thus somewhat increasing the risk to lenders as compared to Alternative 4 and potentially resulting in somewhat higher lending costs than Alternative 4.

The alternative to provide a public record of lender interest in QS (Section 2.2) is expected to decrease lender risk with the attendant positive affects of risk reduction, as discussed in the first paragraphs of this section. The security provided by the ability to register an interest and prevent a transfer may reduce transaction costs, also enhancing net benefits and increasing access to capital.

3.2.2 Impacts on Communities

Overall, the alternatives are expected to improve access to financing and better access to financing is expected to increase the health of the industry and hence the health of the local fishing communities. Increased access to financing could also increase the probability that local control will be maintained over the QS, particularly given that there are a number of nonprofit organizations interested in funding QS purchases for the purpose of maintaining control in local communities. Additionally, the control limit exceptions of Section 2.1 might also facilitate a lending by a community that desires to directly finance QS purchases by members of the community.

3.3 Impacts on Agencies

The primary agency costs would be associated with the implementation and administration of the registration of lender interest in QS (Section 2.2). This registration would occur initially only with joint agreement between the QS owner and the lender, but once established would also require joint agreement prior to QS transfers and in order to end the listing of the lender on the QS account. A need to create separate accounts for those QS a holder had pledged as collateral and those which had not been pledged as collateral would add to administrative costs. Additionally, if a QS holder is to be allowed to pledge QS as collateral to more than one lender, a separate joint account might be needed for each QS/Lender combination.

Agenda Item F.8.a
Attachment 3
March 2012

TRAWL RATIONALIZATION TRAILING ACTIONS

ISSUE: WHITING SEASON AND SOUTHERN ALLOCATION

Draft Council Decision Analysis Document

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FEBRUARY 2012

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CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

This document provides background information about, and analyses for, modifications affecting regulations for the shore-based whiting fishery. The proposed action would require an amendment to the regulations implementing the Pacific Coast Groundfish Fishery Management Plan (FMP). The proposed action 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 is organized so that it contains the analyses required under NEPA.

1.2 Description of the Proposed Action

The action considered under this issue is to amend the regulations governing the groundfish fishery by modifying the season opening date for the shore-based primary whiting season and the allocation cap on the amount of the allocation taken and retained early in the season in the area south of 42° N. lat.

1.3 Purpose and Need for the Proposed Action

The trawl rationalization program generates benefits over the previous management program to the degree that previous management constraints can be relieved and flexibility provided in the new program. The opportunity for regulatory relief is generated by the individual and collective responsibility for staying within allowed catch levels that is imposed by the rationalization program. The self responsibility of the trawl rationalization program is generated through a system of catch shares (in the form of IFQs or catch limits assigned to co-operatives). Flexibility in the new program is provided by providing the opportunity for individuals to trade catch shares among themselves. This flexibility is expected to allow the industry to optimize the value it derives from the fishery, subject to those regulations which need to remain in place to achieve conservations objectives and address socio-economic concerns which would not otherwise be expected to result from the influence of market forces.

A substantial portion of the regulatory relief provided to the shore-based trawl fishery was the near elimination of the system of 2-month trip limits which was used to control harvest of nonwhiting species under the previous management regime. However, the trawl rationalization program made no automatic adjustments to the season structure used to control harvest in the shore-based and at-sea whiting fishery. There may be an opportunity to further enhance benefits of the trawl rationalization program by relieving constraints imposed by the season regulations. The Amendment 20 trawl rationalization program specifically identified consideration of modification of the whiting seasons to be a matter for a trailing action.

CHAPTER 2 **DESCRIPTION OF THE ALTERNATIVES**

2.1 Alternatives

2.1.1 Background

In 1996, the northern shore-based fishery (north of 42° N. lat) and at-sea whiting fisheries (mothership and catcher-processor) all began on May 15, the central shore-based fishery (between 42° N lat. and 40° 30' N lat.) began on March 1 and the southern fishery (south of 40° 30' N lat.) began on April 15. For 1997 the Council adopted, and NMFS approved, a preferred alternative which changed the opening date for the northern shorebased fishery to June 15, and moved the start date for the central fishery to April 1. Additionally, an allocation decision was made to limit the central and southern fisheries (the California fisheries) to taking a total of 5% of the shorebased allocation prior to the start of the northern fishery. These regulations have remained in place and continue under the trawl rationalization program.[1]

In addition to modifying the season dates and establishing a California early season allocation, the Council's action for the 1997 fishery also established a framework for modifying the season opening dates on an annual basis. The framework for taking action is discussed in Section 2.3.

The alternative to status quo would return the northern shore-based season start date to May 15 and would also move the California fishery season start dates to May 15. The 5% limit on the

---

[1] The Council's action implemented for the 1997 fishery:

> **Adopted alternative: establish a season framework.** Under the proposed framework, the Council may set separate season opening dates for each of the three sectors. Objectives and criteria for making these decisions are included in the discussion document. The season for northern California (40°30' N to 42° N latitude) would be modified to open April 15 in 1997 (60 days prior to the opening of the northern shorebased season) and be subject to a limit of 5% of the shore-based allocation (about 4,300 mt in 1997). The 1997 season opening date for mothership processors and catcher-processors will remain May 15, but the shore-based season north of 42°N will be June 15. Seasons may be adjusted annually to achieve the stated objectives. In addition, at-sea processors would be authorized to process whiting waste products when other at-sea whiting operations are prohibited, except for 48 hours before and after the at-sea whiting season is open.

amount of fish taken in the California fisheries prior to the start of the northern fishery becomes nonsensical if the California and northern fisheries start at the same time. Therefore, the alternative to status quo would also eliminate the early season allocation to the California shore-based whiting fishery (south of 42° N. lat).

The environmental assessment for the 1997 action is available from the Council website: http://www.pcouncil.org/wp-content/uploads/02_1997_EA_RIR_Whiting.pdf.

2.1.2 Description of Alternatives

The following are the alternatives being considered for this action.

Status quo: No Action. The current regulations for the start date and sourthern allocation are as follows.

> 660.131(B)(2) Different primary season start dates. North of 40°30' N. lat., different starting dates may be established for the catcher/processor sector, the mothership sector, and in the Pacific whiting IFQ fishery for vessels delivering to IFQ first receivers north of 42°N. lat. and vessels delivering to IFQ first receivers between 42° through 40°30' N. lat. . . .
>
> (iii) Primary whiting season start dates and duration. After the start of a primary season for a sector of the whiting fishery, the season remains open for that sector until the sector allocation of whiting or non-whiting groundfish (with allocations) is reached or projected to be reached and the fishery season for that sector is closed by NMFS. The starting dates for the primary seasons for the whiting fishery are as follows:
>
> (A) Catcher/processor sector—May 15.
> (B) Mothership sector—May 15.
> (C) Shorebased IFQ Program, Pacific whiting IFQ fishery.
> (1) North of 42°N. lat.—June 15;
> (2) Between 42°–40°30′N. lat.—April 1; and
> (3) South of 40°30′N. lat.—April 15.
>
> 660.55 (f)(2) . . . No more than 5 percent of the Shore based IFQ Program allocation may be taken and retained south of 42° N. lat. before the start of the primary Pacific whiting season north of 42° N. lat. . . . .

Alternative (recommendation by the GAP endorsed by the Council, November 2011): Use a single May 15 start date for all whiting sectors including California fisheries and eliminate the 5 percent California early season whiting fishery cap, to the extent that a fishery management plan (FMP) amendment is not required. This change would be implemented through the two-meeting process already authorized under the framework of the Pacific Coast Groundfish FMP.

2.1.3 Rationale

A number of considerations influenced the decision to move the season opening date for the northern shore-based fishery from May 15 to June 15, including providing an opportunity for some catcher vessels to participate sequentially in the mothership sector fishery (opening May 15) and the shore-based fishery (opening June 15), and allowing vessels to complete their May-June DTS cumulative limits before the start of the fishery (it was not permissible to land more than 60% of the DTS limit in a particular month). The shift from a May 15 to a June 15 opening (and from March 1 to April 1 for the central area) was also expected to have some effect in allowing the fish to grow to a larger size prior to harvest (decreasing the total number of individual fish taken to achieve the allocations and having some marginal effect on increasing stock productivity). On the down side was an e expectation that shifting a portion of the season to later in the year might increase bycatch rates of rockfish because more of the whiting stock biomass would be in northern areas where rockfish such as yellowtail and widow are more available to midwater gear. With respect to the salmon fishery, the 1997 EA summarized:

> The salmon bycatch data do not show a consistent pattern other than to indicate that high salmon bycatch rates may occur in the at-sea fishery later in the year. The shore-based fishery has experienced low salmon bycatch rates during most summer periods. It would be diffcult to predict the impact of changing the season timing on salmon bycatch, especially on a year-to-year basis as could occur under the proposed framework" (Council 1997, p. ES-4).

The change in the shore-based season opening dates was supported by all sectors of the industry, including the shore-based processors in northern California.

The 5% limitation on early season whiting catch in the California fishery was seen as "prevent[ing] expansion and further capitalization in that area, contributing to further stability as well as minimizing cost to the nation from further capitalization" (Council 1997, p. ES-4).

For the shorebased industry in the north, the alternative to status quo would increase flexibility to determine the most optimal time to harvest the whiting allocation by adding one month to the season length. The actual timing of harvest would likely take into consideration numerous factors including bycatch rates of other species (bycatch of groundfish is constrained by the quota pounds fishermen hold and bycatch of salmon above certain levels may trigger a reinitiation of consultation under the ESA[2]), opportunity costs related to other fishing opportunities (such as participation in the mothership whiting fishery or pink shrimp fishery), optimal size and condition of whiting for processing and marketing. Moving the season start dates for California fisheries would simplify regulations and eliminate the 5% early season cap (eliminate a management measure requiring a possible inseason action that would constrain participants in the IFQ program) and may have an effect on salmon bycatch. The tradeoff for the California fisheries is a decrease in flexibility due to the shortened season.

With regard to the alternative the TRREC stated in their November 2011 report to the Council:

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[2] The standard for reinitiation of consultation is 0.5 Chinook per mt for any sector or a total of 11,000 Chinook for all sectors including the whiting fishery

The proposed change would simplify the regulations and allow the northern area fisheries to start at the same time as the at-sea vessels. The California fisheries have been relatively dormant in recent years thus the change would be expected to have little impact on those fisheries. Having a uniform start date will provide all sectors a consistent basis on which to plan their operations in the context of other fisheries and provide the shore-based sector with additional flexibility.

2.2 Alternatives Considered But Rejected from Detailed Analysis

The scope of the current alternatives is limited to moving the whiting season opening for the shore-based fisheries to May 15, coastwide, and a complementary adjustment (elimination of the 5% cap on the early season catch in the south). Moving the whiting season opening date even earlier, or other modifications of the whiting season regulations might also be considered but would require a more extensive analysis that could not likely be completed on time to be implemented for the 2013 fishery, given current workload constraints. Therefore, unless directed otherwise by the Council and in line with the Council's direction from November 2011, the current priority is to determine whether some interim regulatory relief can be provided until more substantial adjustments to the whiting regulations can be considered.

2.3 Process for Taking Action

The Council's action for the 1997 fishery (see footnote 1) established a framework for modifying the season opening date on an annual basis. That framework was codifed in the following regulations:

> 660.131(B)(2) Different primary season start dates. North of 40°30' N. lat., different starting dates may be established for the catcher/processor sector, the mothership sector, and in the Pacific whiting IFQ fishery for vessels delivering to IFQ first receivers north of 42°N. lat. and vessels delivering to IFQ first receivers between 42° through 40°30' N. lat.
>
> (i) Procedures. The primary seasons for the whiting fishery north of 40°3′ N. lat. generally will be established according to the procedures of the PCGFMP for developing and implementing harvest specifications and apportionments. The season opening dates remain in effect unless changed, generally with the harvest specifications and management measures.
>
> (ii) Criteria. The start of a primary season may be changed based on a recommendation from the Council and consideration of the following factors, if applicable: Size of the harvest guidelines for whiting and bycatch species; age/size structure of the whiting population; expected harvest of bycatch and prohibited species; availability and stock status of prohibited species; expected participation by catchers and processors; the period between when catcher vessels make annual processor obligations and the start of the fishery; environmental conditions; timing of alternate or competing fisheries; industry agreement; fishing or processing rates; and other relevant information.

The framework does not provide for the modification of the southern allocation nor does it include modifying the season start date for the southern most area (south of 40°30' N. lat.). Additionally, NMFS as made a preliminary determination that an EA will be required for this action. Given that the Council will need to go through the process of adopting a preliminary and preferred alternative, that the framework does not appear to provide any relief in terms of the analytical requirements, and that the current scope of the alternative goes beyond that covered by the framework, it is not readily apparent that use of the framework provisions for changing the whiting season provides any advantage over use of the socio-economic framework contained in the FMP. The socioeconomic framework requires a full rule making process including two decision meetings for the Council (preliminary and final actions).

