NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) Northwest Region will present their routine report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Pacific Fishery Management Council (Council). Topics to be addressed in this briefing include:

- an update on implementation of Amendment 20,
- the partial disapproval of Amendment 23,
- tribal participation in the 2011 Pacific whiting fisheries,
- an update of the expected 2012 international Pacific whiting management process, and
- appropriate *Federal Register* notices since the November 2010 Council meeting.

Disapproval of Amendment 16-5 and matters associated with 2011-12 specifications and management measures will be discussed under Agenda Item H.2.

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

Reference materials under this agenda item include the NMFS letter regarding the approval status of Amendments 23 and 16-5 as well as relevant *Federal Register* notices. A letter from the Washington Department of Fish and Wildlife commenting on the partial disapproval of Amendment 23, as well as the proposed rule to implement the 2011-2012 harvest specifications and management measures, is cross referenced since this letter is included under Agenda Item H.2. The Quileute tribe submitted a letter expressing interest to participate in the 2011 Pacific whiting fisheries.

Council Task:

1. Discussion.

Reference Materials:

1. Agenda Item H.1.b, Attachment 1: NMFS Letter Regarding the Partial Disapproval of Amendment 23 and Full Disapproval of Amendment 16-5.
2. Agenda Item H.1.b, Attachment 2: *Federal Register Notices* Published Since the Last Council Meeting.
3. Agenda Item H.2.b, WDFW Letter Washington Department of Fish and Wildlife Public Comment Letter on the Proposed Rule to Implement the 2011-2012 Harvest Specifications and Management Measures and Amendments 16-5 and 23 (75FR67810).
4. Agenda Item H.1.c, Quileute Tribal Council Letter Regarding Participation in the 2011 Pacific Whiting Fishery.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Regulatory Activities including Update on Implementation of Amendment 20 — Frank Lockhart
c. Fisheries Science Center Activities — John Stein and John Ferguson
d. Reports and Comments of Advisory Bodies and Management Entities
e. Public Comment
f. Council Discussion

PFMC
02/15/11

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

December 27, 2010

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place
Portland, Oregon 97220

Dear Mr. Cedergreen:

By this letter, I am partially approving Amendment 23 and disapproving Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan (FMP). Amendment 23 revises relevant sections of the Groundfish FMP to ensure they are consistent with the Magnuson-Stevens Fishery Conservation and Management Act of 2006 (MSA) and National Standard 1 Guidelines. The guidelines describe fishery management approaches to meet the objectives of MSA National Standard 1 (MSA Section 301). Amendment 16-5 revises rebuilding plans for the following species: Bocaccio south of 40°10′ north latitude; canary rockfish; cowcod south of 40°10′ north latitude; darkblotched rockfish, Pacific Ocean Perch, widow rockfish, and yelloweye rockfish. This amendment also created a rebuilding plan for petrale sole, which was declared overfished on February 9, 2010. In addition, Amendment 16–5 modifies status determination criteria for flatfish and establishes a new precautionary harvest control rule for flatfish.

The National Marine Fisheries Service (NMFS) strongly supports the Council's efforts with these amendments to increase the accounting for scientific and management uncertainty, prevent overfishing, and rebuild overfished species.

NMFS has determined that, except for the removal of dusky and dwarf-red rockfish from the FMP, Amendment 23 is consistent with the national standards and other provisions of the MSA and other applicable laws. A further discussion of the basis for NMFS' disapproval of the removal of the two species from the FMP is provided in the Issues Attachment 1 below.

As you are aware, on April 29, 2010, the District Court for the Northern District of California ruled in part against NMFS in a case on the 2009-2010 harvest specifications (*Natural Resources Defense Council v. Locke)*. Specifically, the court found that NMFS violated:

- National Standard 2 of the MSA by failing to use the best scientific information available on the economic status of fishing communities;

- Section 304(e)(4)(A)(i) of the MSA by establishing rebuilding plans for darkblotched rockfish, cowcod and yelloweye rockfish that do not rebuild those species in time periods that are "as short as possible."

As thoroughly discussed at the November meeting, NMFS concluded that we would not be able to make necessary analytical refinements to the Draft Environmental Impact Statement (EIS) for Amendment 16-5 in time for NMFS to make a final decision by the deadlines imposed in Section 304(a) of the Magnuson-Stevens Act. Therefore, Amendment 16-5 is being disapproved. Because of the disapproval, NMFS' implementation of the 2011 specifications and management measures will be accomplished, in part, under the emergency authority of the MSA. NMFS requests that the Council revise as appropriate and resubmit Amendment 16-5 for implementation of the 2012 specifications and management measures. NMFS understands that the Council has already preliminarily scheduled time in the spring/summer 2011 meeting agendas to accomplish this task.

Items for Disapproval

Amendment 16-5 is being disapproved because there is not currently an adequate EIS to support decision-making. The Magnuson-Stevens Act (16 U.S.C. 1854(a)(3)) requires that before approving an FMP or amendment, NMFS must review the FMP 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 Final EIS, drafted in a manner consistent with the guidance contained within NAO 216-6 (Environmental Review Procedures For Implementing The National Environmental Policy Act). At this time, there is not any Final EIS, let alone an adequate Final EIS, to serve as a basis for either approving or disapproving Amendment 16-5 to the FMP. The Region will continue to work with Council staff to reorganize and refine the Draft EIS analyses to publish a Final EIS in time to support a final decision by the court-ordered April 29, 2011 deadline.

Amendment 23 as recommended by the Council also removes dusky and dwarf-red rockfish from the list of species in the FMP, and from the minor rockfish complex as a management group. The FMP currently specifies that it covers "rockfish," which includes all genera and species of the family Scopaenidae[1], *even if not listed*, that occur in the Washington, Oregon, and California area." NMFS believes that removing any species of "rockfish" from the FMP at this time is a fundamental change to one of the foundations of groundfish management, and as such, should be accompanied by a thorough analysis to support such a change. As described below, a thorough analysis was not provided. Therefore, NMFS is partially approving Amendment 23, which would leave these species in the FMP.

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[1] *Scorpaenidae* genera (*Sebastes, Scorpaena,* Scorpaenodes, and Sebastolobus)

The rationale given by the Council for removing dusky and dwarf red rockfish was that there are very few historical landings of these species. However, these two species are not the only species with little or no landing history that are currently in the FMP. Further, when NMFS looked at Pacific whiting data from the NORPAC database, which includes observer sampling information, there were historical catches of dusky rockfish in most years, including over 2 metric tons in 2003. Although the catches were relatively small in most years, they show that this species is regularly subject to mortality in this fishery. In addition, there are other rockfish species currently in the FMP that have very small landings; our review revealed at least 15 species with less than 1,000 pounds of landings in 2009

Although the FMP includes all rockfish species, individual management of all species of rockfish is not feasible because some species are rarely caught in fisheries, and in many cases there is insufficient information on certain species on which to base management decisions. In response to this circumstance of rare catches and limited scientific information, many species in the FMP are managed within a stock complex. This is the case for both dusky and dwarf-red rockfish, which are members of the minor shelf rockfish complex. Stock complexes are an important management tool for managing many rockfish species on the West Coast.

Removal of a species from the FMP would reflect a determination that conservation and management measures are not necessary. NMFS is not prepared to make that determination at this time without a more comprehensive discussion and review of how the Council and NMFS manage rockfish genera and species within the family of scorpaenidae. NMFS understands that the Council is planning to refine the existing stock complexes for the 2013-14 specifications and management measures. NMFS believes it is prudent, from a management perspective, to take a comprehensive look at all species and complexes in the FMP before deciding to remove or add any. The option to designate species as ecosystem component species is also another option that may be explored through the Council process.

As discussed above, NMFS is approving the remainder of Amendment 23. However, we note that public comments highlighted a lack of clarity in the amendment with respect to the connection between Annual Catch Limits (ACLs) and Accountability Measures (AMs). While NMFS does not believe this is a basis on which to disapprove the amendment, we agree that this lack of clarity needs to be addressed through the development and submission of an additional amendment to the FMP. The National Standard 1 Guidelines require that the FMP describe AMs to prevent ACLs from being exceeded, and to correct or mitigate overages of the ACLs if they occur. Amendment 23 contains an extensive suite of inseason and other management measures, some of which are referred to as accountability measures, but the amendment does not clearly articulate the connection between ACLs and AMs, and it is not entirely clear which management measures constitute AMs. NMFS requests that the Council address this issue in conjunction with its resubmission of Amendment 16-5, and we are committed to working with Council staff to develop the appropriate language.

Amendments 23 and 16-5 were developed over several Council meetings and required significant efforts by the Council, its advisory bodies, and its staff. NMFS will continue to work with the Council to make the changes necessary to Amendment 16-5 for approval for implementation for 2012, as well as the refinements to ACL provisions discussed above. The deliberations by the Council and its advisory bodies, and the work of members of the public at Council meetings and in their home ports, demonstrate an impressive commitment to the principles of the Magnuson-Stevens Conservation and Management Act. Thank you for your time and effort.

Sincerely,

For William W. Stelle, Jr.
Regional Administrator

Issues Attachment
Rationale for partial disapproval of Amendment 23

The Pacific Coast Groundfish Fishery Management Plan was established to manage all "rockfish" genera and species within the family of scorpaenidae, even if not listed individually in the FMP, that occur in Washington, Oregon and California. Although the FMP includes all rockfish species, individual management of all species of rockfish is not feasible because some species are rarely caught in fisheries, and in many cases there is insufficient information to manage a species specifically. In response to this circumstance of rare catches and limited scientific information, many species in the FMP are managed within a stock complex. This is the case for both dusky and dwarf-red rockfish, which are members of the minor shelf rockfish complex.

Stock complexes are an important management tool for managing many rockfish species on the West Coast. NMFS believes it is prudent, from a management perspective, to take a comprehensive look at all species and complexes in the FMP before deciding to remove or add any. The option to designate species as ecosystem component species is also another option NMFS will explore through the Council process.

The rationale given by the Council for removing dusky and dwarf red rockfish was that there are very few historical landings of these species. However, these two species are not the only species with little or no landing history that are currently in the FMP. Further, when NMFS looked at data from the NORPAC database, observer sub-sampling data in the Pacific whiting fishery indicated that incidental catch of dusky rockfish has historically been reported (Table 1). Although the landings were relatively small, they show that this species has been landed. There are other rockfish species currently in the FMP that have very small landings (Table 2). Removal of a species from the FMP would reflect a determination that conservation and management measures are not necessary. NMFS is not prepared to make that determination at this time, without a more comprehensive discussion and review of how the Council and NMFS manage "rockfish" genera and species within the family of scorpaenidae.

The Northwest Fisheries Science Center indicated that dusky and dwarf-red rockfish most likely do not occur in Washington, Oregon or California in numbers sufficient enough to determine abundance or conduct a stock assessment. However, this does not lead NMFS to conclude that these species should be removed from the FMP at this time. NMFS believes that as the stock complexes are further refined, it may be appropriate to remove species from the FMP. However, this discussion and related policy decisions should be addressed in a comprehensive, as opposed to piecemeal fashion. Finally, with the implementation of the trawl rationalization program and full catch accounting of both catch and discards, more information will be available to inform any decisions on removal of species from the FMP.

Landings of dusky rockfish
NORPAC Database

Table 1. Landings of dusky rockfish in individulal hauls from the NORPAC database.

Haul Date	Metric Tons
12/12/1990	0.212
7/23/1991	0.001
9/10/1992	0.036
9/12/1992	0.233
9/12/1992	0.524
9/12/1992	1.220
10/6/1992	0.015
10/6/1992	0.074
4/15/1994	0.817
4/16/1994	0.132
4/16/1994	0.273
5/2/1995	0.027
5/15/1996	0.009
5/18/1998	0.016
5/19/1998	0.005
5/16/1999	0.067
5/23/1999	0.005
5/15/2000	0.014
5/15/2000	0.017
7/17/2000	0.013
7/17/2000	0.017
7/17/2000	0.071
7/17/2000	0.079
7/17/2000	0.093
7/17/2000	0.164
7/22/2000	0.083
7/22/2000	0.479
7/23/2000	0.086
7/23/2000	0.137
7/23/2000	0.250
7/23/2000	2.074
7/24/2000	0.041
9/4/2000	0.002
10/14/2001	0.003
10/24/2001	0.010
10/24/2001	0.018
5/17/2002	0.003
5/15/2003	0.005

Table 2. Landings (in pounds) of rockfish species in the FMP in 2009
PACFIN Database

Table 2. Landings (in pounds) of rockfish species in the FMP in 2009	
Species	**Pounds**
UNSPECIFIED SHELF ROCKFISH	7
FLAG ROCKFISH	20
CALIFORNIA SCORPIONFISH	24
QUILLBACK	27
OLIVE	50
VERMILION	63
SHORTBELLY	102
BROWN	115
STRIPETAIL	144
UNSPECIFIED ROCKFISH	148
UNSPECIFIED SMALL REDS ROCKFISH	172
YELLOWEYE	189
ROSETHORN	228
NORTH UNSPECIFIED NEAR-SHORE ROCKFISH	304
UNSPECIFIED REDS ROCKFISH	309
BLACKSPOTTED	360
GREENSPOTTED	539
BLACK	593
SILVERGREY	690
GREENBLOTCHED	797

Agenda Item H.1.b
Attachment 2
March 2011

FEDERAL REGISTER NOTICES

Groundfish and Halibut Notices
10/16/10 through 02/10/2011

Documents available at NMFS Sustainable Fisheries Groundfish Web Site
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/index.cfm

75 FR 67032. Pacific Coast Groundfish Fishery Management Plan; Amendments 20 and 21; Trawl Rationalization Program; Correction - 11/1/10

75 FR 67810. Pacific Coast Groundfish Fishery; 2011-2012 Biennial Specifications and Management Measures ; Amendment 16-5 and Amendment 23 - 11/3/10

75 FR 75417. Pacific Coast Groundfish Fishery Inseason Adjustments to Fishery Management Measures. Action. Final Rule. This final rule makes inseason adjustments to commercial and tribal fishery management measures - 12/3/10

75 FR 75449. Pacific Coast Groundfish Fishery; Comment Period Extension. NMFS is extending the comment period for the proposed rule to implement the 2011-2012 Specifications and Management Measures - 12/3/10

75 FR 78344. Pacific Coast Groundfish Fishery Management Plan; Amendment 20 and 21; Trawl Rationalization Program - 12/15/10

75 FR 82296. Pacific Coast Groundfish Fishery Management Plan; Amendment 20 and 21; Trawl Rationalization Program' Allocations for the start of the 2011 Fishery - 12/30/10

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

February 15, 2011

To whom it may concern:

This letter addresses some specific issues in the Shorebased Individual Fishing Quota (IFQ) Program associated with the observer monitoring requirements of the recently enacted Pacific coast groundfish fishery's trawl rationalization program, and is written in response to numerous questions recently received by National Marine Fisheries Service (NMFS). As you may know, the trawl rationalization program requires 100% monitoring of catch (landings and discards) via observers on the vessels and catch monitors shoreside at the first receivers. It has been brought to the attention of NMFS that there is some concern about observer, observer provider, and vessel requirements once a vessel has returned to port to offload an IFQ landing. There has been some confusion regarding the requirement that an observer remain on board a vessel that has docked, until all IFQ species have been offloaded from the vessel. There have also been a number of questions regarding whether a crew member must stay on board the vessel as well.

This letter seeks to clarify the Federal regulations concerning these requirements. Federal regulations at 50 CFR part 660 for the new Shorebased IFQ Program require the following:

1) The observer must remain onboard the vessel until all IFQ species have been offloaded, as specified at §660.112(b)(1)(xiii), Trawl fishery - prohibitions.

> *It is unlawful for any person or vessel to "Retain any IFQ species/species group onboard a vessel unless the vessel has observer coverage during the entire trip and until all IFQ species from the trip are offloaded. A vessel may deliver IFQ species/species groups to more than one IFQ first receiver, but must maintain observer coverage until all IFQ species from the trip are offloaded..."*
>
> The intent of this regulation is to maintain the 100% monitoring of fish until all IFQ species are off the vessel. This is particularly important for overfished species and IFQ species where a vessel may be approaching a deficit in their vessel account.

2) At least one crew member or the operator must remain onboard the vessel while the observer is onboard, as specified at §660.140(h)(5)(vii)(A)(5)(ii), Shorebased IFQ Program.

"(ii) During all periods an observer is housed on a vessel, the observer provider must ensure that the vessel operator or at least one crew member is aboard."

The intent of this regulation is to ensure safe conditions for the observer in the unlikely event there is an emergency on the vessel (i.e., bilge pump alarm goes off, etc.) If the observer feels they are placed in an unsafe condition they may depart the vessel and refuse re-boarding until the situation is corrected. However, they must call the Office of Law Enforcement, which will be required to initiate an investigation.

3) Vessels are required to provide reasonable assistance to the observer, as specified at §660.140(h)(2)(viii), Shorebased IFQ Program. In this case, the operator and/or crew of a vessel are required to ensure that at least one crew member or the operator remain on the vessel with the observer while in port until the offload of IFQ species is complete.

"(viii) Assistance. Provide all other reasonable assistance to enable observer(s) to carry out their duties, ..."

The intent of this regulation is to ensure that the assigned observer receives the necessary support from vessel personnel that will allow them to complete their required responsibilities.

NMFS was also asked to clarify how the "24-hour" observer provider requirement relates to the above cited regulations.

The regulations at §660.140(h)(5)(vii)(A)(5)(i) make the observer provider responsible for observer deployment logistics including restrictions on housing an observer on a vessel to which the observer is assigned.

"(i) An observer under contract may be housed on a vessel to which he or she is assigned: Prior to their vessel's initial departure from port; for a period not to exceed twenty-four hours following the completion of an offload when the observer has duties and is scheduled to disembark; or for a period not to exceed twenty-four hours following the vessel's arrival in port when the observer is scheduled to disembark."

The purpose of these regulations are to increase efficiency and decrease expenses for industry and providers by allowing observers to be housed on vessels to which they have been assigned duties. There are three distinct criteria:

a) Prior to departure from port,
b) For a period of up to 24 hours after completion of an offload when the observer has duties. This criterion allows observers that have in-port monitoring duties the ability to stay onboard a vessel in port, for as long as IFQ species remain on board the vessel and up to 24 hours following completion of the offload of all IFQ species. This is the applicable criteria for IFQ observers who have the responsibility to monitor IFQ

species until final offload. Observers are not required to stay onboard a vessel that retains non-IFQ species onboard for delivery at another location.

c) For a period of up to 24 hours after arrival in port. This criterion is for observers onboard vessels that do not have any in port monitoring duties. Observers without in-port monitoring duties include those assigned to Limited Entry or Open Access vessels fishing in a non-IFQ fishery that have received notification from the West Coast Groundfish Observer Program requiring the vessel to obtain observer coverage for a specific fishery (OA Groundfish, OA shrimp, LE fixed gear) during a specified time period.

These new regulations under the Shorebased IFQ Program represent a departure from prior practice. In order to minimize costs, improved communication and advanced planning between vessel operators and processors/first receivers will be necessary. NMFS understands that some observers, observer providers, and industry are frustrated with these requirements because they limit the flexibility of the observer and crew once in port, especially during times when a vessel must wait to offload their fish. NMFS also understands the industry concern over observer costs and observer providers' concern over the role of observers while waiting on a vessel in port. However, these are the regulations that were recommended by the Pacific Fishery Management Council (Council) and implemented by NMFS.

Through Amendment 20 to the Pacific Coast Groundfish Fishery Management Plan in 2010, the Council recommended and NMFS implemented 100% monitoring of the trawl catch share program, including the Shorebased IFQ Program. The Council was clear on this requirement. In addition, the regulations cited above were deemed as necessary or appropriate through the Council process and were also available for public comment during the rulemaking process in 2010. Any changes to the regulations cited above would need to be addressed through the Council process followed by a Federal rulemaking. Contact the Council for ways to bring this issue to the Council's attention (phone: 866-806-7204).

NMFS acknowledges the need to continue to work with the industry, the observer providers, the observers, and the Council to refine the Shorebased IFQ Program as we gain experience under this new program and as new information arises. NMFS looks forward to continuing to work with interested parties to make the Shorebased IFQ Program as efficient as possible within the goals and intent of the Program.

Sincerely,

Frank Lockhart
Assistant Regional Administrator

Copies sent to:

- Alaskan Observer, Inc., Contact: David Edick, (206) 283-7310, aoistaff@alaskanobservers.com
- MRAG Americas, Inc., Contact: Bryan Belay, (907) 677-8772, bryan.belay@mragamericas.com
- NWO, Inc., Contact: Stacey Hanson, (425) 673-6445, alaska@nwoinc.com
- Saltwater, Inc., Contact: Tim Carroll/Kathy Robinson, (907) 276-3241, tim@saltwaterinc.com, kathy@saltwaterinc.com
- TechSea International, Inc., Contact: Troy Quinlan, (206) 285-1408, Info@Techsea.com

NOAA TIQ Team

AKRO•GCAK•HQ•NERO•NWFSC•GCNW•GCF•GCEL•OLE•OMI•SWRO•NOAA NEPA•NOAA PA

Jessie Gharett •Tom Meyer • Marian Macpherson • Julie Mackey • John Stein Moira Kelly • John Ferguson • Janell Majewski • Jonathan Cusick • Jim Hastie Todd Lee • Patricia Burke • Vanessa Tuttle • Alicia Matter • Adam Mouton Maggie Wilson • Carl Lian • Richard Kang • Jeff Cowen • Vimal Nair Vathsala DeSilva • Priya Jhangiani • Rob Marsicek • Brendan Sylvander Marcus Nedelmann • Leonard Kannapell • Rod Davidson • David Berklund Jean Olson • Jerry Leonard • Leif Anderson • Dan Holland • John LaFargue Cameron Hagstrom • Marlene Bellman • Jon McVeigh • Mike McCully Julie Peddy • Chris Leuken • Martin Park • Neil Moeller • James Mize Mariam Mccall • Sheila Lynch • Ryan Couch • Eileen Cooney • Barry Thom Katherine Cheney • Megan Morlock • Alix Smith • Janet Sears • Brian Gorman • Carrie Selberg • Dayna Matthews • Joe Albert• Don Masters Murray Bauer • Vicki Nomura • Tim Broadman • William Giles • Marianne Tomita • Jerry Sutton • Nicolle Hill • Elaine Harrell • Steve Freese • Kevin Ford Evelyn Jackson • Sarah Towne • John Bishop • Trish Farrell Jamie Goen Becky Renko • Kevin Duffy • Sarah Williams • Gretchen Hanshew • Ariel Jacobs • Robert Schumacher • Maryann Nickerson • Sean Matson • Paul Ortiz • Josh Lindsay • Heidi Hermsmeyer • Shelby Mendez

IFQDEMO - Mozilla Firefox

File Edit View History Bookmarks Tools Help

noaa.gov https://www.webapps.nwfsc.noaa.gov/ifqdemo/

Dashboard ‹ Pacific Fis... http://www.alaskaair.c... Company Store Draft Protocol Spec (G... Index of ftp://ftp.pcou... Index of ftp://skrause... Dell PowerVault 124T ... Color Career Counselo... Windows Live Sign In

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NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

NOAA PACIFIC COAST GROUNDFISH INDIVIDUAL FISHING QUOTA
NATIONAL MARINE FISHERIES SERVICE

DEMO DATABASE

IFQ Videos | Help Guide | Login

Home | All Messages

Welcome to the Individual Fishing Quota (IFQ) Program for Pacific Coast Groundfish

Important Messages – Please Read Before Logging Into Your IFQ Account

February 8, 2011: Message to Quota Share Account and Vessel Account Users. The National Marine Fisheries Service (NMFS) would like to remind Quota Share Account and Vessel Account users that you should always guard your online User ID and Password from unauthorized use. If you share this information with someone, all transactions they initiate with the information are

Shorebased IFQ Sector Balances for 2011 (round weight) 03/10/2011 15:17:01 EXCEL

IFQ Species	Sector Quota	Catch to	Quota Pounds Remaining
Arrowtooth flounder	16,804,295	31,326	16,772,969
Bocaccio rockfish South of 40'10' N.	132,277	0	132,277
Canary rockfish	57,100	0	57,100
Chilipepper rockfish South of 40'10' N.	3,252,370	106	3,252,264
Cowcod South of 40'10' N.	2,976	0	2,976
Darkblotched rockfish	552,997	79	552,918
Dover sole	31,216,354	69,306	31,147,048

Transferring data from www.webapps.nwfsc.noaa.gov...

Desktop 3:18 PM 3/10/2011

Agenda Item H.1.c
Supplemental NWFSC PowerPoint
March 2011

NOAA Fisheries Groundfish Science Report to PFMC

March 2011

John Stein and John Ferguson
NOAA Fisheries
Northwest Fisheries Science Center
Seattle, Washington

Trawl Catch Shares Observer Training Sessions

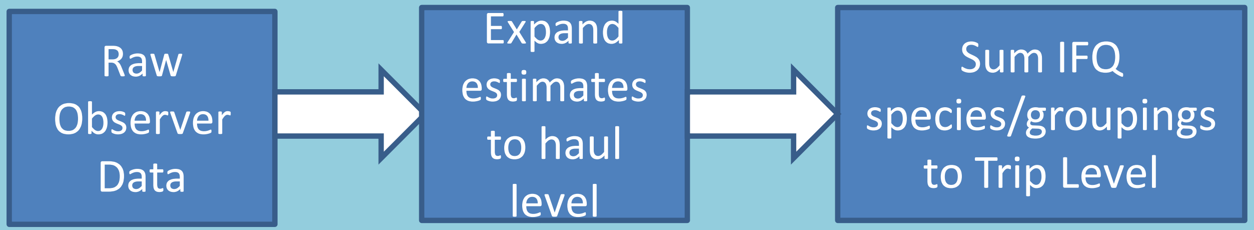
- Trainings – 13 day course for trawl catch share observer candidates who did not work for WCGOP in 2010
  - November 29 – December 15, 2010
  - January 10 – 26, 2011
  - February 7 – 25 (*n* = 80 trained so far)
  - March – conduct WCGOP training
  - April 11- 27
  - May 9 – 25
  - August
  - October (tentative)
- Goal: Was to have 125 observers trained; current goal is to have 175 available to the providers

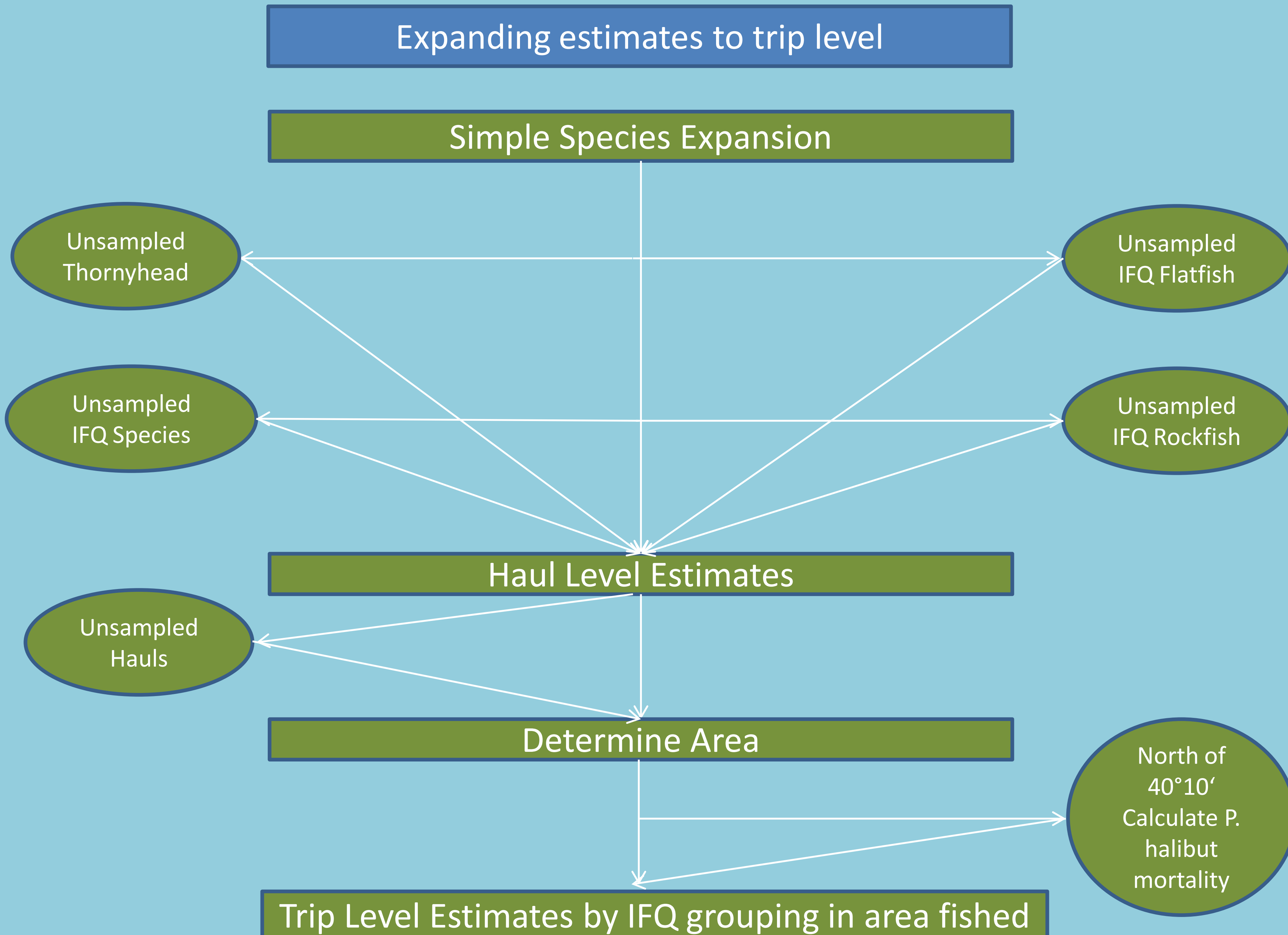
ITQ Update

- Implementing a new program under a CR
- Training vs data delivery
- Coordination with NWR, NWC, providers, and PSFMC
- Implementation is going fairly well….but it's a very dynamic and people want a lot of data (e.g., risk pools, ESA consultation, EFH habitat)

Data Delivery Process

- Determined sampling changes (completed: November 2010)
- Created functionality document and example hauls (completed: February 28, 2011)
- Writing query (in progress)
- Testing query (in progress)
- Make data available