CHAPTER 3 IMPACTS

3.1 Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem, and Biological Environment

The 1997 EA (Council 1997) found that the likely biological and physical environment impacts from shifting the whiting season opening dates would accrue to the whiting resource, salmon (mostly chinook), and other groundfish species (primarily yellowtail and widow rockfish). A summary of the main conclusions of the EA is provided in the following sections. Some of this information may need to be updated for this EA.

3.1.1 Whiting

The 1997 EA stated

> Delaying all or part of the whiting harvest to later in the season allows the whiting to grow, and thus fewer would be caught to achieve the harvest guideline. This could equate to as much as a 10% increase in longterm yield if the entire harvest were delayed until September each year, compared to the entire harvest being taken in April.

Under consideration here is a one month move (from June 15 to May 15) of the shorebased sector's allocation of whiting (42%). The 1997 EA provided results for a four month delay in harvest, a September harvest as compared to a harvest taken entirely in April. Given that the change here is for a one month move in only a portion of the total harvest the maximum impact on long term yield would likely be relatively small. Moreover, movement of the opening date to May 15 does not mean the timing of the entire shore-based harvest will be moved forward by a one month increment. The IFQ program provides an opportunity for harvest to be spread out over a longer period of time. It may be with the extension of the season duration by one month processors and others may encourage a steady but lower rate of harvest, spread out over a longer time.

3.1.2 Bycatch Species

The 1997 EA stated

> Non-target species are affected in that if whiting operations occur in areas where the non-target species are relatively more abundant, bycatch rates will increase. Again, the dynamic nature of the marine ecosystem makes prediction of bycatch rates difficult. For example, salmon bycatch in the whiting fishery is not uniform, but rather patchy, and most tows are free of any salmon. A report by NMFS scientists indicates that in the 1995 at-sea fishery, two sampled tows accounted for 10% of the total salmon bycatch, and 25 tows account for approximately 60% of the total estimated salmon bycatch. These 25 tows represent about 1% of the total of 2,222 tows recorded and 2% of the 1,131 tows sampled. Improved communication among participants in the fishery could help reduce this bycatch by identifying areas of local salmon abundance. Rockfish bycatch is somewhat more uniform, but again a few tows account for the majority of the bycatch.

With respect to salmon in particular, the EA went on to state

> An early season (especially in late April and early May) has been associated with higher salmon bycatch rates, especially in the shore-based fishery. However, during the joint venture period of the 1980s, salmon bycatch generally increased after June, peaked in July, and increased again in October. A NMFS reported dated May 25, 1992 concluded 11there is little apparent seasonality. The late season seems especially variable. (Appendix D.) In recent years, the at-sea fishery has not operated extensively in the summer or fall, so salmon bycatch information is absent. However, in 1992 at-sea processors operated in September and October, and in 1994 operated for 5 days in October. Salmon bycatch in September 1992 was very low, but samples from vessels delivering to motherships in early October showed an extremely high chinook salmon bycatch rate. Catcher-processors during that time period had a very low chinook bycatch rate. After the first week of October, the mothership bycatch rate went to zero and the catcher-processor bycatch rate exceeded the voluntary 0.05 salmon per mt guideline. Thus, the data do not show a consistent pattern other than to indicate that high salmon bycatch rates may occur late in the year. The shore-based fishery has experienced low salmon bycatch during most summer periods. It would be difficult to predict the impact of changing season timing on salmon bycatch, especially on a year-to-year basis, as could occur under the proposed framework.

This information needs to be updated with more recent data. When the season was moved from May 15 to June 15 NMFS found that the rule change was within the scope of the consultation in place at that time.[3]

With respect to rockfish in particular, the EA went on to state

> Rockfish are the primary groundfish taken as bycatch in the whiting fishery, especially widow and yellowtail rockfish. Bycatch of these species could tend to increase if seasons are set late in the year

[3] The ESA Biological Opinion on salmon provide criteria that would require reinitiating an ESA consultation. In September 2010, NMFS issued a public notice which read, in part, as follows:

> The National Marine Fisheries Service (NMFS) is concerned that current Chinook salmon bycatch rates in the 2010 shoreside Pacific Whiting fishery have been consistently higher than 0.05 Chinook/mt of whiting. This catch ratio is the guideline outlined in the 1999 Biological Opinion addressing potential effects of incidental Chinook salmon mortality in the whiting fishery. Consultation shall be reinitiated if: the shoreside catcher/processor, mothership, or Tribal components of the fishery exceed or are expected to exceed the bycatch rate of 0.05 chinook/mt of whiting; and the expected total bycatch of chinook in the fishery is expected to exceed 11,000 fish." (NMFS, 2010)

> when the bulk of the whiting biomass is in northern waters where rockfish are more available to midwater trawl gear. As with salmon, if areas of rockfish concentration can be identified and avoided, bycatch could be reduced.

Irrespective of the effects of a move of the season on the amount of rockfish taken as bycatch, the effects would largely be allocational since total trawl related mortality is limited by sector allocations and the amount of fish allocated to each quota holder. The allocations to each QP holder provide individual vessel incentive to avoid bycatch for IFQ species that may constrain total harvest.

3.2 Direct and Indirect Impacts to the Socioeconomic Environment

3.2.1 Fishery and Business Impacts

Under the trawl rationalization program businesses will time the harvest and processing of product to maximize revenues from all fishing opportunities. Extending the shorebased season by a month will increase the choices available for the northern fishery, providing an opportunity to improve private economic benefits if those benefits are higher in the May 15-June 15 period than later in the year. If the benefits cannot be increased by harvesting during that period then it is unlikely that the change in harvest date will have any effect on the distribution of harvest in the northern fishery. For the southern area, for up to 5% of the shorebased harvest there would be a contraction in flexibility to harvest, with the season opening moving from April 1 (in southern California) and April 15 (in northern California) to May 15. It is reported that little harvest is occurring in this period. Data on the distribution of harvest by area and time period will be provided in the next version of this report. However, even if that data shows little or no harvest is currently occurring, introducing a constraint would reduce the opportunity to take advantage of any newly developing opportunities which may occur with shifts in stock distribution or shifts in other local economic factors.[4]

3.2.2 Impacts on Communities

To the degree the whiting are less available off of California after May 15, as compared to between the status quo April openers and the Alternative May 15 opener, communities in California into which whiting is landed may be disadvantaged. Fish are more likely to have moved out of the area early in warmer water years than colder water years. While the opportunity to own QS ensures the right to harvest the whiting, if whiting are not available after May 15 in concentrations and conditions that allow economically competitive fishing then harvest in the California area might be dampened. Anecdotal reports are that directed whiting harvest in that area has been limited, though in recent years there has been an EFP application to allow whiting fishing earlier in the season. Data on the geographic distribution of whiting landings will be provided in a subsequent draft of this analysis.

3.3 Impacts on Agencies

The alternative would eliminate the need for agencies to monitor the 5% early season cap on the California whiting fishery and create a more consistent whiting management regime for on the water monitoring (vessels using midwater gear in the RCA between May 15 and June 15 would be allowed to do so regardless of whether they were delivering to shore or at-sea). Under status quo, from May 15 to

[4] In the event that extraordinarily favorable conditions occurred in the southern early season, the 5% cap combined with a much larger amount of quota pounds available for harvest, could result in a mini-derby, a race to harvest whiting QP prior the 5% cap being reached.

June 15 vessels are allowed to use midwater gear in the RCA if they are delivering to motherships but not if they are delivering to shore.

References

Council. (1997). **Pacific Whiting Allocation And Seasons:** Environmental Assessment And Regulatory Impact Review Of The Anticipated Biological, Social And Economic Impacts Of A Proposal To Allocate Pacific Whiting Among Non-Tribal Sectors And To Establish A Framework For Modifying Season Opening Dates. Portland OR: Pacific Fishery Management Council.

NMFS. (2010). Pacific Coast Groundfish Fishery: Chinook salmon bycatch in the shoreside Pacific Whiting fishery. Public Notice. September 8, 2010

TRAWL RATIONALIZATION TRAILING ACTIONS

ISSUE: GEAR ISSUES

Note: The analysis in this version of the draft focuses on the chafing gear and midwater gear efficiency issues. Other portions of the analysis are under technical review and will be presented in April.

Draft Council Decision Analysis Document

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BACKGROUND

The Pacific Fishery Management Council (Council) is considering an amendment to Federal regulations affecting certain definitions and prohibitions or restrictions as they apply to the Pacific Coast limited entry trawl fishery. The intent of the initiative is to eliminate or rewrite those provisions that appear to be no longer needed or appropriate. This action stems from implementation of the trawl fishery rationalization program and associated provision for total catch accounting. Under trawl rationalization, it may be possible that certain gear regulations may be eliminated to gain a number of benefits without sacrificing other fishery management objectives. For example, elimination or simplification of the regulations would allow enforcement personnel to narrow the focus of their field operations and to redirect their efforts to more pressing issues. The move would also give fishermen more flexibility to experiment with alternative gear types and gear configurations with the aim of maximizing utilization of their quota shares and/or to minimize catch of overfished groundfish and Pacific halibut. The issues under consideration are grouped as follows:

1. Multiple Gears on a Trip
2. Chafing Gear
3. Gear Efficiencies

Each issue is summarized here in a format consistent with the summaries provided in Agenda Item F.8.a, Attachment 1. At the end of each issue a status summary is provided with an "☼" indicating the need for Council attention.

Alternatives

1. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery (Preliminary NEPA Determination: EA)

The original focus of this topic was on carrying multiple gears on a vessel at the same time as well as the possibility of using multiple gears on a trip. The November 2011 recommendations on the issue from the TRREC covered only the issue of using more than one gear on a trip. Therefore, for Council consideration, alternatives are provided here on two subtopics.

A. carrying but not using more than one gear on a vessel during the same trip, and
B. using more than one gear on a trip.

A. Allowing multiple gears onboard a vessel on the same trip (but not increasing the vessel's flexibility to use the gears)

Current regulations prohibit the onboard possession of various groundfish and non-groundfish fixed and trawl gear type combinations, which vary depending on management area. These prohibitions can be found at §660.130 (c), et seq. The following table provides a summary of the gear combinations which may not be carried on a vessel at the same time. The regulations from which this summary is drawn are provided after the table.

Table 1: Summary of allowable onboard gear type combinations for limited entry trawl vessels

<table>
<tr><td rowspan="2"></td><td colspan="2">Groundfish Trawl/Other Gear Combinations</td><td>Groundfish Trawl Combinations</td><td colspan="2">Bottom Trawl Combinations</td></tr>
<tr><td colspan="2">Groundfish Trawl[a/]</td><td>Midwater Trawl</td><td>Small Footrope[d/]</td><td>Small Footrope (Other than Selective Flatfish)</td></tr>
<tr><td></td><td colspan="5">Combined With</td></tr>
<tr><td>Area</td><td>Groundfish Fixed Gear</td><td>Non-Groundfish Trawl[b/]</td><td>Bottom Trawl [c/]</td><td>Large Footrope Trawl</td><td>Selective Flatfish Trawl</td></tr>
<tr><td>S. of 40˚ 10’ N Lat</td><td>No</td><td>No</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>N. of 40˚ 10’ N Lat (shoreward)</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td>N. of 40˚ 10’ N Lat (seaward)</td><td>No</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
</table>

a/ Groundfish trawl includes all of the gears listed in this table except non-groundfish trawl and groundfish fixed gear.
b/ Shrimp, California halibut, sea cucumber, etc.
c/ Bottom trawl includes small footrope trawl (which includes selective flatfish trawl) and large footrope trawl.
d/ Small footrope includes selective flatfish trawl.

Regulations on which the above table is based:

Coastwide -

- Possession of groundfish trawl and groundfish fixed gear onboard at the same time is prohibited (§660.140 (k))
- Possession of groundfish trawl and non-groundfish trawl gear onboard at the same time is prohibited (§660.130 (c)(4)(i)(A) and §660.130 (c)(4)(ii)(A).
- Possession of bottom trawl gear and mid-water gear onboard at the same time is prohibited (§660.130 (c)(4)(i)(A) and §660.130 (c)(4)(ii)(A)).

Specific to the area north of 40˚ 10' north latitude[1] -

- Possession onboard of two or more bottom trawl gear types is permitted (§660.130 (c)(4)(i)(A), except possession onboard of small footrope trawl and selective flatfish trawl gear is prohibited when fishing shoreward of the RCA, where selective flatfish gear is required (§660.130 (c)(2)(i)).
- Midwater trawl gear is allowed onboard only during the primary whiting season (§660.130 (c)(4)(i)(F)).

Specific to the area south of 40˚ 10' north latitude[2] -

- Possession onboard of small footrope trawl gear (which includes selective flatfish trawl) and any other type of bottom trawl gear is prohibited (§660.130 (c)(4)(ii)(A)).

The following alternatives on carrying multiple gears on board are provided as a point of departure for discussion.