Expanding estimates to trip level
Simple Species Expansion
Unsampled Thornyhead
Unsampled IFQ Flatfish
Unsampled IFQ Species
Unsampled IFQ Rockfish
Haul Level Estimates
Unsampled Hauls
Determine Area
North of 40°10‘ Calculate P. halibut mortality
Trip Level Estimates by IFQ grouping in area fished

FRAMD Director Recruitment Update

- Vacancy announcement was open from February 14 to February 28
- March: Review applications, conduct interviews, and meet with Division staff
- April: Final selection, offer, negotiation
- New Director on board NLT May 1
- Ferguson to stay involved through December to assist new Director and aid a smooth transition

Update: Rockfish/hake Pre-recruit Survey in 2011

Scenario 1: If SWFSC receives 45 days on R/V Shimada for the California part of the survey in May and early June, there are two possible options for the northern portion:

a) charter the Excalibur to do an intervessel fishing comparison at the northern end of the SWFSC survey in early June, and continue up the coast to complete the northern survey until around June 20 when the Excalibur is no longer available (most likely)

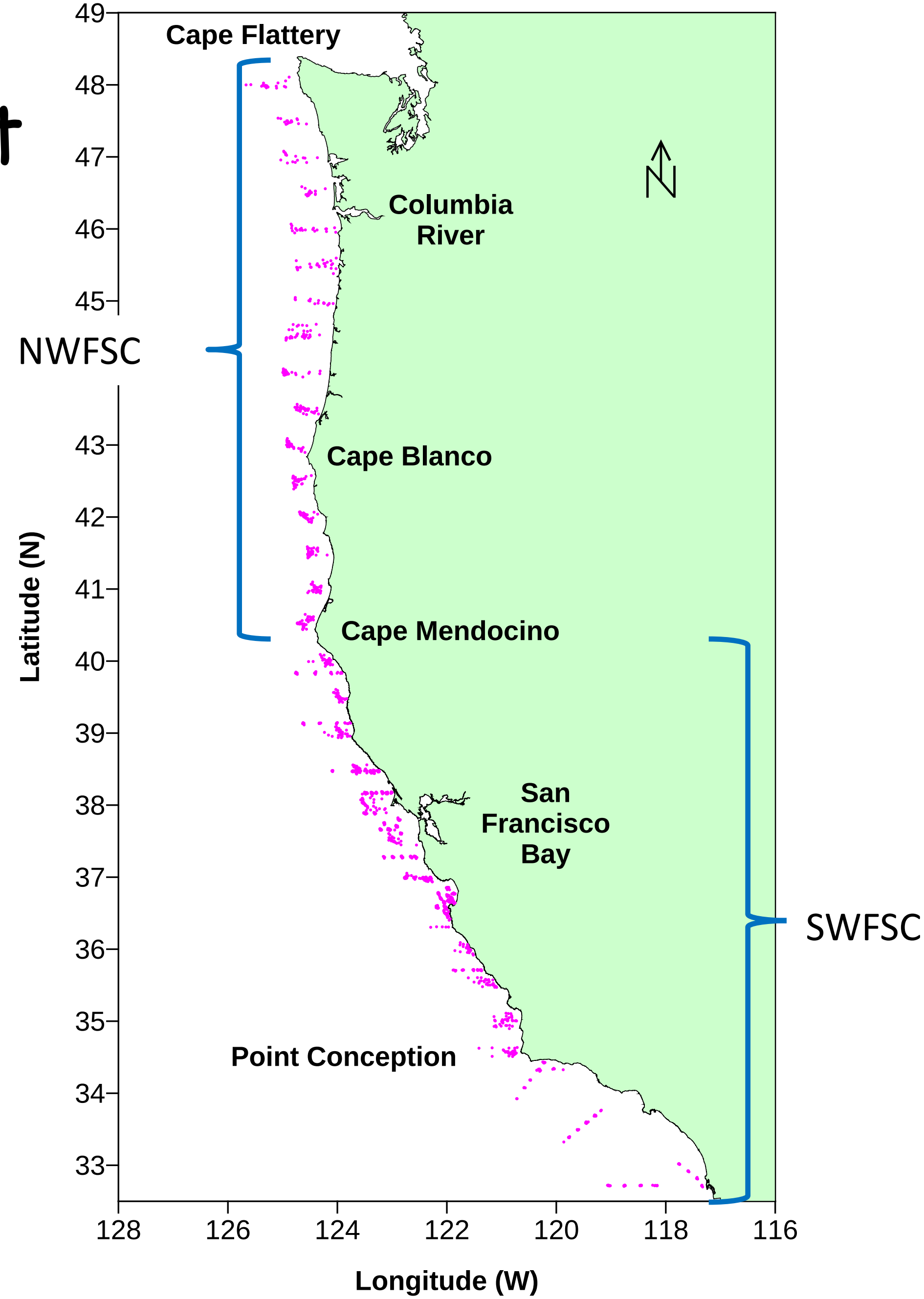
b) charter another vessel to fish later in the summer when we think pre-recruit hake and rockfish are more available in the northern survey area, but there would be no intervessel or interannual comparisons

Scenario 2: If SWFSC does not get time on the Shimada but has funding to charter a fishing vessel, then the best strategy would be to charter one vessel (i.e., the Excalibur) to do the entire survey starting in the south in early May and finishing off Washington around June 20.

Survey Covers US West Coast

Joint effort of the SWFSC and the NWFSC & Pacific Whiting Conservation Cooperative

2001-2009:
1,813 trawls (~200 trawls/yr)



"Big 4" Vision for Annual Surveys along the West Coast[1]

- Groundfish Bottom Trawl Survey (NWC); 2 passes from Canada to Mexico; cooperative with industry
- Juvenile rockfish and hake recruitment survey (joint); Southern California to Mendocino (SWC) and Mendocino to Washington (NWC); cooperative with industry [2]
- Hake and sardine acoustic survey (joint); Shimada; joint with Canadian vessel (Ricker)[2]
- Juvenile salmon recruitment (joint); Monterey to La Push; cooperative with industry [3]

[1] All 4 have ecosystem observation components to aid EBM
[2] Recommended by 2011 hake STAR panel
[3] Recommended by EPDT report to PFMC dated February 2011

Extra slides....

2011 Hake Assessment

- STAR met Feb. 7-11, in Seattle (Deca hotel)
- We made significant progress in addressing comments of prior STAR Panels:
  - Developed sex-specific acoustic estimates to address differential male/female growth rates
  - Created programming to summarize all fishery data by time blocks, to better account for the effects of within-year growth in the analysis of length data
  - Reanalyzed the 2009 acoustic survey data due to squid, and these data are now included in the model
  - Met with Canadian colleagues and reached agreement on inclusion and treatment of data, the assembly of a single, comprehensive assessment document, and suggested changes to TORs

2011 Hake Assessment

- Result:
  - New acoustic data processing that significantly reduced analysis times
  - Including 2009 data tightened up the confidence intervals around estimated biomass
  - Panel review focused on model differences (approach, philosophy)
  - The 2 models have increased congruence in terms of trends and uncertainty
- Summary: Much improved assessment for management decisions

Added Complications

- Need to code to:
  - Recognize situation
  - Employ appropriate equation
- 3 Gear Groups
- 4 Areas
- Pacific halibut
  - Sampling variation leads to multiple equations being needed to accurately calculate mortality

QUILEUTE TRIBAL COUNCIL
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QUILEUTE

January 6, 2011

Will Stelle
Regional Administrator
NMFS Northwest Region
7600 Sand Point Way N.E.
Seattle, WA 98115-0700

Re: Quileute Tribal Request for Whiting Allocation

Dear Mr. Stelle:

As you are aware, the Quileute Tribe has been working diligently over the past couple of years to develop the framework necessary to establish a Quileute Tribe Whiting Fishery within their usual and accustomed fishing grounds and stations ("U &A").

The Secretary of Commerce, through NMFS, has issued regulations allocating whiting to the Pacific Coast Tribes since approximately 1996. The Quileute Tribe pursuant to 50 C.F.R. § 660.324 (d), are hereby advising NMFS of its intent to participate in this fishery in 2011 and requests that NMFS take any action that may be necessary to ensure the Tribe's access to their right. If you would like to discuss this mater or believe that additional action by the Tribe is necessary, please contact Mel Moon, Director of Quileute Natural Resources, at (360) 374-3133 (mel.moon@quileutenation.org).

Sincerely,

Anna Rose Counsell-Geyer
Chair, Quileute Tribal Council

CC: Barry Thom, NMFS
Frank Lockhart, NMFS
Don Chapman, DOC

GROUNDFISH MANAGEMENT TEAM REPORT ON PARTIAL DISAPPROVAL OF AMENDMENT 23

The Groundfish Management Team (GMT) reviewed the "National Marine Fisheries Service (NMFS) Letter Regarding Partial Disapproval of Amendment 23 and Full Disapproval of Amendment 16-5" (Agenda Item H.1.b, Attachment 1) and offers the following comments on the disapproval of the Council's recommendation to remove dusky rockfish and dwarf red rockfish from the Groundfish Fishery Management Plan (FMP).

First, we note that the NMFS letter characterizes the Council's main rationale for the recommendation as there being "very few historical landings" of dusky and dwarf red rockfish. The letter questioned this rationale by pointing out that "these two species are not the only species with little or no landing history that are currently in the FMP."

The Council recommended removing dusky and dwarf red in response to a GMT analysis and recommendation.[1] Our recommendation was not based on historical landings alone but rather on the productivity and susceptibility approach (PSA) we took to help the Council gauge a stock's vulnerability to the groundfish fisheries. Our conclusion was that an ACL for these two stocks "would serve no purpose" because they are not vulnerable to the fishery. Dwarf red is not encountered and dusky rockfish is a northern stock whose range lies almost entirely outside of the U.S. west coast exclusive economic zone (EEZ).

NMFS' larger reason for the partial disapproval appears to be that the Council's recommendation was made "without a more comprehensive discussion and review of how the Council and NMFS manage rockfish genera and species within the family of scorpaenidae [sic]." To inform such a comprehensive discussion we would recommend continuing the PSA approach. The Council will begin planning for the 2013-14 process in April and the GMT will have a statement regarding this issue at that time.

Secondly, we would like to highlight two data discrepancies for the record. The NMFS letter includes two tables of supplemental groundfish landings data. Table 1 included landings of dusky rockfish from the (NORPAC) database. A query of Pacific Fishery Information Network (PacFIN data from 1981 to present day showed no occurrences of dusky rockfish. It is the GMT's understanding that NORPAC data is currently updated into PacFIN, so the lack of dusky rockfish landings is inconsistent with the landings NMFS reported in their partial disapproval letter. The GMT is unsure about the cause of this inconsistency and will investigate further.

The second table in the NMFS letter identifies landings of rockfish species in 2009 as reported from PacFIN (Table 2 in the letter). Our query of PacFIN produces very different numbers for some species. The following table compares our query to the landings as reported by NMFS in Table 2 compared to the PacFIN landings as queried by the GMT.

[1] March 2010 Briefing Book, Agenda Item E.4.b, Supplemental GMT Report.

We will investigate this issue further as well. For now we simply wish to flag the discrepancy for the record.

Table 1. Comparison of GMT PacFIN query to Table 2 in NMFS consistency determination letter.

Species	NMFS Table 2	Pounds landed by State (GMT query)			
		WA	OR	CA	Total
Unspecified shelf rockfish	7	6,837	2,652	2,621	12,110
Flag	20	0	0	530	530
California scorpionfish	24	0	0	7,533	7,533
Quillback	27	0	3,826	2,505	6,331
Olive	50	0	0	4,805	4,805
Vermilion	63	0	8,987	29,247	38,234
Shortbelly	102	0	0	104	104
Brown	115	0	51	54,302	54,353
Stripetail	144	0	75	54	129
Unspecified rockfish	148	60	0	1,945	2,005
Unspecified small reds rockfish	172	0	0	202	202
Yelloweye	189	1,399	511	88	1,998
Rosethorn	228	20	119	94	233
North unspecified nearshore rockfish	304	316	0	0	316
Unspecified reds rockfish	309	0	0	4,340	4,340
Blackspotted	360	359	0	0	359
Greenspotted	539	0	158	1,995	2,153
Black	593	6	294,592	201,080	495,678
Silvergrey	690	107	1,044	34	1,185
Greenblotched	797	0	0	836	836

[1] Data source: PacFIN (table vdrfd) extracted on 02-17-11

PFMC
3/6/11

Agenda Item H.1.e
Supplemental Public Comment
March 2011

February 27, 2011

BY EMAIL, and U.S. MAIL

Chairman Cedergreen and Council Members
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
Telephone: (503) 820-2280
Fax: (503) 820-2299
pfmc.comments@noaa.gov

Re: Agenda Items H.1 and H.2: 2011-2012 Biennial Specifications and Management Measures and Amendment 16–5 to the Pacific Coast Groundfish Fishery Management Plan.

Dear Chairman Cedergreen and Council Members:

The Natural Resources Defense Council (NRDC) submits the following comments concerning the 2011-2012 Biennial Specifications and Management Measures, and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan (FMP). Please include these comments in the administrative record.

As you are aware, the Order on Remedy resulting from *NRDC v. Locke* requires NMFS, by April 29, 2011, to establish new harvest specifications and rebuilding periods for darkblotched, cowcod and yelloweye that are as short as possible pursuant to the Magnuson-Stevens Act (MSA), and to establish rebuilding periods that are based on the best scientific information available.[1] We believe that the harvest specifications and rebuilding periods proposed by the Council will not comply with the Order. In sum, our concerns are as follows:

- **Darkblotched rockfish** is behind schedule according to the 2009 Assessment, and mortalities have likely exceeded optimum yield (OY) for the past two years. The Council should adopt a rebuilding target closer to the T_{MIN} of 2016, adjust for previous OY overages in the 2011-2012 catch levels, and expand the Rockfish Conservation Areas (RCAs) as necessary to prevent future overages.
- **Cowcod** rebuilding is stagnant, with a depletion level of around 4.5% according to the 2009 Assessment. The Council should adopt a rebuilding target closer to the T_{MIN} of 2060 and preserve the existing boundaries of the Cowcod Conservation Areas (CCAs).

[1] *See NRDC v. Locke,* No. 01-cv-00421-JL (N.D. Cal. April 22, 2010).

- **Yelloweye rockfish** is behind schedule according to the 2009 Assessment. The Council should adopt a rebuilding target closer to the T_{MIN} of 2047 and revise existing management measures where necessary to minimize yelloweye mortalities as much as possible.
- The rebuilding plan for **canary rockfish,** while not specifically covered by the Order, still must comply with the MSA's mandate to rebuild in a period as short as possible. Canary rebuilding is six years behind schedule, its depletion level was lowered by roughly 10% in the most recent assessment, and its OY is regularly exceeded. The Council's proposal to postpone canary's rebuilding target by six years in order to maintain status quo catch levels violates the MSA's rebuilding mandate.
- The default target reference points for **petrale sole** should not be lowered until robust analysis and data collection provide better support for such changes.

We believe that elements of NMFS's emergency rule related to cowcod and yelloweye put rebuilding plans for those species on the right track for compliance with the MSA, including the adoption of a 14 mt OY for yelloweye, and adoption of a shorebased trawl allocation of cowcod quota pounds based on a harvest level of 3 mt. We urge the Council and NMFS to incorporate similarly conservative harvest levels into the final harvest specifications for these species, in addition to the actions discussed below.