Status Quo: No Action (maintain the above listed regulations)
Strawdog Alternative 1: Allow any combinations of trawl gear types to be possessed on the same trip (maintain current prohibitions on combinations of groundfish trawl and other gears).
Strawdog Alternative 2a: Allow any combinations of gear types to be possessed on the same trip.
Strawdog Alternative 2b: Same as 2a but also allow groundfish fixed gear to be deployed, but not retrieved, on a trip on which the vessel is using trawl gear

[1] From Table 1 (North) to Part 660, Subpart D. "Selective flatfish trawl gear is required shoreward of the RCA; all bottom trawl gear (large footrope, selective flatfish trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope and small footrope trawl gears (except for selective flatfish trawl gear) are prohibited shoreward of the RCA. Midwater trawl gear is permitted only for vessels participating in the primary whiting season."

[2] From Table 1 (South) to Part 660, Subpart D. "Small footrope trawl gear is required shoreward of the RCA; all trawl gear (large footrope, selective flatfish trawl, midwater trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope trawl gear and midwater trawl gear are prohibited shoreward of the RCA."

B. Allowing use of multiple gears on a single trip

The following alternatives are not necessarily mutually exclusive.

Status Quo: No action.
Alternative 1: Allow vessels to carry and use small footrope and selective flatfish trawl gear on the same trip (from GMT November 2011 report).
Alternative 2: Allow vessels to use multiple trawl gear types (bottom and midwater) to harvest non-whiting groundfish on the same trip (shoreward and seaward of the RCA and constant with current area specific trawl gear use restrictions) (TRREC Recommendation).
Alternative 3: Allow vessels to use multiple trawl and fixed gear types to harvest non-whiting groundfish on the same trip, subject to the declaration process and either
Suboption A: The more restrictive RCA regulations, or
Suboption B: Gear and catch are reporting by the onboard observer.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Provide guidance on further development of alternatives.

2. Chafing Gear (Preliminary NEPA Determination: EA)

The chafing gear issue has been identified as a high priority for Council action. The following chafing gear alternatives were developed during discussions with industry.

Status Quo: No Action
Strawdog Alternative 1: Eliminate all chafing gear restrictions as they apply to midwater trawl gear.
Strawdog Alternative 2: Amend midwater trawl gear restrictions to allow for greater chafing gear coverage on the codend

Chafer may cover the bottom and sides of the codend in either one or more sections. Chafers can only be attached at the open end of the codend (end closest to trawl mouth) and sides. The terminal end (end closest to terminal end of codend) or the end of each chafer section if using multiple chafers must be left unattached. The only chafer allowed on the top codend panel would be reinforced netting panels under lifting, and constraining straps. All chaffers will conform to codend mesh size regulations.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Provide guidance on further development of alternatives and process to follow (e.g. possible inclusion in PIE 2 rule).

3. Gear Efficiencies: Allow trawl gear modifications that increase efficiency and selectivity (Preliminary NEPA Determination: EA)

At its November 2011 meeting, the Council adopted the GAP guidance on this issue, which endorsed a TRREC recommendation on the issue, provided here as Alternative 1.

Status Quo: No action.
Alternative 1 (recommendation by the GAP endorsed by the Council, November 2011):
Eliminate codend, mesh size, chafing gear and selective flatfish trawl gear requirements and restrictions. Retain large and small footrope requirements and restrictions because of the prohibitions on gear use in the groundfish EFH (50 CFR660.130(b)(4)).

In addition to these alternatives, in November 2011, the Council endorsed a TRREC recommendation categorized under the multiple gears on board section which might more appropriately be categorized as regulatory relief related to gear regulations and efficient gear use:

<u>TRREC Recommendation 2 (allow year round use of midwater within the RCA):</u>

b) allow use--with declaration--of mid-water trawl gear for all IFQ species within the RCA and groundfish essential fish habitat (EFH) conservation areas coastwide year round, except whiting would also be subject to whiting regulations. Possession of midwater trawl gear on board within the RCA or groundfish EFH conservation areas would not require declaration, but when midwater gear is used within the RCA or groundfish EFH conservation areas it is the only gear which may be used on the trip.

	Summary: Status and Next Steps
✓	Prioritized for implementation in 2013.
☼	Provide guidance on further development of alternatives.
☼	Consider whether to expand the scope of this item to include alternatives that would lift gear use restrictions (specifically, allowing midwater gear to be used year round within the RCA).

Analysis of Chafing Gear and Midwater Gear Efficiency Issues

This analysis looks at the chafing gear issue and the gear efficiency issue with respect to midwater gears. The analyses compare the proposed regulation changes with existing gear restrictions in the PFMC and North Pacific Fisheries Management Council (NPFMC) areas; provide possible rationale for proposed changes; and provide an assessment of potential impacts on the fishery, enforcement efforts, and fishery monitoring and groundfish stock assessment programs.

Some of the vessels that fish in the NPFMC area also fish in the PFMC management area. It follows that there is interest by trawl vessel owners that fish both areas that the gear restrictions allow for the use of the same nets in both areas. It is for that reason that the gear restrictions in the NPMFC and PFMC management areas are compared in the following sections

Some midwater trawl vessels that fish in the PFMC management area for Pacific whiting also fish midwater trawl for Alaska pollock in the NPFMC area. Comparative groundfish landings data for the two management areas in recent years are shown in Appendix C *(not provided at this time)*.

The nets used for pollock in the NPFMC area and whiting in the PFMC area are very expensive to purchase or make, thus it is very important to the vessel owners that the trawl gear construction specifications and use provisions are in close agreement between the two areas so that the nets used in one area can be used in the other area. Midwater trawl vessel owners have brought it to the Council's and NMFS' attention that some midwater trawl gear restrictions are not in conformance between the PFMC and NPFMC management areas and that some of their nets may not be consistent with PFMC midwater trawl gear restrictions, particularly as they relate to chafing gear placement and coverage restrictions (PFMC 2011b).

<u>Comparison of NPFMC and PFMC Midwater (Pelagic) Trawl Regulations:</u> A review of the midwater (pelagic) trawl gear restrictions between the PFMC and NPFMC areas for this analysis showed only a few areas of agreement (or absence of conflict) between the two regulation sets (e.g., allowable number of chafing gear sections; bareness of footropes; provision for protective net meshes under transfer, lifting or splitting straps; and provisions for addition of weights to net wing tips) (Table 1. See Figure 1 for midwater trawl net illustration). The PFMC regulations were more restrictive in several areas [codend mesh construction; chafing gear placement (several areas); footrope construction and bareness of net lines running parallel to the footrope, sweep lines and bridle lines]. The NPFMC regulations were more restrictive in other areas (minimum mesh size; chafing gear placement on the footrope and headrope; attachment mechanism between the main fishing net and the headrope and footrope; configurations that would possibly negate the intent of minimum mesh size regulations; presence of flotation devices; limitation on number footropes and fishing lines; and presence of metallic components other than for fishing instrumentation). The alternatives contained in this section were developed by staff based on conversations with members of industry.

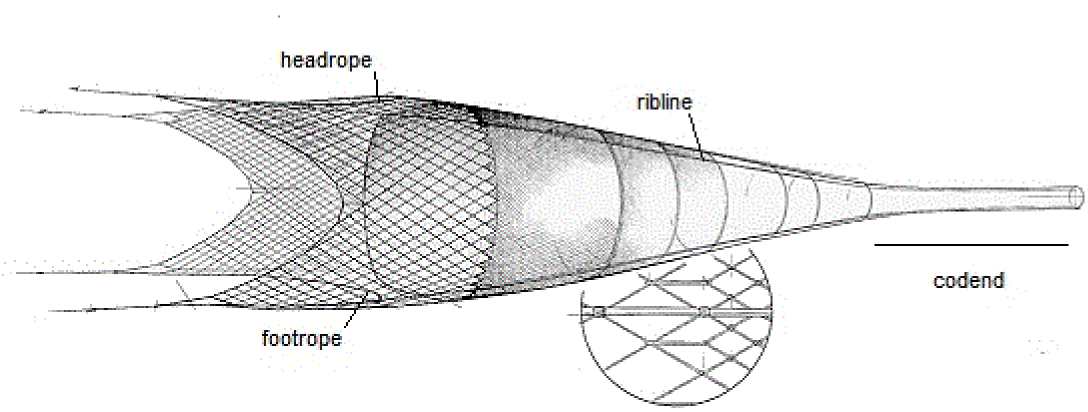

Figure 1: Side view illustration of a typical midwater trawl net used in the NPFMC and PFMC management areas (modified from NET systems web page: http://www.net-sys.com/index.php)

Chafing Gear

Some PFMC area vessel owners have commented that the most problematic regulatory conflict is between the chafing gear restrictions in the two management areas (Table 1). They report that the nets that they use in the Alaska fishery may not be in compliance with PFMC area regulations as currently worded (PFMC 2011b). In large part this is because the NPFMC regulations are very liberal as they apply to chafing gear placement on the net; they only prohibit "chafe protection attachment" to the footrope or fishing line (Table 1). The PFMC regulations are complex in comparison. For example, the regulations limit chafing gear placement on the codend to the 50 most terminal meshes regardless of codend length and limit chafing gear coverage of the codend to 50% of the net circumference. These latter restrictions are the most difficult for the vessel owners to comply with because the nets they use in the NPFMC area have greater chafing gear coverage on the codend than PFMC regulations allow. According to one industry member, chafing gear used in Alaska is applied to the bottom and sides of the codend and sometimes to a straight tubular netting section ahead of the codend. The purpose of chafer panels is to minimize damage to the codend netting from wear against the stern ramp and trawl alley during net retrieval.

Strawdog Alternative 1: Eliminate all chafing gear restrictions as they apply to midwater trawl gear.

Rational: The proposal here is to eliminate all chafing gear restrictions for midwater trawl nets used in the PFMC area. This would bring them into close agreement with the comparative midwater fishery regulations in the NPFMC area (Table 1). It would free vessel owners to configure their chafing gear to their own fishery needs.

Impacts (EC, GAP, GMT and SSC review needed): The projected fishery impact would be to allow vessels owners to use and place chafing gear the entire length of the codend and to cover an unlimited amount (100%) of the net to protect it from onboard abrasion sources. The effect would be to lengthen the effective lifespan of each net, thus reduce average annual net replacement cost. It would also be a step toward allowing them to use the midwater trawl nets that they use in the NPFMC area in the PFMC area.

The effect of the proposed regulation change would not be expected to have any sea floor habitat consequences provided the nets are fished well off the sea floor, which is believed to be the case in the West Coast whiting fishery under status quo regulations and would be expected to continue to be the case under the proposed regulation change. This is because whiting is a midwater species and allowing the net to drop to the sea floor would represent an operational inefficiency, as would fishing the net close to the sea floor where whiting are in low abundance or absent compared to midwater depths. The change could have biological consequences if expanded chafing gear coverage resulted in increased retention of nonmarketable size whiting stemming from reduced net sorting effect. There could also be increased biological impacts if increased bottom contact and close trawling to the sea floor resulted in increased harvest of non-target species. This would be a particular concern when fishing is conducted within the RCA where overfished groundfish species, which usually live close to the sea floor, are most abundant. Such outcomes would seem to be unlikely because all fish harvested under IFQ management count against vessel QP accounts and harvest of nonmarketable size fish and nontarget species, including overfished groundfish, take away from a vessel's potential fishery harvest, hence fishery revenues, On the other hand, it may be more economical for fishers to increase the harvest (and waste) of nonmarketable sized fish, depending of the operational savings associated with longer net life stemming from greater chafing gear coverage.

Close trawling to the sea floor when fishing in the RCA would be a particular concern because impacts to over fished species could result in vessel tie up, hence reduced fishery income potential, for an extended period of time due to inadequate overfished species QP. Close fishing to the sea floor, as discussed above, would represent an operational inefficiency because whiting, the target species of whiting IFQ trips, are found at midwater depths and not close to the sea floor.

The proposed regulation change would allow fishery enforcement efforts currently aimed at chafing gear compliance to be redirected to other fishery issues. No impact would be expected from the proposed regulatory change to other fishery management activities ranging from onboard observer program to states' fishery sampling and data entry programs.

Strawdog Alternative 2: Amend midwater trawl gear restrictions to allow for greater chafing gear coverage on the codend - Chafer may cover the bottom and sides of the codend in either one or more sections. Chafers can only be attached at the open end of the codend (end closest to trawl mouth) and sides. The terminal end (end closest to terminal end of codend) or the end of each chafer section if using multiple chafers must be left unattached. The only chafer allowed on the top codend panel would be reinforced netting panels under lifting, and constraining straps. All chaffers will conform to codend mesh size regulations.

Rationale: The strawdog alternative presented here is to amend the regulatory language that pertains to chafing gear placement on codends of midwater trawl nets used in the PFMC area. It would not affect the other midwater trawl gear restrictions as they apply to the forward (non-codend) portions of the net. The alternative presented here differs from the previous alternative in that it places restrictions on the placement of chafing gear on the codend, but allows for greater chafing gear coverage compared to current regulations overall (Table 1).