I. Introduction

Under the MSA, overfished species must be rebuilt in a time period that is "as short as possible" while giving consideration to "the status and biology of the overfished species and the needs of the fishing communities."[2] The justification for this priority, even when it causes economic hardship, lies in the statutory recognition that a healthy, rebuilt fishery is in the interests of both fishing community and environmental goals.[3] Congress stated explicitly that it intended with the MSA "to take immediate action to conserve and manage the fishery resources."[4]

The issue of how to interpret "considering the needs of the fishing community" in light of the MSA's mandate to "rebuild as quickly as possible" has been squarely considered by a federal Court of Appeals.[5] In *NRDC v. NMFS*, the Ninth Circuit concluded that "Congress intended to ensure that overfished species were rebuilt as quickly as possible, but wanted to leave leeway to avoid disastrous short-term consequences for fishing communities."[6] The Court used a "total fishing ban" as an example of "disastrous short-term consequences."[7] "The purpose of the Act is clearly to give conservation of fisheries priority over short-term economic interests."[8] Based on available data on recent revenues in the groundfish fishery,

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[2] 16 U.S.C. 1854(e).
[3] *See* 16 U.S.C. § 1801(a)(1) (noting that the nation's fishery resources "constitute valuable and renewable natural resources," that many of these species' survival is threatened and that others' survival will soon be threatened by "increased fishing pressure, . . . the inadequacy of fishery resource conservation and management practices and controls.").
[4] 16 U.S.C. § 1801(b)(1).
[5] *NRDC v. NMFS*, 421 F.3d 872 (9th Cir. 2005).
[6] *Id*. at 880.
[7] *Id.*
[8] *Id.* at 879.

we believe the Council can strengthen rebuilding plans—creating more value for fisheries faster—without coming close to disastrous consequences.

The mandate to "rebuild as quickly as possible" was revisited in the recent ruling in *NRDC v. Locke*, which held that the 2009-2010 harvest specifications for three overfished species – darkblotched, cowcod and yelloweye – violated the MSA since they were based neither upon rebuilding periods that were as short as possible nor upon on the best scientific information available.[9] The associated Order on Remedy requires NMFS by April 29, 2011 to establish new harvest specifications and rebuilding periods for darkblotched, cowcod and yelloweye that are as short as possible pursuant to the MSA and to establish rebuilding periods that are based on the best scientific information available.[10] The Court recently reemphasized the importance of its Order on Remedy in its February 14, 2011 Order on Fees, stating that **"[t]his Court's April 2010 rulings compelled Defendants to revise their rebuilding scheme for the fishery."[11]**

In short, the Court has made clear that lower catch levels are necessary for yelloweye, cowcod and darkblotched rockfish. The Council and MNFS must now adopt appropriate catch levels and management measures, and demonstrate that the target rebuilding dates for overfished species meet the requirements of the MSA.

II. Darkblotched Rockfish

History and background

Darkblotched rockfish was declared overfished in 2001. The 2005 darkblotched assessment incorporated what turned out to be an overly optimistic stock recruitment curve. On the basis of that erroneous parameter, in 2007 NMFS increased darkblotched catch limits to the highest levels since the species was declared overfished, from a status quo of 200 mt (2006) to 290 mt (2007) and 330 mt (2008). The 2007 darkblotched assessment revealed the error in the 2005 assessment, which was major enough to be called a "fundamental change in our understanding of the stock's productivity;" indeed, the updated assessment indicated that the target rebuilding year of 2011 in the darkblotched rebuilding plan could not be achieved even under a zero harvest rebuilding strategy.[12]

Yet rather than returning to the catch levels used prior to the introduction of the faulty stock assessment (i.e., the 2006 OY of 200 mt), NMFS adopted catch levels for 2009-10 that were actually higher than those adopted on the basis of the erroneous assessment, and simply pushed the target rebuilding date back 17 years to 2028. In *NRDC v. Locke*, the Court found:

> **"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 2008 – when it**

[9] *See NRDC v. Locke,* No. 01-cv-00421-JL (N.D. Cal. April 22, 2010).
[10] See *id.*
[11] *Id.*
[12] PFMC, Agenda Item H.1.c, Supplemental GMT Report, April 2008 at 3. See also 2009-2010 Groundfish Harvest Specifications Final Environmental Impact Statement (FEIS), at 26 ("[T]he new assessment fundamentally changed our understanding of stock productivity.").

> **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."**[13]

<u>2009 Assessment indicates rebuilding is behind schedule.</u>

The 2009 darkblotched assessment update essentially confirms the conclusions of the 2007 assessment with respect to the faulty 2005 assessment: according to the DEIS, "the 2009 assessment did not change our fundamental understanding of the stock."[14] The 2011 target rebuilding date is still infeasible (with T_{MIN}=2016), and maintenance of the status quo SPR harvest rate would rebuild the species by 2027 (one year later than estimated in the 2007 assessment).[15] While the 2009 assessment estimates that darkblotched is slowly rebuilding with a 2009 depletion level of 27%, it tempers that estimate with the qualification that it is based upon "*recent survey trends [that are] are noisy and relatively flat*. The estimated increase in stock size is driven primarily by the assumption that darkblotched productivity is analogous to that of other similar species, and *not on survey and fishery data indicating an upward trend*."[16] These facts indicate a need for caution in setting catch levels that are based on this uncertain assumption of increased biomass.

<u>The proposed rebuilding date and harvest levels do not respond to the Court Order.</u>

The Council's proposed rebuilding date of 2025, while a nominal improvement over the vacated 2028 target rebuilding date, does not respond to the Court's order to establish a rebuilding period for darkblotched that is "as short as possible" within the meaning of the MSA.[17] As shown in Table 1 below, the T_{TARGET} of 2025 would maintain the status quo catch limits that were set in 2007-08 based on faulty information about darkblotched productivity, and extended in the 2009-10 harvest specifications invalidated in *NRDC v. Locke.* According to the 2009 assessment, it is possible to rebuild darkblotched by 2016 with no catch.[18] A catch limit of 130 mt is estimated to rebuild darkblotched by 2018, and a catch limit of 222 mt is estimated to rebuild darkblotched by 2022.[19]

Table 1: Darkblotched Rebuilding Plan Targets and Catch Levels

Year	T_{TARGET}	Catch Level (mt)
2012	2025	296
2011		285
2010	2028	291*
2009		285*
2008	2011	330
2007		290
2006	2019	200

*Catch levels vacated by *NRDC v. Locke*

[13] *NRDC v. Locke,* No. 01-cv-00421-JL at 32.
[14] DEIS at 345.
[15] DEIS at 38.
[16] DEIS at 43 (emphasis added).
[17] *See NRDC v. Locke,* No. 01-cv-00421-JL.
[18] DEIS at 38.
[19] *Id.*

Fishery revenue data and recent catch levels justify a shorter rebuilding period and lower catch levels.

Recent catch levels as well as trends in the economic health of the fishery reveal that it is indeed possible to meet MSA's conservation priorities by establishing faster rebuilding targets and lower harvest levels while accommodating the needs of the fishing community.

According to the FMP, "darkblotched rockfish is … most frequently taken in the commercial trawl fisheries north of 38˚ N. latitude."[20] Historical revenue data indicates that ex-vessel revenues in the groundfish trawl sector have increased over the past five years, from roughly $23.8 million in 2005 to $30.5 million in 2009.[21] Indeed, 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.[22] In 2008, revenues in the fishery exceeded $113 million dollars.[23] 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 in 2009 than they were in 1998 after adjustment for inflation.[24]

The catch level for darkblotched was set at 200 mt in 2006, prior to the introduction of the faulty stock assessment that led NMFS to increase the catch level by over 50%. Nonetheless, economic data from both the commercial trawl sector and the larger groundfish fishery indicate that revenues in 2006 continued to rebound from 2002 lows.[25] 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, and we urge the Council and NMFS to adopt a rebuilding plan with a target rebuilding date that is associated with that catch level.

Darkblotched OY has been exceeded for the past two years, requiring adjustments in the 2011 OY to account for the overage and changes to the RCAs.

The darkblotched OY was exceeded in 2009 and 2010. The 2009 mortality report revealed that darkblotched exceeded 2009 OY (285 mt) by 15 mt. Under-projection in the trawl sector was responsible: non-whiting trawl exceeded its 2009 projection of 200 mt by 72 mt, or 36%. Darkblotched mortality data from 2010 revealed that darkblotched was on track to exceed the 2010 OY (330 mt) by 53 mt, or 16%. Once again, under-projection in the trawl sector was largely responsible for the overage.

According to the MSA's National Standard 1 Guidelines (NS1 Guidelines), when OY for a rebuilding species is exceeded, the catch limit for the following year should be adjusted by the full amount of the overage.[26] The Council didn't make the necessary adjustment to the OY in 2010, intensifying the need to do so in 2011.

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[20] FMP at 46.
[21] DEIS at F-11 (Table F-18).
[22] DEIS at F-3 (Table F-2).
[23] *Id.*
[24] DEIS at 240.
[25] DEIS at F-3, F-11.
[26] *See* 50 CFR Sec. 600.310(g)(3).

Additionally, the NS1 Guidelines hold that if catch exceeds the annual catch limit (ACL) more than once in the last four years, the system of ACLs and accountability measures (AMs) should be re-evaluated, and modified if necessary, to improve its performance and effectiveness.[27] In the wake of two consecutive darkblotched OY overages, the Council has not yet performed this required evaluation and modification, despite the Groundfish Management Team's (GMT's) suggested expansion of the RCAs during the summer months as one potential fix.[28] We strongly urge the Council to follow the GMT's suggestion to expand the seaward RCA boundary from 200 fm to 250 fm during both the winter and summer months.

III. Cowcod

History and background

Cowcod was declared overfished in 2000. The 2005 cowcod assessment incorporated a model-specification error that suggested cowcod's population to be at 18% of unfished biomass, leading NMFS to establish a target rebuilding year of 2039 and an associated catch limit of 4 mt per year for the 2007-08 harvest specifications for cowcod. However, a correction of the model-specification error in the 2007 cowcod assessment indicated that cowcod in the area covered by the assessment was at only 4.6% of its unfished biomass and could not be rebuilt by the target year, as the new $T_{F=0}$ was estimated to be 2061.[29] In spite of the new information revealing that cowcod was actually worse off than previously thought, NMFS chose to maintain the status quo harvest level of 4 mt per year and delay cowcod's target rebuilding date by 33 years, to 2072. Invalidating those harvest levels, the Court in *NRDC v. Locke* ruled that **"NMFS's decision to delay rebuilding the most depleted overfished species by more than a generation … violates [the MSA requirement that rebuilding periods are as short as possible]."[30]**

2009 Assessment indicates that cowcod is not rebuilding.

The 2009 cowcod assessment reveals no new data to indicate that cowcod is any closer to rebuilding than it was when the invalidated 2009-2010 specifications were adopted.[31] Indeed, the estimated cowcod depletion level in 2009 is 4.5%,[32] slightly lower than the 4.6% rate estimated in the 2007 assessment, suggesting that the cowcod population is failing to rebuild as projected, and may actually be in decline.

The proposed rebuilding date and harvest levels do not respond to the Court Order.

Nevertheless, as illustrated in Table 2 below, the Council's proposed rebuilding plan would essentially maintain the status quo target rebuilding year of 2071 (an improvement of one year over the current target rebuilding year), in order to sustain the invalidated harvest limits of 4 mt per year.

[27] *Id.*
[28] PFMC, Agenda Item H.6.b, Supplemental GMT Report 2, November 2010, at 16.
[29] 73 Fed. Reg. 80,516, 80,520-80,521 (Dec. 2008).
[30] *NRDC v. Locke*, No. 01-cv-00421-JL at 35.
[31] The DEIS notes that cowcod "continues to display a slow upward trend," in spite of the stagnant depletion rate. DEIS at 338.
[32] DEIS at 338.

Table 2: Cowcod Rebuilding Plan Targets and Catch Levels

Year	T_{TARGET}	Catch Level (mt)
2012	2071	4
2011		4
2010	2072	4*
2009		4*
2008	2039	4
2007		4

*Catch levels vacated by *NRDC v. Locke*

The 2009 cowcod assessment estimates a $T_{F=0}$ rebuilding year of 2060, and a rebuilding year of 2064 with a harvest level of 2 mt per year. It is possible to rebuild cowcod more quickly than the 2071 target proposed by the Council, and the Council and NMFS have not addressed why a target rebuilding year that is 11 years later than T_{MIN} is "as short as possible" pursuant to the requirements of the MSA.[33]

<u>Fishery revenue data and recent catch levels justify a shorter rebuilding period and lower catch levels.</u>

According to the FMP, cowcod "is most frequently taken off Southern California in commercial non-trawl and recreational fisheries. All groundfish fishing communities off the southern U.S. west coast are affected by cowcod rebuilding measures."[34] As discussed above, overall groundfish fishery revenues have rebounded substantially since 2002. That trend applies to the commercial nontrawl sector as well. In the limited entry fixed gear sector, per-vessel revenue has increased significantly since 1998: In 2009, average per-vessel revenue was 2.5 times greater than average revenue in 1998, after adjustment for inflation.[35] Top-earning vessels realized revenue in 2009 that was close to 3.5 times greater than average revenue in 1998.[36] In the open access fixed gear sector, 2009 average revenues are almost 2 times greater than 1998 average revenues, and generally indicate a trend of increasing revenues over the past 12 years.[37]

Historic morality data for cowcod (which are admittedly subject to high levels of uncertainty) suggest 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. Furthermore, analysis in the DEIS indicates that fishing communities would not be severely impacted by lower catch levels for cowcod. Alternative 2, which would set catch at 3 mt per year, is associated with a projected 10% drop in revenue for most nontrawl sectors (except for open access nearshore, which is associated with a 6% rise in revenue).[38] Alternative 1, which would set catch at 2 mt per year, is associated with essentially identical projected revenue impacts.[39] These potential revenue impacts are well within the range of "inter-annual percentage changes witnessed

[33] *NRDC*, 421 F.3d at 880.
[34] FMP at 43.
[35] DEIS at 246.
[36] *Id.*
[37] DEIS at 249.
[38] DEIS at 413.
[39] *Id.*

over the recent past [1999-2009]" that the Council has deemed acceptable in the DEIS.[40] Alternative 2 is also associated with negligible impacts to both community income and the number of bottomfish recreational angling trips in the Southern California Bight where cowcod is generally located.[41]

The emergency rule issued by NMFS is on the right track: we laud NMFS's use of the 3 mt catch level in the emergency rule to establish the cowcod allocation under the IFQ program, and we urge the Council and NMFS to incorporate a similarly conservative catch level into the final harvest specification and rebuilding plan for cowcod.

Given cowcod's poor rebuilding performance and stagnant depletion level, no reductions should be made to the existing Cowcod Conservation Areas.

The Cowcod Conservation Area ("CCA") has proven quite effective in restricting take of cowcod below prescribed catch levels, which is a critical element for protecting and rebuilding the highly vulnerable stock. Nonetheless, cowcod's estimated depletion level is just 4.5%, and the stock appears to be stagnating rather than rebuilding as planned (see discussion supra). Cowcod, which under the current rebuilding plan will not achieve rebuilt status until 2072, was ranked as one of the most vulnerable stocks in the fishery by the recently completed Productivity and Susceptibility Analysis (PSA).[42]

By moving the existing CCA boundary from 20 fm to 30 fm, the Council's proposal would open a substantial portion of currently protected area to fishing. Specifically, the change would open 61.2 square miles of cowcod habitat within the existing CCA to fishing.[43] Since cowcod are known to occur between 20 fm and 267 fm,[44] allowing fishing at 30 fm could result in increased take of cowcod. Furthermore, juvenile cowcod occur in habitats at depths between 28 and 180 fm,[45] so the change would move the CCA boundary inside of known juvenile habitat. This change would effectively eliminate the 10 fm buffer created by the existing 20 fm boundary between fishable area and known cowcod habitat.[46]

The 10 fm buffer is a critical feature of the CCA that helps address a number of sources of management uncertainty, including gaps in enforcement, difficulty by anglers in identifying boundaries, and errors in bycatch estimates. Eliminating the buffer and allowing fishing in known habitat for both adult and juvenile cowcod presents threats to both the viability of the beleaguered cowcod stock as well as the quality of its habitat.

In addition, it is unclear in the DEIS what other bycatch species co-occur with cowcod and would be subject to increased fishing pressure and habitat impacts by the proposed change. For example, china rockfish, which is subject to overfishing according to the depletion-based stock reduction analysis (DB-SRA), occurs in highest density between 2-50 fm,[47] and in areas currently within the CCA, including the area off San Nicolas Island.[48] Since china is

[40] DEIS at 409.
[41] DEIS at 416, 418.
[42] DEIS at 291.
[43] DEIS at B-84.
[44] DEIS at B-90.
[45] DEIS at B-91.
[46] DEIS at B-96.
[47] DEIS at 235.
[48] http://www.dfg.ca.gov/marine/nearshorefinfish/chinarockfish.asp

an unassessed species and managed in the nearshore complex, it is difficult to determine what impacts the boundary shift would have on the overfished stock, though it would almost certainly result in increased fishing pressure. The proposed boundary change must be supported by an analysis of impacts on all affected species and habitats.

We strongly urge the Council to maintain the existing CCA boundary of 20 fm so that the necessary 10 fm buffer will remain in place. Cowcod's rebuilding progress is stagnating, and the stock has the lowest known depletion level in the fishery. By protecting juvenile habitat, the buffer is a crucial feature for allowing this stock to gain a foothold so that it continue down the long path of rebuilding. The CCA may also have the added benefit of protecting other fish that are severely depleted and subject to overfishing, though analysis of impacts to other species by the proposed change in absent in the DEIS.

IV. Yelloweye

History and background.

Yelloweye rockfish was declared overfished in 2002. In the wake of year-after-year declines in the stock's unfished biomass, NMFS in 2007 adopted a "ramp-down" rebuilding strategy for yelloweye, which utilized hard catch limits rather than a constant harvest rate. The 2007 ramp-down plan provided for an initial harvest limit of 23 mt in 2007 that would gradually decline until it landed at 12.6 mt in 2011, where it would remain for the rest of the rebuilding period. The stated intention of the ramp-down strategy was to provide time for the fishery to prepare for lower catch levels.

In 2009, NMFS responded to an assessment indicating that yelloweye was behind schedule by increasing the 2010 harvest level from the 14 mt specified for 2010 in the 2007 ramp-down plan to 17 mt and simultaneously extended yelloweye's target rebuilding date. In invalidating the 2009-2010 specifications for yelloweye, the Court in *NRDC v. Locke* noted that increasing fishing pressure in light of estimates that a rebuilding species is in worse shape clearly violates the MSA's rebuilding mandate:

> **"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 [MSA], 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.'"[49] "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. Accordingly, the NMFS 'ramp-down' harvest plan does not provide for rebuilding within the shortest time possible and violates the MSA."[50]**

[49] *NRDC v. Locke*, No. 01-cv-00421-JL at 38 (quoting *NRDC v. NMFS*, 421 F.3d 872, 881(9th Cir. 2005)).
[50] *Id.* at 39.

2009 Assessment indicates that yelloweye rebuilding is behind schedule

The 2009 rebuilding analysis indicates that yelloweye rebuilding is three years behind schedule under the status quo harvest rate – in other words, forecasted yelloweye rebuilding under the status quo harvest rate is three years beyond the invalidated rebuilding target year of 2084.[51] Historic yelloweye rebuilding targets and catch levels are summarized in Table 3 below.

Table 3: Yelloweye Rebuilding Plan Targets and Catch Levels

Year	T_{TARGET}	Catch Level (mt)
2012	2084	20
2011		20
2010	2084	17*
2009		17*
2008	2084	20
2007		23

*Catch levels vacated by *NRDC v. Locke* as not low enough given that yelloweye was behind schedule

The proposed rebuilding date and harvest levels do not respond to the Court Order.

It is possible to rebuild yelloweye by 2047 with no fishing, and 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 in Amendment 16-5 that would rebuild yelloweye more quickly and still allow for unavoidable bycatch. The Council proposes a rebuilding target date that is almost four decades longer than possible with zero fishing, and associated catch levels that are actually higher than those invalidated by the order, despite the fact that yelloweye is once again behind schedule.

Fishery revenue data and recent catch levels justify a shorter rebuilding period and lower catch levels.

The FMP indicates that yelloweye "is most frequently taken in recreational and commercial hook-and-line fisheries north of 40˚10' N. lat. Measures to rebuild yelloweye rockfish by eliminating its directed harvest and preventing its incidental catch affect all hook-and-line groundfish fishing off the northern U.S. west coast."[52] 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.[53] Annual ex-vessel revenues for the fishery averaged nearly $18 million between 2005-2009, reaching a new high of $22.8 million in 2009, almost 50% greater than average revenue in 1998 after adjustment for inflation.[54]

The Court Order resulting from the decision in *NRDC v. Locke* vacated the 2010 yelloweye catch level of 17 mt and replaced it with a catch level of 14 mt. Accordingly, the Council's proposed status quo target rebuilding date of 2084 and *higher* catch level of 20 mt for 2011-12 is inconsistent with the Court Order and the MSA. The adoption of a 14 mt OY for

[51] DEIS at 356.
[52] FMP at 55.
[53] DEIS at F-6 (Table F-6).
[54] *Id.*

yelloweye, consistent with the 2010 catch level set by the Order, will equip the Council and NMFS with the flexibility to establish a final OY and a new rebuilding plan for yelloweye that rebuild the species in a time period that is "as short as possible" while giving consideration to "the status and biology of the overfished species and the needs of the fishing communities," consistent with the Magnuson-Stevens Act ("MSA")[55] and the Order.

V. Canary

History and background

The rebuilding plan for Canary rockfish is six years behind schedule, according to the 2009 stock assessment. The new assessment shows a biomass depletion level of 23.7% instead of 32.4% just two years before.[56] As a result, the species is "very unlikely to rebuild by Ttarget."[57] In addition, the cumulative OY from 2000-2007 (years with reliable catch data since rebuilding began) was exceeded by 14%.[58] The current Tmin is estimated as three years more than the previous Ttarget, meaning that if all fishing mortality was halted, it would take three years longer than the current Ttarget (with fishing) to rebuild.[59]

In response, the Council's proposed rebuilding plan would postpone rebuilding by six years, extending the target rebuilding date from 2021 to 2027, in order to maintain status quo catch levels of roughly 100 mt per year. Rather than responding to new information that a species is doing worse than expected by lowering catch rates, the Council has again has indicated that it is willing to extend target rebuilding dates in order to maintain status quo catch levels. Table 4 below summarizes the proposed and historical target rebuilding date and catch levels.

Table 4: Canary Rebuilding Plan Targets and Catch Levels

Year	Relative depletion	T_{TARGET}	Catch Level (mt)
2012	23.7%	2027	107
2011			102
2010	32.4%	2021	105
2009			105
2008	9.4%	2063	44
2007			44

The FMP indicates that canary "is taken coastwide in all of the groundfish fisheries, commercial and recreational, as well as in many commercial and recreational fisheries targeting species other than groundfish."[60] As discussed above, 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.[61] In 2008, revenues in the fishery exceeded $113 million dollars.[62] Per-vessel

[55] 16 U.S.C. 1854(e).
[56] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, at 29.
[57] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, at 24.
[58] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, Table 2-11.
[59] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, Table 2-11.
[60] FMP at 39.
[61] DEIS at F-3 (Table F-2).

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 adjustment for inflation.[63] Therefore, maintenance of the status quo catch levels at the expense of a longer rebuilding period for canary is clearly inconsistent with the MSA's mandate to rebuild in a period as short as possible.

In addition, the GMT explained that "the canary rockfish management challenge has been extreme" due to the fact that it is caught in all groundfish fisheries, has unpredictable distribution, and the impact projection model used to predict catch is relatively imprecise.[64] The uncertainty of recreational catches of Canary further confuses the picture. The GMT concluded that "current catch monitoring systems and impact projection models have failed to adequately perform in managing fishery impacts within canary rockfish OYs."[65] To address these shortcomings, the GMT recommended the use of annual catch targets (ACTs) for Canary and stocks presenting similar management challenge,[66] but the Proposed Rule does not incorporate them for Canary.

VI. Petrale Sole

Petrale sole, which is currently estimated at 11.6% of unfished biomass, was declared overfished in 2009 based on most recent stock assessment.[67] The assessment shows that fishing mortality has continually exceeded the status quo target of F40% since the 1940s and the overfished threshold of B25% since 1953.[68]

We are concerned with the proposed changes to the default reference points and harvest control rules for assessed flatfish species in Amendment 16-5. While the default reference points for groundfish are a proxy Fmsy harvest rate of F40%, a B40% target and B25% overfished level, the Proposed Rule would lower those reference points to F30%, B25% target and B12.5% overfished levels, and change the harvest control rule from 40-10 to 25-5.

From Hilborn (2010) Pretty Good Yield:

> "…there is little long term yield to be lost by keeping most stocks at 50% of unfished stock size. Given the growing social acceptance of more intact ecosystems as an objective of fisheries management, higher target stock size ranges than 35–40% should be considered desirable. Furthermore, it is generally expected that fisheries will be more profitable at the higher end of stock sizes, and economic arguments would favor aiming at or above the 35–40% target levels."

A similar conclusion was reached by Worm *et al. Science* 325, 578 (2009) Rebuilding Global Fisheries.

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[62] *Id.*
[63] DEIS at 240.
[64] *Id.* at 3.
[65] *Id.* at 3.
[66] *Id.* at 4.
[67] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, at 37.
[68] PFMC, Agenda Item B.3.a, Attachment 2, June 2010, at 37.

> "… a wide range of exploitation rates yield ≥90% of maximum catch but with very different ecosystem consequences: whereas at high end of range, almost half of the species are predicted to collapse, reducing exploitation rates to the lower end of the range is predicted to rebuild total biomass, increase average body size, and strongly reduce species collapses with little loss in long-term yield. In addition to reconciling fishery and conservation objectives, setting exploitation rate below MSY reduces the cost of fishing and increases profit margins over the long term."

These recent statements by prominent fisheries scientists and ecologists illustrate that the greatest benefits to the nation (e.g., long-term catch, profits from fishing, more intact ecosystems, reduced risk of species collapse, increased average body size) are achieved at levels above the PFMC's default proxy target reference point of B40%. One only has to consider how different the West Coast groundfish fishery would be today had we been managing the currently overfished species at rates more conservative than F40%, as the fishery would be much more profitable than it is in the current state of rebuilding.

However, rather than increasing the reference points above B40%, the Council and NMFS are proposing to make drastic reductions in the target reference points from B40% down to B25% for all assessed flatfish species. At this time, such a reduction is premature, lacks crucial analyses, and fails to consider key potential consequences and significant environmental impacts.

In its analysis of the flatfish reference points, the SSC Groundfish Subcommittee Report on Petrale Sole highlighted the lack of analysis on which to base the new B25% harvest control rule proxy for flatfish:

"The [SSC groundfish] subcommittee also recommends that a more comprehensive analysis of the PFMC's harvest control rule proxies be undertaken as soon as practicable, which may influence and/or supersede these recommendations. In particular, biomass targets and thresholds should be established that are consistent with expected stock productivities and in accordance with expected levels of intrinsic stock variability. The subcommittee recognizes that this will be a major undertaking, which logically should be conducted as a full management strategy evaluation, but these issues and concerns are fundamental to proper utilization, conservation, and stewardship of groundfish resources."[69]

Since that recommendation has been made, no management strategy evaluation has been performed, nor has additional comprehensive analysis been conducted, and such analysis as absent in the 2011-2012 specifications DEIS. Furthermore, there has been no analysis of the services rendered by flatfish such as petrale sole in the California Current marine ecosystem, or other benefits associated with higher biomass, such as increased catch rates as predicted in Hilborn (2010). Instead, the Council proposes to make a radical change in fishery management that fails to consider the overall benefits to the nation, in an apparent attempt to maintain the status quo fishing levels as close to the harvest rates associated with the massive historical overfishing on which the Pacific Coast groundfish fishery has become accustomed.

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[69] AFSC, Seattle WA – August 31, 2009, presented as part of Agenda Item E.2.c Supplement al SSC Report, September 2009.

It would be a grave mistake to make such a decision without robust analysis of the consequences , and in direct conflict with the growing understanding among fisheries scientists that the greatest benefits to the nation accrue when fish stocks are kept above B40%.

Furthermore, the 25-5 rule is not as precautionary as the corresponding rule that would mimic the 40-10 rule. According to the SSC, "*A policy that mimics the Council's default proxies for groundfish would be to set the MSST to B15%, which is 60 percent of the target stock size, and to implement a 25-6.25 precautionary adjustment for OY"* SSC Suppl. report (Nov 2009). Rather than the corresponding minimum stock size threshold (MSST) of B15%, it is set at B12.5%, and rather than the level at which all fishing stops at 6.25%, it is set at 5%. Given the uncertainty in stock biomass (i.e., lower bound of sigma = 0.36) and the precipitous drop in recruitment at low biomass levels for species like flatfish populations with high steepness parameters, we believe the risk of recruitment failure and/or complete stock collapse under such a strategy has been overlooked, and clearly is not analyzed in the Groundfish Specifications 2011-2012 DEIS. Finally, in addition to the incautiously lowered reference points and risk-prone rebuilding rule, the 2011-2012 specifications for Petrale sole violate the Council's own 25-5 rule, setting the ACL for 2011 above the maximum level specified by the 25-5 rule.

At present, there is insufficient analysis of the environmental consequences of the changes to the reference points and the default harvest control rule for assessed flatfish. Any lowering of reference points or major changes to the harvest control rule must be accompanied by a comprehensive analysis, including a Management Strategy Evaluation, which considers the impacts and overall benefits to the nation, as required in the definition of Optimum Yield.

Our concerns with Petrale sole are summarized as follows,

1. It is premature and irresponsible to lower the default target reference points for flatfish from B40% to B25% based on the analysis in the DEIS;
2. Even if the target reference point is lowered to B25%, the 25-5 rule is more aggressive than the equivalent rebuilding strategies to the 40-10 rule corresponding with the B25% target reference point,
3. The 2011-2012 specifications allow catch levels exceed the 25-5 rule and do not result in the quickest rebuilding time for this species.