Impact (EC, GMT, GAP and SSC review needed): The previous alternative would allow for unlimited (100%) chafing gear coverage of midwater trawl nets, including codends, used in the PFMC area. Assuming all codends used in the PFMC area are of four panel design as described under this alternative and each panel is equal in size, chafing gear coverage, except at lifting straps, would be limited to 75% of the codend circumference. If the top panel of some nets is smaller than the other panels, the coverage would be >75%. Overall, there would not appear to be much difference in potential habitat or biological impact of this alternative compared to the previous alternative as it applies to codend coverage because the difference in allowable chafing gear coverage is about 25% less under this proposal. The major difference in this alternative would be with regard to chafing gear coverage of the forward net panels, which would be unchanged from current regulations.

If chafing gear placement on the codend is a factor in potential threat to seas floor habitats and harvest of nonmarketable fish and nontarget species, including overfished groundfish species, the impact under this alternative would seem to be about the same as under the previous alternative. If chafing gear coverage of net panels forward of the codend is important with regard to the potential for increased habitat and biological impacts, the threat under this alternative would appear to be the same as under status quo regulations because the proposal here is for no change in chafing gear regulations as they apply to chafing gear placement to net sections forward of the codend. Overall the potential impact of this alternative to sea floor habitats and biological systems would seem to be intermediate to those of status quo regulations and those projected for the previous alternative. On the other hand, further discussion and analysis may show that the chafing gear has little or no affect on interactions with sea floor habitat or the harvest of nonmarketable fish and nontarget species, in which case there would be little or no variation among these options with respect to these types of impacts.

The proposed regulation change under this alternative would be expected to have minimal impact to fishery enforcement efforts because there would be minor change in the number and complexity of chafing gear provisions that apply to the midwater trawl fishery. No impact would be projected from the proposed regulatory change to other fishery management activities ranging from onboard observer program to states' fishery sampling and data entry programs.

Other Possible Efficiencies for Midwater Trawl Gear

Since the issue of chafing gear for midwater trawl is being considered, in order to further the discussion of gear efficiencies a comparison of other midwater gear regulations is provided along with some discussion of the effects that might arise from harmonizing the NPFMC and PFMC midwater gear regulations.

Comparison of NPFMC and PFMC area regulations: NPFMC area regulations allow for footrope augmentation except for discs, bobbins, or rollers, which are prohibited (Table 1). NPFMC regulations also allow for addition of small mesh netting to the forward part of midwater trawl nets to support fishing instrumentation. PFMC regulations specifically prohibit footrope enhancement by wrapping in midwater trawl nets and do not provide for the addition of small mesh to the anterior most portion of midwater trawl nets (Table 1). It is important to note that modification of the footrope specifications that apply to midwater trawl gear would likely entail consideration of the definitions of bottom trawl gear types found at §660.11(11)(i). This is because of conflict in footrope parameters currently used to distinguish between midwater trawl and bottom trawl gear types. Bottom trawl gear types (large and small footrope trawl) are defined, in part, based on diameter of footrope augmentations such as rollers, bobbins, or other material encircling or tied along the length of the footrope.

It is reported that some trawl manufacturers making gear for the NPFMC area wrap the footrope of midwater (pelagic) trawl nets used in Alaska with synthetic rope or braid twine over the footrope, which is usually a length of chain. The wrapping is done to protect the net from fouling of the net with the footrope on the net reel and to prevent rust damage from the footrope chain to the net during storage. It is also reported that net manufacturers may add a web patch or “kite” made of small mesh webbing to the center of the headrope in order to support a netsounder. PFMC regulations allow for footropes made of a variety of materials, including chain and wire (660.11(11)(iii)(F)). The regulations do not allow for the net modifications such as adding a web patch..

Impact of Allowing Other Midwater Gear Modifications: (EC, GAP, GMT and SSC review needed): The fishery impact would be to allow vessels owners to afford greater protection to their nets and to facilitate the use of fishery electronics to make their fishing trips more productive. These are fishery economic issues. Longer net life means lower annual net replacement cost and more efficient fishing trips means reduced overhead cost per pound of fish landed. Regulatory changes could also allow the vessel owners that fish in the NPFMC and PFMC areas to use the same midwater nets in both areas.

If other regulatory adjustments to generate efficiencies for midwater gear are considered, impacts of the changes on habitat and gear selectivity would have to be evaluated.

Table 1. Comparison of PFMC and NPFMC midwater (pelagic) trawl gear restrictions

	PFMC	**NPFMC**	**More restrictive area**
Codend: 1/	Single-walled webbing only (§660.130(b)(1))	No comparative restriction	PFMC
Mesh size:	3 inch minimum mesh size (§660.130(b)(2)) except for additional midwater trawl gear mesh size restrictions, explained below.	§679.2(14): (iii) Except for the small mesh allowed under paragraph (ix) of this definition (see below): (A) Has no mesh tied to the fishing line, headrope, and breast lines with less than 20 inches (50.8 cm) between knots and has no stretched mesh size of less than 60 inches (152.4 cm) aft from all points on the fishing line, headrope, and breast lines and extending passed the fishing circle for a distance equal to or greater than one half the vessel's length overall (LOA); *or* (B) Has no parallel lines spaced closer than 64 inches (162.6 cm) from all points on the fishing line, headrope, and breast lines and extending aft to a section of mesh, with no stretched mesh size of less than 60 inches (152.4 cm) extending aft for a distance equal to or greater than one-half the vessel's LOA; (iv) Has no stretched mesh size less than 15 inches (38.1 cm) aft of the mesh described in paragraph (14)(iii) of this definition for a distance equal to or greater than one-half the vessel's LOA; (ix) May have small mesh within 32 ft (9.8 m) of the center of the headrope as needed for attaching instrumentation (e.g., net-sounder device).	NPFMC

	PFMC	**NPFMC**	**More restrictive area**
Chafing (chafe) gear:2/	(1) Chafing gear may encircle no more than 50 percent of the net's circumference (§660.130(b)(3))	No comparative restriction	PFMC
	(2) No section of chafing gear may be longer than 50 meshes of the net to which it is attached (§660.130(b)(3)).	No comparative restriction	PFMC
	(3) Chafing gear (when used on the codend) may be used only on the last 50 meshes, measured from the terminal (closed) end of the codend (§660.130(b)(3)).	No comparative restriction	PFMC
	(4) Except at the corners, the terminal end of each section of chafing gear on all trawl gear must not be connected to the net (the terminal end is the end farthest from the mouth of the net). Chafing gear must be attached outside any riblines and restraining straps (§660.130(b)(3)).	No comparative restriction	PFMC
	(5) There is no limit on the number of sections of chafing gear on a net (§660.130(b)(3)).	No comparative restriction	No
	No comparative restriction	Has no chafe protection gear attached to the footrope or fishing line (§679.2(14)(ii)).	NPFMC

	PFMC	NPFMC	More restrictive area
General provisions	(1) Footrope 3/ must be bare (unprotected)(§660.130(b)(6)).	(1) Has no discs, bobbins or rollers (§679.2(14)(i)).	Neither
	(2) Footrope must not be enlarged with the use of chains or any other means (§660.130(b)(6)).	No comparative restriction	PFMC
	(3) Ropes or lines running parallel to the footrope must be bare and not suspended with chains or any other materials (§660.130(b)(6))	No comparative restriction	PFMC
	(4) Sweep lines and the bottom leg of the bridle must be bare (§660.130(b)(6)).	No comparative restriction	PFMC
	(5) For at least 20 ft behind the footrope or headrope, bare ropes or 16 inch minimum stretch mesh must encircle the net (§660.130(b)(6)).	See 679.2 (14) (A and B), above.	NPFMC
	(6) A band of mesh *may* encircle the net under transfer cables, lifting or splitting straps, but must be: over riblines and restraining straps and of the same mesh size and coincide knot-to-knot with the net to which it is attached (§660.130(b)(6)).	No comparative restriction	Optional
	No comparative restriction	(2) Contains no configuration intended to reduce the minimum mesh sizes described above (§679.2(14)(v)).	NPFMC
	No comparative restriction	(3) Has no flotation other than for a net sounder device. (§679.2(14)(vi)).	NPFMC
	No comparative restriction	(4) Has no more than one fishing line and one footrope (§679.2(14)(vii)).	NPFMC
	No comparative restriction	(5) Has no metallic components except for connectors or net sounder (§679.2(14)(viii)).	NPFMC
	No comparative restriction	(6) May have weights on the wing tips. (§679.2(14)(x)).	Optional

1/ Codend is defined as the terminal, closed end of a trawl net (50 CFR 600.10 Definitions)
2/ Chafing gear is defined in PFMC area regulations as webbing or other material attached to the codend of a trawl net to protect the codend from wear (§660.130 (11)(iii)(C)). Chafe protection is referred to in NPFMC regulations (see above restrictions), but is not defined.
3/ Footrope is defined in PFMC area regulations as 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.

Agenda Item F.8.b
NMFS Report 1
March 2012

Draft Rulemaking Plan

NMFS implemented the trawl rationalization program (program) in January 2011. There continue to be follow-up rulemakings to further implement regulations for the program, as needed. NMFS may include other Council trailing actions for the program in these rulemakings, as appropriate. NMFS has termed the annual post-implementation rulemaking to make changes to the program the "Program Improvement and Enhancement (PIE)" rule and envisions multiple PIE rules over the next couple of years, as needed. The second PIE rule (aka: PIE 2) is scheduled to be developed over 2012 for implementation in 2013. Below is a tentative schedule of rulemakings related to the program for 2012, a summary of what might be included in those rules, and the affected sectors.

- **Tribal Whiting/Reapportionment**
  1. Timing: Proposed rule – February
     Final rule – late April/early May (with whiting final rule)
     Effective – late April/early May 2012
  2. Includes: tribal allocation and reinstating previous reapportionment authority from tribal to nontribal whiting fisheries
  3. Sectors affected: limited entry (LE) trawl (IFQ/MS/C/P), tribal

- **Correction**
  1. Timing: Final rule & effective – June 2012
  2. Includes: Items needing more immediate correction, such as observer coverage on vessels processing at sea; observer/offload language; MS/CV processor obligations. Also see Agenda Item F.8.b, NMFS Report 3, March 2012.
  3. Sectors affected: LE trawl (IFQ/MS/C/P), LE fixed gear, open access

- **Cost Recovery**
  1. Timing: Proposed rule – June
     Final rule – November
     Effective – January 1, 2013
  2. Includes: Cost recovery for the trawl rationalization program
  3. Sectors affected: LE trawl (IFQ/MS/C/P)

- **PIE 2**
  1. Timing: Proposed rule – June
     Final rule – November
     Effective – January 1, 2013
  2. Includes: Any items ready for rulemaking with a target implementation of January 1, 2013, including any trailing actions such as risk pools/lenders, observer provider certification requirements, etc. Also see Agenda Item F.8.b, NMFS Report 2, March 2012.
  3. Sectors affected: LE trawl (IFQ/MS/C/P), LE fixed gear, open access, tribal

- **Whiting Season/Trawl Gear Changes**
  1. Timing: Proposed rule – Fall
     Final rule – Winter
     Effective – May 2013
  2. Includes: Consideration of changes to the whiting primary season, changes to chaffing gear requirements, allowing multiple gears on board, and other gear modifications.
  3. Sectors affected: LE trawl (IFQ/MS/C/P), LE fixed gear, open access

Agenda Item F.8.b
NMFS Report 2
March 2012

NMFS Items for PIE 2

This document includes items NMFS is bringing forward to be addressed through a future rulemaking (i.e., PIE 2) for the Pacific Coast groundfish fishery that are in addition to the Council's list under this agenda item (Agenda Item F.8.a, Attachment 1). NMFS intends to implement many of these through a rulemaking with a target effective date of January 1, 2013. These items are still in development and additional items may be added as the rulemaking progresses. Some of these items are a result of the trawl rationalization program actions but affect others sectors as well (i.e., limited entry fixed gear and open access). Items 1 through 6 were initially available at the September 2011 Council meeting under Agenda Item G.8.b, Supplemental NMFS Report 1: Additional Potential Trailing Actions from NMFS.

1. Clarify sablefish at-sea processing exemption for the Shorebased IFQ Program, such that the limited entry fixed gear permit doesn't need to be registered to the vessel (i.e., a limited entry trawl permit would be registered to the vessel and the limited entry fixed gear permit would be "unidentified").

   At the April 2010 Council meeting, the Council motion expanded the NMFS suggested prohibition on processing sablefish at sea in the Shorebased IFQ Program (Agenda Item I.1.b, Supplemental NMFS Report 3, #5) to all groundfish in the Shorebased IFQ Program, unless specifically authorized by NMFS regulations. On that basis, regulations at §660.112(b)(1)(xii) allow the vessel with an exemption from the prohibition on processing sablefish at-sea in the limited entry fixed gear primary sablefish fishery to process sablefish in the IFQ fishery as well. However, the way the sablefish exemption at §660.25 is structured (vessel/permit/owner combo) does not work in the IFQ fishery because the vessel must be registered to a limited entry trawl permit and the vessel cannot be registered to a limited entry fixed gear permit and a limited entry trawl permit at the same time (i.e., permit stacking). Regulations at §660.25(b)(6)(i) should be reviewed and revised, as necessary.