Conclusion

The mandate from the Court in *NRDC v. Locke* is clear: rebuilding plans and catch levels for overfished species must rebuild those species as quickly as possible without causing severe short-term consequences for fishing communities. The purpose of rebuilding species as quickly as possible is simple: healthy fish populations support both the health of the marine ecosystem and livelihoods. Extended rebuilding periods based on so-called "long-term cumulative yield" prioritizes yield over conservation and incurs risks that some species will not rebuild, delaying sustainable prosperity indefinitely. That approach is fundamentally inconsistent with the intent and letter of MSA's rebuilding provision.

The Council must adjust its rebuilding targets and catch levels for yelloweye, darkblotched and cowcod to respond to the Court's Order, to make them consistent with the MSA and honor the intent of MSA's rebuilding provisions to protect valuable marine resources for generations to come. We are heartened by NMFS's direction for cowcod and yelloweye in the emergency rule, and strongly urge the Council and NMFS to move forward by formalizing shorter rebuilding periods and lower catch levels for those species, along with the other overfished species discussed above.

Sincerely,

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PROCESS FOR IMPLEMENTING THE 2011-2012 SPECIFICATIONS AND MANAGEMENT MEASURES

In June 2010, the Council adopted final preferred alternatives for harvest specifications and management measures for the 2011-2012 groundfish fisheries. Council action included the adoption of Amendment 16-5 to the groundfish Fishery Management Plan (FMP) which proposed to modify all existing overfished species rebuilding plans, institute a new rebuilding plan for petrale sole, modify the status determination criteria for flatfish, and establish a new precautionary harvest control rule for flatfish.

At the November 2010 Council meeting, the National Marine Fisheries Service (NMFS) Northwest Region provided an update on the status of implementing the 2011-2012 harvest specifications and management measures, stating that implementation would not be able to occur on January 1, 2011. The proximate reason provided for the delay was the Final Environmental Impact Statement (EIS) and internal review had not been completed to support the NMFS final decision-making process. However, there was also a stated concern that the rationale expressed in the Draft EIS for the Council's preferred alternative on yelloweye rockfish, a 20 mt annual catch limit and a 17 mt annual catch target to address management uncertainty, did not adequately describe how the rebuilding time was as short as possible, after taking into account the status and biology of the stock, the needs of fishing communities, and other mandates in the Magnuson-Stevens Act. Based on this latter concern, notice was given that Secretarial disapproval of at least part of Amendment 16-5 was under serious consideration. There was no discussion relative to potential disapproval of the status determination criteria for flatfish and the new precautionary harvest control rule for flatfish.

NMFS also described a process by which groundfish fishery management would proceed during the 2011-12 period. Three distinct periods were described.

(1) The period from January 1, 2011 until about April 28, 2011, when further resolution of the balance of the biennial period would occur. During the first period, the 2010 harvest specifications and management measures would remain in place, unless modified by an emergency rule; NMFS stated the intent to modify any existing 2010 specifications for which the Council process had concluded proper conservation dictated a lower fishery impact than allowed for in the 2010 regulations.

(2) The period between about April 28, 2011 and December 31, 2011, when management via a new emergency rule might occur, or Council-approved specifications and management measures would be implemented, or some combination of the two. In particular, it was noted that an emergency rule might be needed if there is Secretarial disapproval of Amendment 16-5 elements, such as the yelloweye rockfish catch limits or targets.

(3) 2012, when management might proceed based on Council reconsideration of any matters subject to Secretarial disapproval. NMFS suggested the Council consider a two meeting process, at the April and June, 2011 Council meetings, for such reconsideration. It was not clear if this two meeting process would reconsider any specifications or management measures that achieved Secretarial approval.

After receiving the NMFS briefing on the issues in November, the Council took action relative to the stated problem of insufficient rationale for the Council recommendation on yelloweye catch levels and practical problems associated with the delay of the Council's recommendations expected to start January 1, 2011.

Regarding the yelloweye rockfish matter, the Council scheduled an agenda item for the March, 2011 Council meeting to provide further justification of the Council's preferred alternative adopted in June, 2010. While somewhat late in the described Secretarial approval process, NMFS indicated input by the Council at this meeting would be considered. Additionally, Council requested NMFS extend the open comment period considering 2011-12 specifications and management measures. While the Council process would not be able to meet during an immediate extension of the open comment period, State agencies and the public would be provided the opportunity to comment on the new information being provided at the November Council meeting.

Regarding practical matters associated with rolling over most of the 2010 specifications and management measures beyond January 1, 2011, the Council recommended specific management measures and allocations different than in place for 2010. Some of the management measures recommended could be viewed as routine, and implemented via inseason adjustments for 2011 recreational and commercial fisheries similar to the measures recommended under normal biennial processes. For those management measures not considered routine, the Council recommended that NMFS implement them via an emergency rule. Because of the uncertainty in the overfished species harvest specifications for 2011, the Council also recommended the flexibility to modify the proposed off-the-top deductions (groundfish mortality from exempted fishing permits, research, incidental open access, and tribal fisheries) and two-year allocations for bocaccio, canary, cowcod, petrale, and yelloweye rockfish. With regard to allocations, the Council recommended that NMFS temporarily suspend the yelloweye rockfish allocations that were recommended by the Council for the 2011-12 biennial cycle. Given a yelloweye rockfish specification of only 14 mt, the Council recommended a trawl allocation of 0.3 mt for the start of the year. The Council also modified the non-trawl apportionments of yelloweye within the non-nearshore, Oregon recreational, and California recreational fisheries. The Council also reduced the estimates of yelloweye rockfish research. A comparison between the Council's final preferred allocations and apportionments and the November action can be found in Attachment 1. The Council asked NMFS to provide flexibility to modify the allocations once the final harvest specifications are issued in April 2011.

On December 20, 2010, NMFS issued an emergency rule specifying harvest specifications, allocations, and quota pounds necessary for the implementation of the trawl rationalization program, effective January 1, 2011 (75FR82296). The emergency rule implemented the lower of the 2010 or Council-approved 2011 harvest specifications on an interim basis, to address conservation concerns until the final rule is implemented. The emergency rule was necessary for the trawl rationalization program, which specifies that quota pounds are based on the trawl allocated portion of each management unit's annual specification. The emergency rule did not include the non-routine management measures recommended by the Council at its November 2010 meeting.

In a letter dated December 27, 2010, NMFS disapproved proposed Amendment 16-5 in its entirety (see Agenda Item H.1.a, Attachment 1). The letter states, "Amendment 16-5 is being disapproved because there is not currently an adequate EIS to support decision-making." The letter also mentioned "…necessary analytical refinements…" in the draft EIS and the Magnuson-Stevens Act provision on rebuilding decision criteria in the discussion of disapproval rationale. Further, NMFS requested that the Council reconsider Amendment 16-5 for implementation of the 2012 specifications and management measures.

With regard to submissions during the open public comment period for the proposed rule that closed January 4, 2011, the Council has received copies of letters from the Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, California Department of Fish and Game, and a consortium of fishing industry interests.

Under this agenda item, it is anticipated the NMFS will speak to (1) regulatory activities of relevance during the January 1 – March 4, 2011 period, (2) Secretarial disapproval of Amendment 16-5, (3) the status of the final EIS, (4) the anticipated process for implementing the harvest specifications and management measures for the remainder of 2011, including the status of any emergency rulemaking currently under consideration, and (5) the anticipated process for the reconsideration of Amendment 16-5 and any harvest specifications and management measures for 2012.

Council tasks include hearing from the Groundfish Advisory Panel (GAP) and the Groundfish Management Team (GMT) regarding further justification for the Council harvest levels for yelloweye rockfish or other matters associated with identified shortcomings in the final EIS, and providing input to NMFS with regard to impending decisions relative to 2011 groundfish fishery management. For example, the GAP may provide further detail about the shortcomings of a lesser yelloweye rockfish catch from the needs of the fishing communities, and the GMT may provide further analysis on the impacts of a lesser yelloweye rockfish catch on research program value (including international research efforts), rebuilding times and relative harvest rates, treaty tribe obligations, management uncertainty (particularly in recreational fisheries and research efforts), or inter-related allocation arrangements. Additionally, the Council should discuss any necessary activities relative to groundfish fishery management in 2012, such as the agenda items currently scheduled for April and June, 2011.

Reference materials include the NMFS disapproval letter which was presented under Agenda Item H.1 (Agenda Item H.1.a, Attachment 1) and public comments letters submitted by the states of Washington, Oregon, and California on the proposed rule to implement the 2011-2012 harvest specifications and management measures, including Amendments 16-5 and 23. Public comment received by the briefing book deadline is also included.

Council Action:

1. **Hear NMFS report regarding the specifics of this agenda item.**
2. **Provide input to NMFS regarding further justification of the Council's recommendations for Amendment 16-5, with particular reference to yelloweye rockfish.**
3. **Discuss Council activity to be scheduled for future Council meeting regarding implementing 2011-12 biennial specifications and management measures.**

Reference Materials:

1. Agenda Item H.2.a, Attachment 1: A Comparison of the Yelloweye Rockfish Allocations and Apportionments Between the Council's 2011 Final Preferred Alternative and Actions Taken at the November 2010 Council Meeting.
2. Agenda Item H.1.a, Attachment 1: NMFS Letter Regarding the Partial Disapproval of Amendment 23 and Full Disapproval of Amendment 16-5.
3. Agenda Item H.2.c, WDFW Letter: Washington Department of Fish and Wildlife Public Comment Letter on the Proposed Rule to Implement the 2011-2012 Harvest Specifications and Management Measures and Amendments 16-5 and 23 (75FR67810).
4. Agenda Item H.2.c, ODFW Letter 1: Oregon Department of Fish and Wildlife Public Comment Letter on the Proposed Rule to Implement the 2011-2012 Harvest Specifications and Management Measures (75FR67810).
5. Agenda Item H.2.c, ODFW Letter 2: Oregon Department of Fish and Wildlife Public Comment Letter on the Proposed Rule to Implement the 2011-2012 Harvest Specifications and Management Measures (75FR67810).
6. Agenda Item H.2.c, CDFG Letter: California Department of Fish and Game Public Comment Letter on the Proposed Rule to Implement the 2011-2012 Harvest Specifications and Management Measures (75FR67810).
7. Agenda Item H.2.d, Public Comment.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. NMFS Briefing — Frank Lockhart
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action:** Action as Necessary to Implement the 2011-2012 Groundfish Fishery Specifications and Management Measures

PFMC
02/15/11

Yelloweye rockfish allocations and apportionments for 2011 under the Council's Final Preferred Alternative, Compared to November 2010 Action.

Fishery	DEIS	November 2010	% Decrease
Limited Entry Trawl - Shoreside	0.6	**0.3**	50%
At-Sea - Whiting Trawl			
At-sea whiting motherships	0.0	0.0	
At-sea whiting cat-proc	0.0	0.0	
Tribal - Whiting Trawl	0.0	0.0	
Tribal			
Midwater Trawl	0.0	0.0	
Bottom Trawl	0.0	0.0	
Troll	0.0	0.0	
Fixed gear	2.3	2.3	
Non-nearshore a/	1.3	**0.9**	31%
LE FG - Projected Impacts	0.8		
OA FG - Projected impacts	0.1		
Directed OA: Nearshore a/	1.1	1.1	
Incidental OA b/	0.2	0.2	
Recreational Groundfish a/			
WA	2.6	2.6	
OR	2.4	**2.3**	4%
CA	3.1	**2.7**	13%
EFPs	0.1	0.1	
Research c/	3.3	**1.3**	61%
TOTAL	17.0	13.8	
2011 ACL/ACT d/	17	14	18%
Difference	0.0	0.2	
Percent of OY	100.0%	98.6%	

Key

a/ Values represent the fishery apportionment within the non-trawl allocation.

b/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment. In November 2010, this value was incorrectly specified at 0.3 mt. This cell has been updated per the analysis in the DEIS (Appendix B, Table B-8).

c/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

d/ Value for yelloweye under the DEIS column represents an ACT, which is a value less than the ACL to account for

The NMFS has identified a NMFS preferred alternative (Alternative 4) that is a modified version of the Council's Preferred Alternative.

Comparison of the target year and harvest control rule for overfished species under the Current regulations, the Council Preferred Alternative, and the NMFS Preferred Alternative.

Species	Current Values			Council's Preferred			NMFS' Preferred		
	T_{TARGET}	SPR Harvest Rate	2010 OY	T_{TARGET}	SPR Harvest Rate	ACL (ACT) 2011/2012	T_{TARGET}	SPR Harvest Rate	ACL (ACT) 2011/2012
Bocaccio	2026	F77.7%	288	2022	No change	263/274	2022	No change	263/274
Canary	2021	F88.7%	105	2027	No change	102/107	2027	No change	102/107
Cowcod	2072	F79.0%	4	2071	No change	4/4	2068	F82.7%	3/3
Darkblotched	2028	F62.1%	330	2025	F64.9%	298/296	2025	F64.9%	298/296
Petrale	--	--	1,200	2016	F31%/ F32.4%	976/1160	2016	F31%/ F32.4%	976/1160
POP	2017	F86.4%	200	2020	No change	180 (157)/ 183 (157)	2020	No change	180 (157)/ 183 (157)
Widow	2015	F95.0%	509	2010	F91.7% F91.3%	600/600	2010	F91.7% F91.3%	600/600
Yelloweye	2084	F71.9% [a/]	14	2084	F72.8%	20 (17)/ 20 (17)	2074	F76%	17/ 17

a/ The yelloweye SPR harvest rate of F71.9% is the constant harvest rate in the current rebuilding plan that would be specified starting in 2011 after the harvest rate ramp-down strategy is completed in 2010.

State of California –The Natural Resources Agency
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***ARNOLD SCHWARZENEGGER**, Governor*
***JOHN McCAMMAN**, Director*

December 31, 2010

William W. Stelle, Jr.
Regional Administrator
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way
Seattle, WA 98115-0070
Attn: Becky Renko

Subject: Notice of Availability for 2011-2012 Biennial Specifications and Management Measures, Amendment 16-5 and 23 of the Pacific Coast Groundfish Fishery Management Plan (RIN 0648-BA01)

Dear Mr. Stelle:

The California Department of Fish and Game (Department) is writing to comment on the proposed rule (75FR60868) dated November 3, 2010 that would establish the 2011-2012 Biennial Specifications and Management Measures and implement Amendments 16-5 and 23 of the Pacific Coast Groundfish Fishery Management Plan (PCGFMP).

As the National Marine Fisheries Service (NMFS) is aware, new harvest specifications are founded on groundfish stock assessments which are conducted mainly by NMFS staff. The stock assessment process is rigorous, highly respected and includes extensive peer review by an independent panel of experts. In addition, the Pacific Fishery Management Council's (Council) Science and Statistical Committee (SSC) reviews and recommends all stock assessments used for Council management decision making. This process allows the Council to make timely use of new fishery and survey data, to assure that the results are as accurate and error-free as possible, to analyze and understand these data as completely as possible and to have a reasonable characterization of uncertainties in stock status.

Perceptions of stock status can change between successive assessments for a variety of reasons including, but not limited to, newer modeling platforms, inclusion of additional or improved information, or corrections to errors in prior model specifications. To help address the variability in results between assessments, the Council routinely takes a precautionary approach in choosing harvest specifications for each biennial management cycle. Based on the recommendation of the SSC, the Council chose to use constant harvest rates (taking the same proportion of the stock each time) for overfished species, as opposed to using a constant catch strategy, because constant harvest rates are more precautionary and they maintain rebuilding by T_{TARGET} even with changes in stock biomass. Although the Council considers prior assessments when recommending harvest rates, it relies most on the new assessments because they incorporate the best available and most current information. The Department fully supports this decision making approach.