2. Clarify fishery closure language.

   This issue may be addressed through the 2013-2014 harvest specifications as part of the enhanced accountability measures for the carryover provision. If it is not addressed through the harvest specifications, NMFS may consider adding language for a shorebased trawl closure to the automatic actions at §660.60(d). Automatic management actions may be initiated by the NMFS Regional Administrator without prior public notice, opportunity to comment, or a Council meeting. These actions are nondiscretionary, and the impacts must have been taken into account prior to the action. Unless otherwise stated, a single notice will be published in the Federal Register making the action effective if good cause exists under the APA to waive notice and comment. Currently, automatic actions are only specified for the Pacific whiting fishery. Consider adding automatic action authority for a closure of the shorebased trawl fishery or the *overall trawl fishery (shorebased and at-sea) if there is a conservation concern or if the shorebased trawl allocation or overall trawl allocation is projected to be attained. A conservation concern may include projected attainment of an ACL. NMFS may also specify at §660.55 how address closure of a fixed allocation versus how address attainment of a set-aside. In other words, NMFS may not necessarily close a fishery based on attainment of a set-aside.*

3. Revise the first receiver site license application requirements, including site inspection and the expiration date.

   NMFS is reviewing the first receiver site license application and issuance process to look for ways make the process more efficient, to reduce costs of the program, and to decrease the burden on applicants.

   NMFS suggests continuing to require an application for a first receiver site license each year (with an updated catch monitoring plan, current scale inspection dates, copy of a valid state buyer's license, and application fee), but only requiring a site inspection at least once every three years at the discretion of the NMFS-designated representative.

   In addition, NMFS is considering changing the expiration date on the license from one year from the date of issuance to a specific date each year (e.g., June 30). This would reduce the costs of operating the program because the application review and any corresponding site inspections would largely occur at one time during the year. The Catch Monitor Program could more efficiently review applications (including catch monitoring plans) and could coordinate site inspections in geographic areas, reducing travel costs. Applications for a first receiver site license would continue to be available at any time during the year. However, licenses issued to new applicants (including any previous license holder that let their license lapse past its effective date) could be effective for a period of less than a calendar year (i.e. they would expire on June 30). If the applicant re-registers for their license in the following year in a timely manner and doesn't allow a lapse in their license beyond the effective date, then their license would be effective for an entire calendar year. Because license applications require review by the Fisheries Permits Office in addition the Catch Monitor Program and to stagger workload in the Fisheries Permits Office (limited entry permit renewals happen in the fall of the year), NMFS suggests that the expiration date for first receiver site licenses be June 30 each year.

   An example of how the revised application process might work:

   - *All site licenses would expire on June 30, regardless of issuance date.*
   - *Timeline for re-registering applicants:*
     1. *The Fisheries Permits Office would mail application (re-registration) packages on or about February 1 of each year;*

2. *The Fisheries Permits Office would encourage that re-registration packages be submitted by applicants by April 15 to ensure a continuation of ability to receive landings, with no lapse between the expiring license and the new license;*
3. *For all of the applications received by April 15, the Catch Monitor Program would schedule site inspection visits at least once every three years by location between approximately April 15-June 15, and do all of the inspections for licenses at that Port in the same trip. For applications received after April 15, NMFS would not guarantee that the licenses would be issued by July 1 (i.e., there may be a lapse in the effectiveness of their licenses).*
4. *The NMFS-designated inspector would visit the sites at least once every third year (or more frequently at their discretion); if after the site inspection the catch monitoring plan requires revisions, the revised catch monitoring plan would be submitted to the Fisheries Permits Office by June 15th to ensure time to review and mail the license without a lapse.*

- *New entrants could continue to apply at any time. Licenses for new entrants would expire on the same timeline, June 30. Applicants with a lapse in license will be considered "new entrants" at the time they submit their application, and will be required to have a site inspection.*

NMFS is also suggesting revisions to the process to make license holders more accountable and make the requirements more enforceable. NMFS may require the buyer or designated contact as presented in Section A of the license application to be present at the site inspection. This would help ensure that the license holder, as the liable party, is aware of and accountable for any questions or concerns that might arise during the site inspection. In addition, NMFS may clarify the regulations at §660.140(f)(3)(iii)(C) to require the catch monitoring plan to have the applicant's printed name, their contact information, signature, and the date. While the contact information is available on the license application, adding it to the catch monitoring plan itself would be useful because it would be readily available to the catch monitors working at the facilities. Catch monitors receive a copy of the catch monitoring plan, but do not have the license application.

4. Revise the catch monitor certification requirements for briefings to be more broad.
Currently, regulations on catch monitor certification state that certification is maintained if the catch monitor completes annual briefings. The regulatory language should be revised to include hake briefings, as well, which may occur outside the annual briefing. Suggested regulatory language: "Successfully complete ~~NMFS-approved annual~~ any required briefings as prescribed by the catch monitor program."

5. Review regulations on quota share (QS) permits and transfers.

   Beginning in 2013, QS will be transferrable and new applicants may register for a QS permit. NMFS is further developing the process for QS transfers and the online IFQ system that will be the vehicle for transfers. NMFS will register transfers of QS percentages in the year the transfer occurs. However, the resulting QPs issued as a result of the new QS percentage will not be available until the following year. In addition, any QP top-ups to QS accounts will accrue to the original QS permit owners (the owner that started the year with the percentage) based on their QS percentage as of January 1 and not to any subsequent transferee. The regulations at §660.140(d)(3) should be reviewed and revised, as appropriate. Including, but not limited to: Add language to §660.140(d)(3)(i)(C) that non-renewed QS permit cannot transfer QS %; Revise §660.140(d)(3)(i)(C) to state "Any QS permit for which SFD does not receive a complete QS permit renewal package ~~request~~ by November 30…" to be consistent with §660.140(d)(3)(i)(A); Add new QS permit application process.

6. Revise renewal process for limited entry permits, vessel accounts, and QS permits to start by September 15th each year.

   NMFS recommends moving the date by which permit renewal notices are mailed from September 1st to the 15th for several reasons. Moving the date will allow NMFS' Permits Office to complete any pending transfers (changes in vessel registration or permit ownership) for the start of the September 1 cumulative limit period before sending out permit renewal notices. This will reduce the burden on the Permits Office sending out revised notices due to last minute transfer requests. In addition, moving the date allows more time for submitted EDC forms, which are due to NMFS by September 1, to be reviewed for completeness by NMFS. A complete EDC form is a prerequisite for permit and vessel account renewal in the trawl rationalization program. Finally, it would result in less time that NMFS holds submitted renewal checks before depositing them at the start of the October 1 fiscal year. This is consistent with the FMP at 11.2.12 (2) which states "notice of upcoming [limited entry permit] renewal periods will be sent by September 15 each year…" The FMP should be reviewed to see if any changes to the FMP are needed to reflect this change for the renewal process for limited entry permits, vessel accounts, and QS permits.

NEW ITEMS since September 2011 Council meeting:

7. Implement certification and decertification requirements for observer providers.

   Current regulations allow any observer provider permitted in the North Pacific fishery to deploy observers in the West Coast groundfish fishery. This was done to expedite implementation of the trawl rationalization program for January 2011. For 2013 (two years since implementation of the program), NMFS suggests implementation of a certification and decertification process for observer providers. This will provide a *process for new providers to enter the program as well as a process to decertify providers that do not comply with the regulations. This change will also require existing providers since 2011 to apply for a certification. NMFS will review and revise regulations accordingly, including regulations at §660.140(h)(4) on the application process to become an observer provider. Currently, the same companies are both the catch monitor providers and observer providers. In an effort to reduce complexity in the regulations, where appropriate, NMFS will align these new requirements with the existing certification and decertification requirements for catch monitor providers.*

8. Review regulations on sorting requirements for IFQ fishery to be clear on the exceptions.

   The sorting requirements for the Shorebased IFQ Program are described at §660.130(d)(2) for both catcher vessels and IFQ first receivers. The PIE 1 rule (published on December 1, 2011) changed the sorting requirements to allow all IFQ landings (not just whiting trips) to be weighted on a belt or automatic hopper scale before sorting if allowed by state laws. The PIE 1 rule changed regulations at §660.112(b)(2)(ii) on trawl fishery prohibitions and §660.130(d)(2)(i) on trawl management measures to make them consistent with §660.140(j)(2)(ix)(A) on IFQ catch weighing requirements. However, in reviewing this issue due to a question on undersized lingcod being landed in a shorebased whiting landing, NMFS discovered that similar revisions to clarify the exemptions from the sorting requirements should be made to §660.12(a)(8) (i.e., not just at-sea whiting sectors) and potentially to §660.130(d)(2)(ii). The retention requirements at §660.140(g), including consideration of a non-whiting maximized retention vessel, should also be reviewed and revised, as necessary.

   In addition, assuming the size limits for the Shorebased IFQ Program should also apply to the "maximized" retention fisheries, then groundfish with a size limit specified at §660.60(h)(5)(ii)(B) (e.g. lingcod) should be listed under the prohibited species at §660.130(d)(2) and potentially elsewhere. These changes should be consistent with any changes to the lingcod size limit being addressed through the 2013-2014 harvest specifications.

9. Remove the end-of-the-year ban on QP transfers between vessel accounts.

   QP transfers between vessel accounts are prohibited from December 15-31 in order to allow any needed end-of-the-year account reconciliation. However, over 2011 and through the PIE 1 rule (effective January 1, 2012), NMFS developed and implemented an end-of-the-year account reconciliation process that doesn't occur during December 15-31, but occurs early the following year once more complete data is available. Therefore, NMFS is considering removing the prohibition at §660.140(e)(3)(iii)(B) on QP transfers between vessel accounts during December 15-31.

10. Consider the limited entry trawl permit requirements for vessel accounts, especially within the context of risk pools.

The vessel account registration regulations at §660.140(e)(2) and the renewal regulations at (e)(3) only require a limited entry trawl permit to be registered to the vessel associated with the vessel account at the time the account is established. Once a vessel account is established, the limited entry trawl permit does not need to remain registered to the vessel for the account to remain open (active). Nor does it need to be registered to the vessel during renewal of the vessel account. Note, under this circumstance, the vessel would not be eligible to fish in the Shorebased IFQ Program (i.e., the vessel must be registered to a limited entry trawl permit to fish). The vessel accounts were structured this way to allow fishermen flexibility, including the ability to move between limited entry and open access fisheries without closing their vessel accounts. Consistent with this, NMFS intends to add regulations at §660.140(e)(3)(ii) to make it clear that changing the vessel registration of the limited entry permit so that it is no longer registered to the vessel with the account is not considered a change to the vessel account that must be reported to NMFS.

Over 2011 and in to 2012, some vessel accounts have operated in this way. NMFS is aware that some vessel accounts are operating as "pass through" accounts or risk pool accounts to move QP between vessel accounts, but the vessel associated with the vessel accounts is not being used to fish.

NMFS and the Council should review the purpose and functioning of the vessel account system to make sure it is what the Council had intended. Any review of the vessel account requirements should include consideration of the Council's recommended provisions for risk pools.

11. Clarify that the processor obligation could be to more than one MS permit.

Given that the Council recommended and NMFS implemented a provision in the MS Coop Program to allow multiple MS/CV endorsements and their associated catch history assignments to be registered to a single limited entry trawl permit (PIE 1 rule, 76 FR 74725, published on December 1, 2011), NMFS may revise regulations on the processor obligation to clarify that a permit with multiple MS/CV endorsements may obligate each endorsement and associated catch history assignment to an MS permit. For example, a trawl permit with 2 MS/CV endorsements could obligate each endorsement to a different MS permit.

This clarification is a logical extension of allowing multiple endorsements to be registered to a single permit and of the regulations at §660.150(c)(2)(i)(A) on annual MS sector sub-allocations and at (g)(2)(iv)(D) on multiple MS/CV endorsements that allow a permit with multiple MS/CV endorsements to be registered to more than one coop or to both the coop and non-coop fishery.

Therefore, regulations at §660.150(c)(7)(i) on processor obligations may be revised as follows:

> *(i) Processor obligation. Through the annual MS/CV-endorsed limited entry permit renewal process, the MS/CV-endorsed permit owner must identify to NMFS to which MS permit the MS/CV permit owner intends to obligate the catch history assignment associated with that permit if they are participating in the MS coop fishery. Only one MS permit may be designated for each MS/CV endorsement and associated catch history assignment~~(the obligation may not be split among MS permits)~~.*

In addition, regulations at §660.150(g)(2)(iv)(D) may need to be revised to clarify the process for a permit with multiple MS/CV endorsements that intends to participate in the non-coop fishery. The coop permit application may not be the best avenue to notify NMFS of non-coop fishery participation. Therefore, regulations at §660.150(g)(2)(iv)(D) may be revised as follows:

> *(D) A limited entry trawl permit with multiple MS/CV endorsement registrations may be simultaneously registered to more than one coop or to both a coop(s) and non-coop fishery. In such cases, as part of the coop permit application process, specified at paragraph (d)(iii) of this section, the permit owner must specify on the coop permit application form which MS/CV endorsement and associated CHA is specifically registered to a particular coop ~~or to the non-coop fishery~~.*

12. Review and revise observer program regulations.

The observer program regulations at §660.140 (Shorebased IFQ Program), §660.150 (MS Coop Program), and §660.160 (C/P Coop Program) will be reviewed and revised to make the regulations more clear or more consistent and to improve the program. NMFS will also review the catch monitor program regulations at §§660.17, 660.18, and 660.140 to determine if similar changes should be made for consistency.

For consistency, the requirement for a physician statement should be reviewed. It appears that a cross-references should be at §660.150(j)(5)(iv)(A)(2) for MS and at §660.160(g)(5)(iv)(B) for C/P, however, the cross-reference is missing – the regulations do not appear to have an ongoing certification requirement, which, for C/P, would be at §660.160(g)(6)(iii)(B), currently "Reserved". Missing requirement for signed and dated physician's statement.

For the Shorebased IFQ Program, the changes listed below are being considered (deletions are in ~~strikeout~~ and insertions are underlined). The MS Coop Program and C/P Coop Program observer requirements will be reviewed to make similar changes, if needed.

- *§660.140(h)(5)(ii)(B)(1) regarding observer contracts:*
  (1) ~~That all the observer's in-season messages and catch reports required to be sent while deployed are delivered to the Observer Program Office as specified by written Observer Program instructions;~~ That the observer will return all phone calls, emails, text messages, or other forms of communication within the time specified by the observer program;

- *§660.140 (h)(5)(vii)(A) on provide observer deployment logistics:*
  (A) An observer provider must ensure each of its observers under contract:
  (1) Has an individually assigned mobile or cell phone, in working order, for all necessary communication. An observer provider may alternatively compensate observers for the use of the observer's personal cell phone or pager for communications made in support of, or necessary for, the observer's duties.
  ~~(2) Calls into the NMFS deployment hotline upon departing and arriving into port for each trip to leave the following information: observer name, phone number, vessel departing on, expected trip end date and time.~~
  (2~~3~~) Remains available to NOAA Office for Law Enforcement and the Observer Program until the conclusion of debriefing.
  (3~~4~~) Receives all necessary transportation, including arrangements and logistics, ~~of observers~~ to the initial location of deployment, to all subsequent vessel assignments during that deployment, and to/from the ~~debriefing~~ location designated for an observer to be interviewed by the observer program ~~when a deployment ends for any reason~~; and
  (4~~5~~) Receives lodging, per diem, and any other services necessary to observers assigned to fishing vessels. * * **

- *§660.140 (h)(5)(ix) on verify vessel's safety decal:*
  This should be changed to require providers to verify that each of their observers completes the pre-deployment vessel safety orientation. Something along the lines of: Ensure observer completes a vessel orientation, including ensuring the US Coast Guard Vessel Safety Inspection Decal is current, prior to embarking on the first trip on all/any vessels.

- *§660.140 (h)(5)(xi)(A)(1) on observer training, briefing, and debriefing registration materials:*
  (1) Training registration materials consist of the following:
  (i) Date of requested training;
  (ii) A list of observer candidates that includes each candidate's full name (i.e., first, middle and last names), date of birth, and gender;
  (iii) A copy of each candidate's academic transcripts and resume;
  (iv) A statement signed by the candidate under penalty of perjury which discloses the candidate's criminal convictions;
  ~~(v) Projected observer assignments. Prior to the observer's completion of the training or briefing session, the observer provider must submit to the Observer Program Office a statement of projected observer assignments that includes each observer's name, current mailing address, e-mail address, phone numbers and port of~~

~~embarkation ("home port"); and~~
(v~~vi~~) Length of each observer's contract.

- *§660.140 (h)(5)(xi)(A)(2) on observer training, briefing, and debriefing registration materials:*
  (2) Briefing registration materials consist of the following:
  (i) Date and type of requested briefing session;
  (ii) List of observers to attend the briefing session, that includes each observer's full name (first, middle, and last names);
  ~~(iii) Projected observer assignments. Prior to the observer's completion of the training or briefing session, the observer provider must submit to the Observer Program Office a statement of projected observer assignments that includes each observer's name, current mailing address, e-mail address, phone numbers and port of embarkation ("home port"); and~~
  (iii~~iv~~) Length of each observer's contract.

- *§660.140 (h)(5)(xi)(B) on physical examination:*
  (B) Physical examination. A signed and dated statement from a licensed physician that he or she has physically examined an observer or observer candidate. The statement must confirm that, based on that physical examination, the observer or observer candidate does not have any health problems or conditions that would jeopardize that individual's safety or the safety of others while deployed, or prevent the observer or observer candidate from performing his or her duties satisfactorily. The statement must declare that, prior to the examination, the physician was made aware of the duties of the observer and the dangerous, remote, and rigorous nature of the work by reading the NMFS-prepared information. The physician's statement must be submitted to the Observer Program Office prior to certification of an observer. The physical exam must have occurred during the 12 months prior to the observer's or observer candidate's deployment. ~~The physician's statement will expire 12 months after the physical exam occurred. A new physical exam must be performed, and accompanying statement submitted, prior to any deployment occurring after the expiration of the statement.~~

- *§660.140 (h)(5)(xi)(G) on observer status report:*
  (G) Observer status report. ~~Each Tuesday, o~~Observer providers must provide NMFS with an updated list of observer deployment per observer program protocol. Deployment information includes provider name, observer last name, observer first name, trip start date, trip end date, status of observer, vessel name, and vessel identification number. ~~contact information for all observers that includes the observer's name, mailing address, e-mail address, phone numbers, port of embarkation ("home port"), fishery deployed the previous week and whether or not the observer is "in service", indicating when the observer has requested leave and/or is not currently working for the provider.~~

- *§660.140 (h)(6)(v) on issuance of an observer certification:*
  The observer program is reviewing observer post-training deployment timelines to

assess if any enhancements and improved standards can be realized through redrafting of the observer certification regulations.

- *§660.140 (h)(6)(vi) on maintaining the validity of an observer certification:*
  Revise (D) to read: (D) Successfully complete any required~~NMFS-approved annual~~ briefings as prescribed by the West Coast Groundfish Observer Program.
  Revise (G) to read: (G) Successfully meet all expectations in all debriefings including reporting for assigned debriefings or interviews and meeting program standards.
  Add (J) to read: (J) Pass a fish identification test once every 12 months.
  Add (K) to read: (K) Pass safety training once every 12 months.

- *§660.140 (h)(6)(viii) on standards of behavior:*
  Delete (B) because it is not a 'standard of behavior', is already part of observer program protocol and is already stated within previous regulatory sections.
  ~~(B) Immediately report to the Observer Program Office and the NOAA OLE any time they refuse to board a vessel.~~

13. Review use of term "permit holder" in regulations and consider changing to "vessel owner."
    In regulation, the term "permit holder" is the owner of a vessel registered to a limited entry permit. While this term is defined as such in regulation, it has caused some confusion with the regulated public. In some cases, the regulated public has used the term permit owner and permit holder interchangeably, which is not accurate. In an effort to make the regulations more clear, NMFS will review the regulations and, where appropriate, consider changing the term "permit holder" to "vessel owner" or "owner of a vessel registered to a limited entry permit."

14. Revise the process for a permit holder (vessel owner) to change their vessel ownership.
    Regulations at §660.25(b)(4)(iv) do not clearly describe the process for a permit holder (vessel owner) to request a change in vessel ownership. NMFS will revise these regulations to clarify the process for a vessel owner to request a change in vessel ownership through the Fisheries Permits Office. The request will include a requirement for a copy of the new vessel registration documentation (USCG or state).

15. Delete initial issuance regulatory language.
    Initial issuance of QS permits, MS permits, MS/CV endorsements, and C/P permits was a one-time issuance based on catch history. Once appeals are done, these regulations are no longer necessary and will be deleted to save publication space in Federal regulations.

16. Revise regulations to reflect current allowable gear types by the Pacific Fishery Management Council in the Groundfish FMP.
    The regulations for the Magnuson-Stevens Act Provisions at §600.725, General Prohibitions, for the Pacific Coast groundfish fishery are outdated, especially given changes implemented through the trawl rationalization program. This revision would make the regulations at 600.725 consistent with the authorized fisheries and gears from

50 CFR part 660, subparts C-G (i.e., the groundfish regulations).

600.725 General Prohibitions ----- (v) The use of any gear or participation in a fishery not on the following list of authorized fisheries and gear is prohibited after December 1, 1999. A fish, regardless whether targeted, may be retained only if it is taken within a listed fishery, is taken with a gear authorized for that fishery, and is taken in conformance with all other applicable regulations. Listed gear can only be used in a manner that is consistent with existing laws and regulations. The list of fisheries and authorized gear does not, in any way, alter or supersede any definitions or regulations contained elsewhere in this chapter. A person or vessel is prohibited from engaging in fishing or employing fishing gear when such fishing gear is prohibited or restricted by regulation under an FMP or other applicable law. However, after December 1, 1999, an individual fisherman may notify the appropriate Council, or the Director, in the case of Atlantic highly migratory species, of the intent to use a gear or participate in a fishery not already on the list. Ninety days after such notification, the individual may use the gear or participate in that fishery unless regulatory action is taken to prohibit the use of the gear or participate in the fishery (e.g., through emergency or interim regulations). The list of authorized fisheries and gear is as follows:

2. West Coast Groundfish Fisheries (FMP):	
A. Pacific groundfish trawl fishery	A. Trawl.
B. Set gillnet fishery	B. Gillnet.
C. Groundfish longline and setline	C. Longline.
D. Groundfish handline and hook and	D. Handline, hook and line.
E. Groundfish pot and trap fishery	E. Pot, trap.
F. Recreational fishery	F. Rod and reel, handline, spear, hook and line.

Proposed revisions (italicized, underlined text needs further consideration):

Fisheries by Gear – After Rationalization	
LIMITED ENTRY	
Trawl IFQ Fishery	• Bottom trawl • Midwater trawl • Demersal trawl - Scottish Seine • *<u>XXX list gears allowed with gear switching XXX</u>* • *<u>Non-groundfish trawl</u>*
Catcher/processor fishery	• Midwater trawl
Mothership fishery	• Midwater trawl
Fixed gear	• Longline • Pot/trap
OPEN ACCESS	
Groundfish, directed	• *<u>Line gear</u>*

Pink shrimp	• Non-groundfish trawl gear
ridgeback prawn	
California halibut	
Sea cucumber	
Pacific halibut fishery	• longline gear
Dungeness crab	• Pot/trap
Prawn	
California Sheephead	
HMS	• line gear • ***Setnet***
Salmon troll gear	• troll gear
California Halibut	• line gear
TRIBAL FISHERY	• midwater trawl • bottom trawl • longline • pot/trap
RECREATIONAL FISHERY	• Rod and reel, handline, spear, hook and line.

NMFS Items for Correction

This document includes items NMFS will implement through a correcting amendment in 2012 for the Pacific Coast groundfish fishery. These items are technical edits and corrections and NMFS is not expecting the Council to take action on these items.

These items are still in development and additional items may be added as the rulemaking progresses. Some of these items are a result of the trawl rationalization program actions but affect others sectors as well (i.e., limited entry fixed gear and open access). Item 1 was initially available at the September 2011 Council meeting under Agenda Item G.8.b, Supplemental NMFS Report 1: Additional Potential Trailing Actions from NMFS.

1. Correct regulations to require observer coverage for all vessels processing groundfish at sea (unless a waiver has been issued by NMFS).

   Before implementation of Amendment 20, any vessel that processed at sea in the groundfish fishery was required to have observer coverage (unless a waiver has been issued by NMFS). The regulations implementing Amendment 20, which also restructured the entire groundfish regulations, erroneously removed a portion of the groundfish regulations pre-Amendment 20. The requirement that any vessel processing at sea in the groundfish fishery must have observer coverage was erroneously applied to only the at-sea whiting fishery (MS & C/P). It should apply to all commercial groundfish fisheries (trawl, fixed gear, open access). See 68 FR 53334 (9/10/2003) for the history on this provision.

NEW ITEMS since September 2011 Council meeting:

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2. Correction to the observer/offload regulations.

   Regulations are corrected to make it clear the observer must be on the vessel while in port unless the observer provides a form to the catch monitor documenting the specified IFQ species. The regulations were unclear on the requirements for documenting IFQ fish (all IFQ fish versus the 4 overfished species) between the prohibitions at 660.112 and the management measures at 660.140. In addition, revisions to this paragraph would clarify whether a vessel must carry an observer in port at any time the vessel is underway in port, not just between delivery points.