In determining the 2011-2012 harvest specifications, the Council maintained status quo harvest rates for stocks where a new assessment did not indicate a fundamental change in stock status. For two species in particular (yelloweye rockfish and cowcod) the Council recommended modified harvest rates based on either a new assessment (yelloweye rockfish) or an error in a previous model (cowcod).

The Department supports the Council's approach for 2011-2012 harvest specifications (including annual catch levels (ACL) and annual catch targets (ACT)), including those adopted for overfished species, because the recommendations are based on the best available science and used the same decision making approach. The rebuilding plans are based on new or updated stock assessments, included the most recent information, corrected errors from previous assessments, and were rigorously reviewed by an independent panel of experts. The Council's recommendations also uphold Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Standards (NS) by basing conservation and management measures on the best available scientific information and protecting, restoring, and promoting the long-term health and stability of the fishery (MSA §301, 303 and NS-2).

Harvest specifications for yelloweye rockfish and cowcod are of critical importance to California fisheries. Both of these overfished species have no directed fisheries; mortality is limited to unavoidable bycatch that varies significantly on an annual basis. Large fishing area closures have been implemented coastwide (Rockfish Conservation Area (RCA)) and within the state (Cowcod Conservation Areas (CCA)) to protect overfished stocks and minimize unavoidable bycatch. In addition, California's fisheries have experienced significantly shortened seasons and reduced fishing areas due to maximum fishing depth restrictions. Most importantly, seemingly minimal changes to harvest specifications for both of these species have the potential to cause significant socioeconomic impacts on California fishing communities by limiting fishing seasons, trip limits, and access to healthy stocks.

Yelloweye Rockfish Rebuilding and Harvest Specifications

California strongly supports the Council's recommendation to revise the rebuilding plan for yelloweye rockfish to reflect the results of the new stock assessment. Similar to canary rockfish in 2007[1], the 2009 yelloweye rockfish stock assessment and rebuilding

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[1] For 2009-2010 biennial specifications, the Council recommended a modification to the canary rockfish harvest specifications based on the 2007 assessment results. This assessment represented a fundamental change in perception of stock status compared to the previous assessment in 2005 and demonstrated that the stock was rebuilding faster than previously thought. Although the 2007 canary rebuilding plan demonstrated that the stock could support a less conservative (i.e. more aggressive) harvest rate without increasing the time to rebuild, the Council took a precautionary approach and set harvest specifications that were more conservative than that adopted in 2005. This approach was supported by the Department because it employed the best available data (i.e. the newest assessment) and set the harvest rate using a methodology which was consistent with prior years.

plan represented a fundamental change in the perception of stock status compared to previous assessments. Even with a more optimistic stock assessment result, the Council chose to maintain a precautionary approach. Compared to the previously adopted 2007-2008 harvest rate, the 2011-2012 harvest rate for yelloweye rockfish is more conservative and rebuilds the stock three years earlier (2009-2010 specifications were vacated by a court ruling). The Department supports the Council's recommendation to implement a 20 mt yelloweye rockfish ACL for 2011 and 2012.

Yelloweye rockfish bycatch allowances significantly restrict fishing opportunities in California, particularly the commercial nearshore and recreational fisheries from the Oregon border to San Francisco. This area is characterized by favorable yelloweye rockfish habitat (deep pinnacles) and as such, has the highest bycatch rate in the state. There is no directed or targeted fishery for yelloweye rockfish and in these fisheries retention is prohibited. These fisheries have already been significantly impacted by management measures implemented to reduce yelloweye rockfish bycatch including reduced season lengths, reduced trip limits, and maximum fishing depth restrictions, all of which precludes access to many healthy stocks and results in forgone economic revenue. The Council has few remaining management measures available to them to further reduce bycatch except a total fishery closure in some areas of the coast. Many northern California communities are dependent on fishing activities and any additional negative impacts to the commercial nearshore and recreational fisheries could have devastating cumulative impacts on local economies. This would de-stabilize the fishery and directly conflict with MSA §303.

Management Uncertainty

Despite the best modeling efforts, projecting yelloweye rockfish bycatch in each fishery sector continues to be challenging. Bycatch varies considerably among years although the management measures (i.e. depth restrictions and season lengths) do not. In Table 1 the yelloweye catch data relative to the yelloweye OY(ACL) is portrayed for the last five years, as well as data about the California recreational fishery bycatch allowance and catch. It is clear from these data that: 1) yelloweye OY(ACL) and total annual "catch" is not a linear function; 2) although 2010 data are not available, Council managed fisheries have not exceeded the yelloweye OY(ACL) in the past six years; and 3) the expected or projected yelloweye bycatch in the recreational fishery is highly variable year to year. This variability of yelloweye rockfish bycatch will definitely continue, and probably escalate, as the stock rebuilds and fishermen have more frequent interactions ("the rebuilding paradox"). Thus, the Department supports the Council's recommendation to implement a 17 mt ACT in addition to the 20 mt ACL. All management measures under the Council's final preferred alternative (FPA) were designed not to exceed this 17 mt ACT. The 3 mt difference between the ACL and the ACT will accommodate management uncertainty and minimize significant disruptions to various fisheries in the event of higher than projected bycatch, while still rebuilding yelloweye rockfish as required by the MSA.

Table 1. Comparison of yelloweye rockfish OY(ACL), Total mortality, Recreational harvest guidelines and actual recreational catches from 2005-2009 (source: West Coast Groundfish Observer Program (WCGOP) Total Mortality Reports)

	Recreational		Total YE mort	YE OY
Year	HG	Actual		
2005	3.7	0.9	15.7	26
2006	3.7	4.1	12.2	27
2007	2.1	8.0	19	23
2008	2.1	1.7	12	20
2009	2.8	3.9	11	17

Commercial Nearshore Fishery

The California nearshore fishery is a federal open access fishery (no permit) and a State restricted access fishery (limited entry permit) of very small to medium sized vessels. At this time and because of bycatch minimization regulations, a significant portion of this fishery operates in State waters. This fishery is primarily a "live-fish" fishery and services non-traditional or niche markets. Although some permittees rely solely on this fishery for their livelihood, most have diversified their fishing portfolios and participate in other fisheries such as Dungeness crab, salmon, and sablefish as a way to reduce their reliance on any one fishery, and to minimize economic impacts due to annual variations in fishery performance or regulatory restrictions. Having a diversified fishing strategy has become more critical in the past decade and especially on the north coast due to the cyclic nature of the Dungeness crab fishery, the closure of the salmon fishery, and the decline in the sablefish ACL for 2011-2012. In light of the uncertainty in participating in other fisheries on the north coast, the ability to maintain status quo opportunities in the nearshore fishery plays an extremely important role in maintaining economic viability of local communities.

The nearshore fishery in California is further divided into regional shallow species permits and coastwide deeper species permits. The permits are species specific and only valid in the designated geographic areas. The yelloweye rockfish ACL and fishery sector bycatch allowances restrict the nearshore fishery, particularly in the area north of 40°10' N lat where bycatch rates are the highest. Based on the small amounts of yelloweye rockfish available to the nearshore fishery under Alternative 1 (14mt ACL), the entire fishing area north of 40°10' N lat might need to be closed to keep the yelloweye mortality within the fishery sector bycatch allowance. If that occurs, the north coast shallow nearshore species permit would be rendered useless as the permittee is not legally able to re-direct fishing effort to another region. It could also decrease the value of the permit itself. The deeper species permit holders who are participating on the north coast could also be negatively affected despite the ability to re-direct the fishing effort geographically. Traveling from the north coast presents a time and financial challenge that reduces economic efficiency. These situations will disadvantage California's commercial nearshore fishery by disproportionately affecting a section of the coast that has few available fishing ports. In 2009, a 20 fm maximum fishing depth restriction was implemented in this north coast area to reduce yelloweye bycatch. Although preliminary West Coast Groundfish Observer Program (WGCOP) data[2] indicate that this restriction may have been successful it has come at a severe cost to local fishermen (Agenda Item G.4, Supplemental Public Comment 2, November 2009). Had the 2009 nearshore fishery been able to maximize target species catch in California, ex-vessel revenues would have been in excess of $4.6 million.

The Department supports the Council's final yelloweye rockfish ACL and fishery sector bycatch allowances because they help maintain trip limits similar to those in 2009-2010 and help provide stability to the fishery. A reduction of the nearshore fishery bycatch allowance of 0.2 mt[3] may seem minor but it would have devastating effects in northern California. Few management measures are available to address lower yelloweye bycatch allowances or to mitigate increases in bycatch. Reducing trip limits would be uneconomical[4] and forcing individuals to fish shallower than the current 20 fm depth restriction is a safety risk. The only available management responses to reduced yelloweye bycatch allowances (resulting from a reduced ACL) would be shortened seasons or a total north coast area closure. Although the nearshore fishery only generates 10 percent of the statewide groundfish revenue (excluding Pacific whiting), this fishery provides the sole income for some permittees and is an important component in many fishermen's fishing strategy. These disproportionate impacts on the north coast would be in direct conflict with the MSA.

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[2] Northwest Fisheries Science Center (NWFSC). 2010. Data report and summary analyses of the U.S. west coast nearshore fixed gear groundfish fishery. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E, Seattle, WA 98112.

[3] This is the difference in the nearshore allowance under the preliminary preferred (0.9 mt) and the final preferred (1.1 mt) 20 mt yelloweye rockfish ACL

[4] The cost of running the vessel would outweigh catch value.

Recreational Fishery
The recreational fishery is extremely important in California. Similar to the commercial nearshore fishery, bycatch of yelloweye rockfish restricts this fishery and prevents access to healthy target stocks. To mitigate yelloweye rockfish bycatch, reduced season lengths and maximum fishing depth restrictions have already been implemented throughout the State. The areas most affected occur north of Point Arena and the Mendocino Management Area in particular has been the most restricted. In this area, the recreational season length is a mere three months long and is restricted to fishing depths of less than 20 fm. This abbreviated season length has already posed severe economic hardships on local communities compared to years when the seasons were unrestricted. The shallow depth restrictions have also caused gear conflicts and competition for space with other fisheries (Agenda Item B.3.c, Supplemental Public Comment 4, June 2010).

Unlike other states, California has not had a year-round fishing season since 1999. Over 700,000 angler trips[5] worth almost $90 million[6] were taken in 1999. Starting in 2000, management measures were implemented to reduce overfished species bycatch and have become increasingly more restrictive because of yelloweye rockfish.

Although the estimated number of angler trips is higher under the FPA (Table 4-33 in 2011-2012 SPEX EIS, Chapter 4) than in previous years, the Department would like to emphasize that this still represents a loss of over 200,000 angler trips worth $25 million in 2011 alone (compared to 1999,Table 2). If NMFS decides to implement a lower ACL, the losses in number of trips and in revenue to the state (compared to 1999) could be as great as 367,000 and $45 million, respectively in each of the next two years. It is the Department's assertion that the recreational fishery has already suffered disproportionate losses compared to other states and imposing further restrictions due to a lower ACL would be devastating. The communities that rely on recreational fishing opportunities have already lost millions of dollars over the last decade due to the management measures taken to protect overfished species.

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[5] Estimate based on MRFFS data

[6] Estimate assumes no multipliers and includes costs for tackle, bait and single space on a boat. Trip costs averaged $100 north of 34°27 N lat and $125 south of 34°27 N lat (M. Michie, CDFG, personal communication).

Table 2. Number of statewide groundfish angler trips and estimated revenues ($1,000) under an unrestricted (i.e. 1999) fishery compared to the yelloweye rockfish ACL alternatives.

1999		No Action		FPA		ALT 1		ALT 2		ALT 3	
# trips	$	# trips	$	# trips	$	# trips	$	# trips	$	# trips	$
736,000	88,000	522,000	62,000	532,000	63,000	369,000	43,000	522,000	62,000	527,000	62,000

Few management measures exist to further restrict the recreational fishery in response to more conservative harvest specifications and/or increased yelloweye rockfish bycatch. Similar to the commercial nearshore fishery, the depth restrictions in the recreational fishery in northern California are as shallow as can be achieved without sacrificing vessel safety. The only management measure available for reducing bycatch is to further reduce the season length which results in significant community economic losses.

Community Vulnerability

The long term, cumulative impacts of ten years of increasingly reduced groundfish opportunities, in conjunction with recent disasters in the salmon fishery, have already caused severe economic hardship on vulnerable north coast communities. While the current management measures have reduced bycatch of yelloweye rockfish, they have come at an enormous cost to local economies, particularly in those areas north of San Francisco.

Historically a large portion of the economy in northern California was supported by a variety of industries including fishing, agriculture, and forestry. Due to the current uncertain economic environment, many historical industries are no longer present or are greatly reduced and unemployment rates have reached as high as 14 percent. Public comment received at the June meeting (Agenda Item B.3.c, Supplemental Public Comment 4, June 2010) speaks to the effect that the small amounts of allowed yelloweye rockfish bycatch has had on local communities. “The uncertainty of fishing is witnessed in cancelled vacations….the reduced seasons are costing our area tens of millions of dollars in revenue that cannot be supplemented by other methods”.

The same commenter spoke to the risks that the recreational fleet has taken to travel to open fishing grounds despite adverse and potentially dangerous weather conditions, and loss to local communities by important infrastructure closures (e.g., loss of Shelter Cove launch ramp). The effects of the yelloweye rockfish “restrictions are having severe adverse affects [sic] on our local communities. The Goals and Objectives of the FMP were specifically designed to prevent this kind of aggressive conservation action to the detriment of local communities. Conservation goal #3, Economic Goals #6 & 7, and Social Factors #15, 16, and 17 speak directly to such aggressive rebuilding action. We would ask the Council to adopt management measures for the 2011 and 2012 years taking the PCGFMP goals into consideration…”.

The updated community vulnerability analysis re-evaluated west coast fishing, community engagement in fishing, dependence on groundfish fisheries, and socioeconomic resilience (2011-2012 SPEX EIS, Appendix E). The counties most affected by yelloweye rockfish restrictions in California (Del Norte, Humboldt, and Mendocino) received ratings of vulnerable and/or most vulnerable in 2006 and 2010, which supports public comments. These three counties are very engaged in fishing activities, very dependent on groundfish, and not resilient.

Yelloweye Harvest Specifications and Rebuilding Comments Summary

The Department continues to support the Council's recommendations on the harvest specifications for yelloweye rockfish (ACT and ACL) because they are more precautionary than current specifications, provide greater protection of the stock while it continues to rebuild, minimize disruptions to the fisheries, account for management uncertainty without having further devastating long-term socioeconomic impacts on local communities, and meet the goals of MSA and NS.

The Department supports the Council-recommended two year fishery sector bycatch allowances of yelloweye rockfish to the nearshore and recreational fisheries (1.1 mt and 3.1 mt respectively). These allowances do not significantly increase opportunities by liberating fishing areas or season lengths, but they do provide stability by providing management measures that are similar to 2009-2010. If NMFS decides it must modify the Council recommended ACL, the Department requests that fishery sector bycatch allowances be based on the same percentages used under the FPA.