   660.112 Trawl fishery—prohibitions.
   (b) Shorebased IFQ Program —
   (1) General.
   (xiii) Retain any IFQ species/species group onboard a vessel unless the vessel has observer coverage during the entire trip and observer or catch monitor coverage while in port until all IFQ species from the trip are offloaded~~, except for the following IFQ species: Bocaccio, yelloweye rockfish, canary rockfish, and cowcod~~. <u>A vessel is exempted from this requirement</u>

<u>while remaining docked in port, if</u>~~If~~ the observer makes available to the catch monitor an observer program form reporting the weight and number of ~~each of the IFQ species~~ <u>bocaccio, yelloweye rockfish, canary rockfish, and cowcod</u> that were retained onboard the vessel during that trip and noting any discrepancy in those species between the vessel operator and observer~~, the vessel would not need to maintain observer or catch monitor coverage on the vessel while in port and until the offload is complete~~. <u>A vessel must maintain observer coverage while underway in port.</u> A vessel may deliver IFQ species/species groups to more than one IFQ first receiver, but must maintain observer coverage onboard the vessel during any transit between delivery points. Once transfer of fish begins, all fish aboard the vessel are counted as part of the same landing as defined at §660.11. Modifying the list of IFQ species to which this exception applies has been designated as a "routine management measure" and may be modified through an inseason action, as specified at §660.60(c)(1)(iv).

660.140
(h) Observer requirements —
(1) Observer coverage requirements.
(i) Any vessel participating in the Shorebased IFQ Program must carry a NMFS-certified observer during any trip and must maintain observer or catch monitor coverage while in port until all fish from that trip have been offloaded<u>.</u> ~~, with the following exception.~~ <u>A vessel is exempted from this requirement while remaining docked in port, if</u>~~If~~ the observer makes available to the catch monitor an observer program form reporting the weight and number of those overfished species identified in §660.112(b)(1)(xiii) that were retained onboard the vessel during that trip and noting any discrepancy in those species between the vessel operator and observer~~, the vessel would not need to maintain observer or catch monitor coverage on the vessel while in port and until the offload is complete~~. If a vessel <u>gets underway in port or</u> delivers fish from an IFQ trip to more than one IFQ first receiver, ~~the~~ <u>an</u> observer must remain onboard the vessel during any transit between delivery points.

3. Correct coop permit initial administrative determination (IAD) regulations to reference 660.25(g) (i.e., the permit appeals process).

4. Correct regulations at 660.150(g)(2)(i) to on MS/CV permit renewal to say that the processor obligation to an MS permit must be declared on the form rather than an MS vessel.

   (2) Renewal, change of permit owner, vessel registration, or combination —
   (i) Renewal. An MS/CV-endorsed permit must be renewed annually consistent with the limited entry permit regulations given at §660.25(b)(4), subpart C. During renewal, all MS/CV-endorsed limited entry permit owners must make a preliminary declaration regarding their intent to participate in the coop or non-coop portion of the MS Coop Program for the following year. If the owner of the MS/CV-endorsed permit intends to participate in the coop portion of the MS Coop Program, they must also declare which ~~MS vessel~~ <u>MS permit</u> to which they intend to obligate the permit's catch history assignment. MS/CV-endorsed permits not obligated to a permitted MS coop by March 31 of the fishing year will be assigned to the non-coop fishery. For an MS/CV-endorsed permit that is not renewed, the following occurs: * **

5. Correct regulations at §660.150(g)(2)(iv)(B) to state the proper form used to transfer an MS/CV endorsement.

   A request to change the registration of an MS/CV endorsement is a unique form from the Fisheries Permit Office and is not the permit ownership form. Therefore, regulations should be revised to read as follows:

   (B) Application. A request for a change in MS/CV endorsement registration must be made between September 1 and December 31 of each year. Any transfer of MS/CV endorsement and its associated CHA to another limited entry trawl permit must be requested using the appropriate ~~a change in permit ownership~~ form from the Fisheries Permits Office and the permit owner or an authorized representative of the permit owner must certify that the application is true and correct by signing and dating the form. In addition, the form must be notarized, and the permit owner selling the MS/CV endorsement and CHA must provide the sale price of the MS/CV endorsement and its associated CHA. If any assets in addition to the MS/CV endorsement and its associated CHA are included in the sale price, those assets must be itemized and described.

6. Correct the software requirements for electronic fish tickets at §660.15(d)(1)(v).

   The regulations erroneously state that an operating system such as Windows 2007 may be used. There is no such operating system. The regulations should read Windows 7 instead, as follows:

   (v) Operating system: Microsoft Windows XP with Service Pack (SP) 2, Windows Server 2003 with SP1, or later operating system such as Windows Vista or Windows 7 ~~2007~~;

ENFORCEMENT CONSULTANTS REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS AND ACTION

The Enforcement Consultants (EC) have reviewed the documents pertaining to Agenda Item F.8 Trawl Rationalization Trailing Actions and Allocation Amendments and Actions, Agenda Items F.8.a Attachments 1,2, 3, and 4, and Agenda Item F.8.b NMFS Reports 1,2, and 3.

Attachment 1

No. 5, *Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time.*
The EC endorses Alternative 2, which was recommended by the Trawl Rationalization Regulatory Evaluation Committee and endorsed by the Council in November 2011. We believe the current requirements and restrictions on permit stacking and transfers are not appropriate in this period of catch share management, and add unwarranted complexity to the management scheme. Further, we believe there are cost savings for the industry and NOAA Fisheries that could be realized under this proposal. The noted staff recommendation is an important clarification point that should be included if this option is adopted by the Council.

No. 6, Change *the opt-out requirement for quota pound (QP) deficits.*
The EC endorses the alternative that will allow vessels that have carried a known deficit for more than 30 days to avoid a violation by opting out of the fishery (so long as the deficit is less than the carryover allowance (10 percent)). Such vessels may opt back in once they have cured their deficit. This action represents a relaxing of the opt out rule currently in place which requires a vessel to remain out of the fishery until the next calendar year.

In the first year of Trawl Rationalization (TRat), there were over 3000 individual fishing quota deliveries with hundreds of landings where vessels accounts went into deficit, but there were no violations of the requirement to cover those deficits in 30 days. There were three vessels that opted out of the fishery. These opt-out declarations took place in mid-December and were part of a strategy employed by the vessel account holders where the deficits were covered with QP issued after January 1, 2012, thus avoiding the need to lease QP in 2011.

Given this level of activity, the robust tracking capability of the TRat vessel account system and the demonstrated compliance by the industry, we believe a relaxation of the opt-out rules is warranted.

Attachment 4:

The EC recognizes the importance of the Council doing a comprehensive review of its gear regulations as they apply in the TRat program. The gear regulations currently in place address risk placed upon the species rather than upon the fishermen. Rationalization has reversed the risk equation, placing risk upon the fisherman. Correspondingly, regulations should be developed that reflect this change.

The gear issues analyzed in Attachment 4 are a positive first step, but a number of issues raised within this package will need review and analysis. The EC would like to convene its June 2012 meeting one day early and invite participation by interested members of the Groundfish Management Team and Groundfish Advisory Subpanel. In addition, NW Region and Science Center staff should be encouraged to attend. The proposed agenda will evaluate the alternatives contained in Attachment 4 and bring recommendations forward for Council consideration, with the understanding that these recommendations may be acted upon in 2013, as the Council schedule allows.

No. 2 Chafing Gear
Notwithstanding the statement above, the EC strongly encourages the Council to move forward with Strawdog Alternative 2 as outlined in Agenda Item F.8.a, Attachment 4.

As noted in previous EC statements, the whiting fishery is generally out of compliance with the current chafing gear requirements at 660.130(b)(3). This is an untenable position for industry, state, and Federal enforcement programs, which needs to be addressed. Having consulted with industry, the EC believes Strawdog Alternative 2 meets the needs of the whiting industry in regards to bringing their nets as currently configured into compliance. Alternative 1 may be too broad in its potential application and was therefore rejected.

PFMC
03/06/12
11:59 a.m.

Agenda Item F.8.b
Supplemental GAP Report
March 2012

GROUNDFISH ADVISORY SUBPANEL REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS

The Groundfish Advisory Subpanel (GAP) received a report from Mr. Jim Seger and Ms. Jamie Goen on trawl rationalization trailing actions and amendments. The GAP notes that due to recent developments, the agency and Council have less time than anticipated to analyze and implement these actions. With that in mind, the GAP wishes to emphasize that any actions prioritized by the Council should focus on ensuring that the trawl program overall is as effective and efficient as possible. Trailing actions affecting few participants, or non-trawl participants, should receive a lower priority.

To organize our recommendations, the GAP used the Council Action Template (Agenda Item F.8.d) below. Our prioritized recommendations can be found at the end of the document.

F.8.d – Council Action Template

Agenda Item F.8.a, Att 1. (this attachment)	**GAP COMMENTS**
Cost Recovery Rule	
1. Cost Recovery (no action anticipated)	The GAP offers no comments on this item.

PIE Rule 2	
2. Quota Share/Quota Pound (QS/QP) Control Rules – Safe Harbors	The GAP offers no comments on this item.
A. Risk Pools (no action anticipated)	The GAP offers no comments on this item.

. Lenders	*Lending entities qualifying for an Exception:* The GAP recommends alternative 1 and notes this alternative was already endorsed by the GAP and Council at the November 2011 meeting. The GAP is not concerned about quota pounds being stranded as a result of default so does not believe alternative 3 is necessary. *Scope of the Exception:* The GAP recommends alternative 3 and notes this alternative was endorsed by the GAP and Council in November 2011. The GAP recommends modifying the language of alternative 3 slightly to remove the conflict between items C & G in table 1 from Immediate Timeframe Council Priority Trawl Trailing Actions: Descriptions and Next Steps (Agenda Item F.8.a, Attachment 1, Table 1). The new language for alternative 3 would read "Same as alternative 2 but further limit the exception under paragraph C ***and G*** so that the lenders exception pertains only to control over the transfer of QS and IBQ…" Finally, the GAP notes that the relative priority of this safe harbor is dependent on the outcome of council action to freeze quota share transfers in 2013. Specifically, this issue is not as critical if permanent trading is prohibited next year.
3. Other Lender Issues	The GAP recommends postponing action on these issues at this time.
4. Develop a process to certify new observer providers (see NMFS Report 2)	The GAP believes this could benefit the fishery by providing additional flexibility in finding observers to cover a fishing trip. However, the GAP does not believe that this item is as important as several other items on this list.

5. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time	The GAP supports alternative 2 as recommended by the TRREC in November 2011. However, the GAP adds the caveat that permit stacking should not be a means to authorize at-sea processing of trawl program sablefish. The regulations should be drafted to prevent that outcome. For more on this item see Council Action 2 Issue 1 below.
6. Change the opt-out requirement for QP deficits	The GAP strongly endorses the alternative authorizing vessels that have opted out of the fishery to avoid a violation to opt back in once they have cured that deficit. This creates flexibility for fishermen and does not pose a threat to the resource. This alternative was endorsed by the Council in November 2011. (The GAP notes that this alternative only applies to deficits that are less than the carryover allowance.)
7. Eliminate double filing of co-op reports	The GAP recommends doing away with this burdensome requirement. If it is a relatively easy fix it should go forward at this time, but it does not rise to the same level of priority as some of the other items in this list.

Whiting Season Rule	
8. Whiting season opening date and southern allocation	If it is a relatively easy fix, the GAP recommends analyzing an April or May start. The GAP does not recommend analyzing a year round fishery at this time as that is likely to be a much more cumbersome analysis. The GAP also recommends doing away with the early opener in the south. The GAP notes that much of the information for analysis of an early start may already be available based on years when the fishery opened in April.

Council Action: 2. "Take action as necessary on the NMFS identified trailing actions."

Agenda Item F.8.b. NMFS Reports	**GAP COMMENTS**
NMFS Items for PIE 2	
1. Sablefish at-sea processing exemption fix	The GAP does not endorse the concept of allowing a fixed gear vessel to process sablefish trawl quota by acquiring a trawl permit. The exemption provided was only intended to apply to fixed gear permits. As mentioned above, the GAP believes the process is already overloaded and any actions adopted by the council should focus on helping the trawl program overall. This item does not meet that bar.
2. Fishery closure language	The GAP offers no comments on this item.
3. First receiver site license changes	The GAP supports efficiencies to reduce the costs of this program.
4. Catch monitor certification requirements	The GAP offers no comments on this item.
5. QS permits and transfers	The GAP offers no comments on this item.
6. Start renewal process 9/15 for LE permit, vessel account, and QS permits	The GAP offers no comments on this item.
7. Observer provider certification	As noted above, the GAP believes this could benefit the fishery by providing additional flexibility in finding observers to cover a fishing trip. However, the GAP does not believe that this item is as important as several other items on this list.
8. Sorting requirements	The GAP offers no comments on this item.
9. Remove 12/15-31 ban on QP transfer	The GAP supports removing the ban on QP transfer at the end of the year.
10. Trawl permit requirements for vessel accounts	The GAP supports reviewing the purpose and functioning of the vessel account system.
11. Clarify processor obligation (could be to >1 MS permit)	The GAP offers no comments on this item.
12. Observer program reg changes	The GAP offers no comments on this item.
13. Change "permit holder" to "vessel owner"	The GAP offers no comments on this item.
14. Process for changes vessel ownership	The GAP offers no comments on this item.
15. Delete initial issuance regs	The GAP offers no comments on this item.
16. Revise regs to reflect gear types in FMP	The GAP offers no comments on this item.

NMFS Items for Correction	**GAP COMMENTS**
1. Observer coverage required for at-sea processing (unless NMFS waiver) (no action anticipated)	The GAP offers no comments on this item.
2. Observer/offload regs (no action anticipated)	The GAP offers no comments on this item.
3. Coop permit IAD regs refer to regs for permit appeals process (no action anticipated)	The GAP offers no comments on this item.
4. MS/CV permit renewal- processor. obligation to MS permit not MS vessel (no action anticipated)	The GAP offers no comments on this item.
5. List proper form used to transfer an MS/CV end. (no action anticipated)	The GAP offers no comments on this item.
6. Software requirements for e-fish tickets (no action anticipated)	The GAP offers no comments on this item.

Council Action: "3. Provide guidance as needed on moving forward on gear rule, including placement of the chafing gear issue."

Agenda Item F.8.a. Att 4. Gear Rule	**GAP COMMENTS**
1. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery	
A. Allowing multiple gears onboard a vessel on the same trip	The GAP recommends allowing multiple gears on board. This will create additional flexibility for fishermen, while saving time and fuel. Some gear is difficult to remove, and right now fishermen have to run back and forth when they want to change gear.
B. Allowing use of multiple gears on a single trip	This is also an important issue for the GAP. The GAP supports the proposed EC meeting to discuss how to move forward with this and other gear issues.

2. Chafing Gear	This is the GAP's highest priority as most boats in the whiting fishery are currently out of compliance. The GAP supports a short term fix, alternative 2, which will need to be followed by a longer term fix to be developed at the EC meeting described above.
3. Allow trawl gear modifications that increase efficiency and selectivity	This is another major GAP priority. We have already seen tremendous bycatch reduction through gear and behavior modifications. Facilitating fishermen's ability to access their full allotment of target stocks while avoiding sensitive stocks should be one of the highest priorities for this program, and removing archaic gear regulations that hinder innovation will help achieve that goal. The GAP recommends that this item be added to the agenda for the EC meeting described above.

Other issues:

10 Percent Carry Over – The GAP has serious concerns regarding the final outcome of the previously approved 10 percent carry over. A long-term fix is needed for this issue. While it is understood that a legal problem exists due to the potential to exceed the annual catch limit (ACL), the GAP points out that fishing plans, quota pound (QP) transfer and future quota share sales arrangements already exist based on assurances from National Marine Fisheries Service (NMFS) that this problem would be resolved. The industry needs certainty on this issue and feels strongly that the 10 percent carryover should be allowed for all species.

The GAP concerns are as follows:

1. Business plans have been made based on NOAA's prior approval of the 10 percent carryover.

2. The proposed fix for 2012 only includes carry over for those species, that with a 10 percent carryover plus the projected annual landings, will fall below the ACL.
There is likely to be no carryover for economic and resource critical species such as Pacific Whiting, Sablefish and Petrale, because the ACL is likely to be fully subscribed.

Sablefish discard mortality credit – The GAP notes that this is an important issue and recommends the flat rate approach. This year, due to QP being required for all catch, the market was flooded with small fish. This caused market disruption and also creates negative implications for the future of the fishery.

Reducing observer costs – This remains a major priority for the GAP. As the GAP noted in November 2011, observer costs, along with all of the other costs impacting the fleet (e.g., buyback loan, high diesel prices, cost recovery), have the potential to increase consolidation and limit profitability.

One promising way to reduce observer costs is with new technology, particularly electronic monitoring. Electronic monitoring is likely to not only reduce monitoring costs, but also increase flexibility in timing of fishing trips, reduce insurance requirements, free up deck and bunk space, and provide a safer fishing experience. The GAP is encouraged by recent signals from the agency that electronic monitoring is likely to begin moving forward this summer. We request that this remain a major priority and that other agency needs not impede the ability to move forward on this issue.

HIGHEST PRIORITIES

Recognizing that NMFS and the Council do not have the time to tackle all of the 36 items listed above, the GAP prioritized our most important issues below. These issues are listed in priority order and have a direct bearing on the success of the trawl program overall, or, in the case of chafing gear, are needed to put the fleet back in compliance with the law. The list below is not meant to suggest that many of the other items listed above are not also incredibly important. It may be that some of the items we supported above could also be moved forward without adding significantly to the workload or preventing any of the items listed here from being accomplished. In that case, the GAP would support moving forward on those items.
In order, here are the GAP's priorities:

- Chafing gear – Necessary to put the whiting fleet back in compliance with the law.

- 10 percent carryover – Critical for business planning, this is a program component that has already been approved and relied upon.

- Observer costs – Program costs are one of the limiting factors to the overall success of this program.

- Stacking permits – This creates efficiency and flexibility. The GAP once again notes that its support for this item should not be construed as support for as-sea processing of trawl sablefish. The regulations should be drafted accordingly.

- Non-whiting trawl gear modifications – This will foster continued gear innovation and access to target stocks.

PFMC
03/06/12

Agenda Item F.8.b
Supplemental GMT Report
March 2012

GROUNDFISH MANAGEMENT TEAM REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS

The Groundfish Management Team (GMT) received a briefing from Mr. Jim Seger, Council staff, and Ms. Jamie Goen from the National Marine Fisheries Service (NMFS) Northwest Region (NWR) on trawl rationalization trailing actions, process improvement and enhancement (PIE) rules, and NMFS items for corrections. We were also provided with a list of NMFS priorities, given current agency workload constraints. The priorities were: biennial groundfish harvest specifications and management measures, cost recovery, and response to litigation. As such, it is uncertain whether NMFS will be able to address additional trailing actions described under this agenda item. Given this situation, the GMT looks to the Council to help us prioritize our workload based on these NMFS priorities.

PIE 2 (Agenda Item F.8.a, Attachment 1)
Allow a fixed gear permit and trawl permit to be registered to the same vessel at the same time
The GMT sees the benefit of this option to the fishery and to NMFS' administration of permit transfers; however it may cause some catch accounting issues and problems differentiating what permit was associated with the vessel at the time of landing. It may be possible to work out those issues relatively easily, however the GMT did not have time to fully discuss it here at this meeting. In short, state fish ticket systems do not flag individual fishing quota (IFQ) landings on their own. Yet we are currently working on a way of using the Federally-mandated electronic reporting system to match state fish ticket numbers to IFQ landings.

There may be separate issues with the Vessel Monitoring System declaration system and matters of enforcement. We did not have occasion to discuss this with the Enforcement Consultants (EC) because of our workload at this meeting.

NMFS Items for PIE 2 (Agenda Item F.8.b, NMFS Report 2)
Clarify Fishery Closure Language
The GMT reviewed the proposed language which considers adding automatic action for fishery closure if "there is a conservation concern or if the shorebased trawl allocation or overall allocation is projected to be attained. A conservation concern may include projected attainment of an ACL." The GMT would like to point out that the IFQ fishery is managed to a sector-specific allocation, and exceeding that allocation may not necessarily constitute a conservation concern. Further, exceeding an ACL may not necessarily constitute a conservation concern.

Trawl Rationalization Trailing Actions: Gear Issues (Agenda Item F.8.a, Attachment 4, March 2012)
Alternative 1B, Using more than one gear on a trip
The GMT discussed the use of multiple gears during same trip. The GMT noted that small and large footrope trawls already can both be used during the same trips north of 40°10 N. latitude seaward of the rockfish conservation area. However, other combinations may be advantageous for attaining individual quota pounds under the current IFQ program. The GMT concluded that although versatility and flexibility are certainly advantageous to fishers, this issue of expanding multiple gear use should be thoroughly scoped regarding unintended consequences within

Federal and state regulations, fishery data recording and management, enforcement, and vessel safety, before being developed and before implementation. Preliminary concerns have been raised regarding these issues and are described in Agenda Item E.9.b, GMT Report, November 2011 (http://www.pcouncil.org/wp-content/uploads/E9b_GMT_RPT2_NOV2011BB.pdf).

Alternative 3. Allow trawl gear modifications that increase efficiency and selectivity:
The GMT recommends that regardless of the option selected under this alternative, that status quo large and small footrope requirements and restrictions remain in effect because of prohibitions on gear use in the groundfish essential fish habitat areas (50 CFR 660.130(b)(4)).

Enforcement Committee Report (Agenda Item F.8.b Supplemental Report)
The GMT supports the concept of a one-day workshop dedicated to gear regulations as they apply in the IFQ program. The GMT agrees that this workshop should occur immediately prior to the June Council meeting. Participants should include the Enforcement Consultants, Groundfish Advisory Subpanel, and GMT. The NWR and Fisheries Science Center staff should also be encouraged to attend.

PFMC
03/06/12

Agenda Item F.8.b
Supplemental SSC Report
March 2012

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS AND ACTIONS

Mr. Jim Seger briefed the Scientific and Statistical Committee (SSC) regarding a number of trawl rationalization trailing actions. The discussion focused largely on alternatives pertaining to use of multiple gears on a single trip. Gear combinations specified by these alternatives include small footrope and selective flatfish trawl gear (Alternative 1), multiple trawl gears (Alternative 2), and multiple trawl and fixed gear types (Alternative 3).

Due to differences in gear selectivity, it is important that catch data used in stock assessments be distinguished by gear type (i.e., midwater trawl, bottom trawl, fixed gear). To determine the effects of the multiple gear alternatives on stock assessments, the SSC recommends that the analysis include a discussion of whether existing data reporting provisions (e.g., split tickets) are adequate to ensure that harvest on single trips can be distinguished by gear type.

The SSC briefly discussed the potential changes in chafing gear and whiting season regulations. Neither was expected to be an issue for stock assessments.

An ongoing research issue with potential implications for ecosystem management pertains to effects of gear on habitat. Such research requires information on the spatial distribution of effort by gear type, which is typically obtained from logbook and observer data. To determine the effects of the multiple gear alternatives on ecosystem research, the SSC recommends that the analysis include a discussion of whether existing logbook and observer data requirements are adequate to ensure that effort on single trips can be distinguished by gear type as well as area.

With respect to the impacts of the gear alternatives on science, the SSC recommends that the analysis separate impacts on stock assessment science from impacts on ecosystem science.

PFMC
03/04/12

F.8.d – Council Action Template

Following is a detailed list of action items for potential use in motion making.

Council Action: "1. Select preliminary preferred alternatives for trailing action."

Agenda Item F.8.a, Att 1. (this attachment)	Council Action
Cost Recovery Rule	
1. Cost Recovery	(no action anticipated)

PIE Rule 2	
2. Quota Share/Quota Pound (QS/QP) Control Rules – Safe Harbors	
A. Risk Pools	(no action anticipated)
B. Lenders	
3. Other Lender Issues	
4. Develop a process to certify new observer providers (see NMFS Report 2)	
5. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time	
6. Change the opt-out requirement for QP deficits	
7. Eliminate double filing of co-op reports	

Whiting Season Rule	Council Action
8. Whiting season opening date and southern allocation	

Council Action: 2. "Take action as necessary on the NMFS identified trailing actions."

Agenda Item F.8.b. NMFS Report 2	Council Action
NMFS Items for PIE 2	
1. Sablefish at-sea processing exemption fix	
2. Fishery closure language	
3. First receiver site license changes	
4. Catch monitor certification requirements	
5. QS permits and transfers	
6. Start renewal process 9/15 for LE permit, vessel account, and QS permits	
7. Observer provider certification	
8. Sorting requirements	
9. Remove 12/15-31 ban on QP transfer	
10. Trawl permit requirements for vessel accounts	
11. Clarify processor obligation (could be to >1 MS permit)	
12. Observer program reg changes	
13. Change "permit holder" to "vessel owner"	
14. Process for changes vessel ownership	
15. Delete initial issuance regs	
16. Revise regs to reflect gear types in FMP	

Agenda Item F.8.b. NMFS Report 2: Items for Correction	Council Action
1. Observer coverage required for at-sea processing (unless NMFS waiver) (no action anticipated)	(no action anticipated)
2. Observer/offload regs (no action anticipated)	(no action anticipated)
3. Coop permit IAD regs refer to regs for permit appeals process (no action anticipated)	(no action anticipated)
4. MS/CV permit renewal- processor. obligation to MS permit not MS vessel (no action anticipated)	(no action anticipated)
5. List proper form used to transfer an MS/CV end. (no action anticipated)	(no action anticipated)
6. Software requirements for e-fish tickets (no action anticipated)	(no action anticipated)

Council Action: "3. Provide guidance as needed on moving forward on gear rule, including placement of the chafing gear issue."

Agenda Item F.8.a. Att 4. Gear Rule	Council Action
1. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery	
A. Allowing multiple gears onboard a vessel on the same trip	
B. Allowing use of multiple gears on a single trip	
2. Chafing Gear	
3. Allow trawl gear modifications that increase efficiency and selectivity	