Cowcod Rebuilding and Harvest Specifications

California also supports the Council's recommendation to revise the rebuilding plan for cowcod to incorporate the error corrections contained in the updated 2009 assessment and rebuilding plan that resulted in the Council choosing a 4 mt ACL. The harvest rate previously adopted in the PCGFMP was based on the results of a modeling error in 2005 (Agenda Item B.7.b, Supplemental GMT Report, June 2010) and failure to revise the rebuilding plan to reflect these revisions would be in direct conflict with MSA §301 and NS-2 because the harvest rate would not reflect the best available science.

The Council's recommended 2011-2012 harvest rate would add 11 years to the no (zero) harvest option and results in the stock rebuilding one year earlier than T_{TARGET}. Protective management measures such as prohibition of cowcod retention in all fisheries, depth restrictions, and large area closures including the RCA and CCA have already been implemented to protect cowcod.

The current take of cowcod consists of research catches and unavoidable bycatch in the trawl and recreational fisheries south of 40°10' N lat (Cape Mendocino). The WCGOP Total Mortality Reports from 2004-2009 indicate that cowcod bycatch has varied annually between 1.0 mt and 3.4 mt; the trawl fishery is the most variable (ranging from 0.2 to 3.0 mt annually; Table 3). Similar to yelloweye rockfish, bycatch of cowcod is difficult to project annually and encounters are expected to increase as the stock slowly rebuilds.

Table 3. Summary of cowcod mortality by fishery sector from 2004-2009 summarized from WCGOP Total Mortality Reports.

Year	Non-Whiting Trawl	CA Recreational	Research/ Other	Total Mortality	OY(ACL) (mt)	%OY (ACL)	%ABC
2004	0.9	1.0	0.5	2.4	4.8	50%	10%
2005	1.5	0.4	0.1	2.0	4.2	47%	8%
2006	0.9	0.2	0.0	1.1	4.2	26%	5%
2007	3.0	0.3	0.1	3.4	4.0	83%	9%
2008	0.2	0.2	0.1	0.5	4.0	13%	1%
2009	0.5	0.2	0.2	0.9	4.0	23%	4%

Commercial Fishery

Trawling activity has increased in recent years south of 40°10' N lat, as other overfished species have rebounded and greater bycatch allowances for those species have been provided. Trawl ex-vessel revenue in the area has doubled (Table 4). As trawl fishermen expect to try to implement fishing strategies that allow them to access valuable target species through the 2011 federal trawl rationalization program, their concern for a sufficient cowcod bycatch allowance grows.

Table 4. Ex-vessel value ($1,000) of limited entry trawl groundfish landings (excluding Pacific whiting) south of 40°10' N lat from 2006-2009 (PacFIN data)

	2006	2007	2008	2009
Total south of 40°10'	$1,994	$2,276	$4,819	$4,352

Similar to yelloweye rockfish, cowcod bycatch varies considerably year to year and small changes to cowcod bycatch allowances can have a large effect on this fishery. The Council's recommended trawl bycatch allowance of 1.8 mt cannot completely account for historical variability of bycatch and could still restrict this fishery. The bycatch needs in this fishery are really unknown as the trawl rationalization program gets underway and fishermen learn to access healthy species while avoiding bycatch species. Despite all attempts to avoid cowcod, disaster tows can and will occur. The entire trawl fishery south of 40°10' N lat could be shut down in the event of a disaster tow that exceeded the fishery sector bycatch allowance, resulting in losses of over $4 million to local communities. If NMFS decides it must implement a lower ACL than the Council's final preferred alternative, the trawl fishery bycatch allowance would be further reduced and could jeopardize the success of the trawl rationalization program overall and disproportionately affect California trawl fishermen and communities.

Recreational Fishery

Participation in recreational groundfish fisheries south of 34°27' N lat (Point Conception) is also important to the economy in southern California. More favorable weather conditions and fewer overfished species interactions in this area provide fishermen greater access to healthy target stocks and longer fishing seasons. As a result, many of the local economies are moderately dependent on the revenues and tourism generated by recreational fishing activities[7]. Reductions to the recreational bycatch allowance would necessitate reductions in the season or depth restrictions, either of which would have adverse impacts on fishing opportunity. The current 60 fm maximum fishing depth restriction, establishment of the CCA, and prohibition of cowcod retention have minimized cowcod bycatch in recent years (Table 3).

Cowcod Harvest Specifications and Rebuilding Plan Comments Summary

Annual variability in cowcod bycatch, restrictive management measures currently in place (i.e. CCA), rebuilding needs and the needs of both the recreational fishery and the trawl fishery as it transitions to a rationalized fishery were important considerations in the Council's recommendation of cowcod harvest specifications for 2011-2012. The Department supports the Council's recommended cowcod specifications because they continue to support the cowcod rebuilding plan, support the southern California economy and prevent disruption to successful implementation of the trawl rationalization program. Setting harvest levels that are more conservative could result in an unnecessary closure of the entire trawl fishery south of 40°10' N lat and severely restrict the recreational fishery south of 34°27' N lat resulting in significant losses of economic opportunities and infrastructure for those communities.

<u>GENERAL COMMENTS/CORRECTIONS</u>

<u>Modifications to Recreational Regulations for the Cowcod Conservation Area</u>

The Department supports increasing the maximum fishing depth restriction to 30 fm in the CCA and allowing the retention of shelf rockfish. These measures are not expected to alter the rebuilding schedule of cowcod or significantly increase bycatch of other overfished species. Rebuilding analyses are conducted using results from individual stock assessments and the proposed depth modifications are not expected to alter the input data to the cowcod assessment in any way. The proposed fishing depths to be liberalized do not include historical submersible survey sites and therefore would not impact any past or future survey data.

In addition modeled fishing depth restrictions currently over-estimate cowcod bycatch in the CCA (the area is modeled to 60 fm, but the fishery occurs in 20 fm or less). Therefore any increases in cowcod encounters from 20 fm to 30 fm are already accounted for and will not cause the ACL to be exceeded or jeopardize rebuilding.

While a 40 fm depth restriction in the CCA was analyzed in the EIS, the Council chose to limit fishing in the CCA to a maximum depth of 30 fm in 2011-2012. Therefore, the

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[7] See pg. E-12 Appendix E. Vulnerability Analysis Update

Department requests that the waypoints delineating the 40 fm depth restriction be removed around Santa Barbara Island, San Nicholas Island, Tanner Bank, and Cortes Bank to eliminate any confusion.

Allowing retention of shelf rockfish within any maximum fishing depth in the CCA would reduce waste and decrease discard mortality. The Department received over 300 letters of support for these two actions[8] (depth change and retention of shelf rockfish) indicating that the changes would greatly improve the quality of fishing opportunity by reducing regulatory discarding and subsequent mortality. This preference was also expressed in public comment received by the Council (Agenda Item B.3.c, Public Comment, June 2010).

Page 67824: The Department would like to clarify that the advisory bodies did not recommend using the 40-10 adjustment for the California cabezon assessment to better align the California management strategy with the PCGFMP. Because the 2009 stock assessment indicated that the California cabezon stock was healthy with a depletion level of 48 percent statewide, no 40-10 adjustments were necessary under the base case model. The Council advisory bodies recommended using the federal F_{MSY} proxy ($F_{45\%}$) instead of the state proxy ($F_{50\%}$).

Page 67828: Relative to rebuilding plans for overfished species, the Department would like to clarify that cowcod are primarily taken in the commercial fishery with trawl gear, not the recreational fishery. WGCOP data (Table 2) indicates that the highest cowcod bycatch has occurred in the trawl fishery.

Page 67828: Relative to the canary rockfish stock assessment, the federal register incorrectly characterizes canary rockfish as having a "very low level of depletion" and is considered to "have a higher sensitivity to changes in harvest rate and higher harvest rates for these species have a greater risk of not rebuilding by T_{TARGET}". The 2009 assessment estimated that canary rockfish have a depletion level of 23.7 percent, which would not be considered very low when compared to other species like cowcod (depletion level of 4.5 percent). The 2009 canary rebuilding analysis indicated that 2011 ACLs of 102 mt and 129 mt both rebuild in the same year (2027) and both have a 50 percent probability of recovery in that same year. In addition, an ACL of 155 mt had a 50 percent probability of recovery one year later in 2028. This clearly demonstrates that the canary stock appears to have a lower sensitivity to changes in harvest rates.

Page 67829: Relative to bocaccio, the Department would like to point out that the fishery sector bycatch allowances and/or harvest guidelines were incorrectly identified for all fishery sectors for 2011 and 2012. The values for both 2011 and 2012 should be as follows: limited entry non-whiting trawl, 60 mt; limited entry and open access non-nearshore fixed gear, 57.9 mt; limited entry and open access nearshore fixed gear, 0.7 mt; and California recreational, 131 mt.

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[8] Submitted separately to Mr. Frank Lockhart 12/10/10.

Page 67830: Relative to canary rockfish allowances, the Department would like to point out that the fishery sector bycatch allowances and/or harvest guidelines were incorrectly identified for all fishery sectors for 2011 and 2012. The values should be as follows for 2011: limited entry non-whiting trawl, 20 mt; limited entry whiting trawl, 13.5 mt (catcher/processor 4.6 mt, trawl mothership 3.2 mt, and shoreside 5.7 mt); limited entry and open access non-nearshore fixed gear, 2.3 mt; limited entry and open access nearshore fixed gear, 4.0 mt; Washington recreational, 4.0 mt; Oregon recreational, 7.0 mt; and California recreational, 14.5 mt.

For 2012, the values should be as follows: limited entry non-whiting trawl, 20 mt; limited entry whiting trawl, 13.5 mt (catcher/processor 4.9 mt, trawl mothership 3.4 mt, and shoreside 6.0 mt); limited entry and open access non-nearshore fixed gear, 2.3 mt; limited entry and open access nearshore fixed gear, 4.0 mt; Washington recreational, 4.0 mt; Oregon recreational, 7.0 mt; and California recreational, 14.5 mt.

Page 67834: Relative to yelloweye rockfish, the Department would like to point out that the fishery sector bycatch allowances and/or harvest guidelines were incorrectly identified for some fishery sectors. Those values should be as follows for 2011-12: limited entry non-whiting trawl, 0.6 mt; limited entry and open access non-nearshore fixed gear, 1.3 mt; limited entry and open access nearshore fixed gear, 1.1 mt; Washington recreational, 2.6 mt; Oregon recreational, 2.4 mt; and California recreational, 3.1 mt.

Page 67844: Relative to elimination of the recreational lingcod spawning closure, the Department would like to request that NMFS modify regulatory language to reflect this statewide modification for all modes of fishing including boat-based and shore-based fishing as well as spear diving as reflected in Agenda Item B.3.b, CDFG Report 2, June 2010 as recommended by the Council.

In Closing

The Department fully supports the NMFS approach used in the past to provide notices for public comment via an automatic email notification. Unfortunately that very successful public notification approach was not used to solicit public comment on 75FR60868 and has created confusion among our constituents.

Thank you for the opportunity to provide comment on the 2011-2012 Biennial Specifications and Management Measures and implementing Amendments 16-5 and 23 of the PCGFMP. If you require additional information, please contact Ms. Marija Vojkovich, Regional Manager in the Department's Marine Region at (805) 568-1246 or via e-mail at mvojkovich@dfg.ca.gov.

Sincerely,

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TO: William Stelle, Administrator
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ATTN: Sarah Williams
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FROM: Stephen Williams, Deputy Administrator
Fish Division, Oregon Department of Fish and Wildlife

RE: RIN No. 0648-BA01

Date: January 4, 2011

This comment is in response to a recent Proposed Rule concerning 2011-2012 Biennial Specifications and Management Measures (50 CFR Part 660: Federal Register /Vol. 75, No. 212 /Wednesday, November 3, 2010 /Proposed Rules). Please refer to RIN No. 0648-BA01. The purpose of this comment is to provide a State perspective regarding the impacts to Oregon coastal communities of varying yelloweye rockfish (*Sebates ruberrimus)* rebuilding Alternatives proposed by the Pacific Fishery Management Council (Council or PFMC). The Oregon Department of Fish and Wildlife (ODFW) favors the Council's Final Preferred Alternative (FPA) of a 17 metric ton (mt) annual catch target (ACT) and a 20 mt annual catch limit (ACL). ODFW provides evidence that an ACL of 13 mt or 14 mt would devastate the economies of Oregon costal communities. Therefore, ODFW recommends that the National Marine Fishery Service (NMFS) adopt the Council's FPA.

Note that terminology has been changed per Amendment 23 of the Fishery Management Plan (PFMC 2010b). ACLs are functionally analogous to and replace Optimum Yields (OY) identified in previous management cycles. The ACT is an amount that can be set below the ACL if there is uncertainty in the ability of the management system to effectively keep total fishing mortality below the prescribed ACL (PFMC 2010a).

Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that overfished stocks must be rebuilt as quickly as possible while taking into account the needs of fishing communities (Sec 303; 104-297(e)(A)(i)). Furthermore, the MSA states that "Conservation and management measure shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities" (Sec 301(a); 104-297(8)). Balancing these requirements of the MSA is complicated and difficult with varying interpretations of the law.

The federal government is currently responsible for rebuilding overfished groundfish stocks off the coasts of Oregon, California, and Washington. Rebuilding plans are adopted for each stock declared overfished and are amended as needed through the biennial harvest and management measures specification process. Yelloweye rockfish were declared overfished in 2002 and have been managed based on outcomes of the rebuilding plan while taking into account, but not necessarily meeting, the needs of fishing communities. Setting catch limits under these conditions is problematic because (a) this species is long lived and slow growing (Love et al., 2002) and (b) recent OYs are at levels so low that there is little leeway to allow the prosecution of all fisheries or to conduct research to improve knowledge about this species and stock status.

No fisheries currently target yelloweye rockfish. Yelloweye rockfish are an unavoidable bycatch in many ocean fisheries including directed groundfish fisheries and fisheries targeted at non-groundfish species such as Pacific halibut. Their release is mandatory for all but trawl fisheries, which are allowed to retain no more than 200 pounds (lbs) per month and some tribal fisheries. Mortality rates of released fish are estimated to be between 60-100% due to barotrauma or other catch-related injuries. Current impact allowances, which consider discard mortality rates, are extremely small. For example, the non-whiting trawl fleet was apportioned only 0.6 mt (1,322 lbs) of yelloweye rockfish during 2010, which, at an average weight of 3 lbs (for example) is only 440 fish allowed for all non-whiting trawl vessels along the U.S. west coast (N = 117 vessels in 2009; PFMC 2010a).

In 2006 a stock assessment for yelloweye rockfish indicated a more negative outlook for the stock than was previously thought. The Council recommended and NMFS approved a "ramp-down" strategy by which the impacts would be decreased annually to the level indicated in the rebuilding plan (PFMC 2006). The strategy was to end in 2010 with an indicated OY of 14 mt and it was understood that results from an assessment conducted in 2007 might alter the course. Beginning in 2011, results from a new stock assessment would be used to set impact levels. The "ramp-down" was intended to gradually reduce harvest levels until a yelloweye rockfish spawning potential ratio (SPR) harvest rate of $F_{71.9\%SPR}$ was achieved. Maintaining harvest rates at this level resulted in a projected rebuilding time of 2084. The 2010 OY was increased to 17 mt under the 2009-2010 harvest specifications and environmental impact study (PFMC 2009), based on results from the updated stock assessment conducted in 2007. However, the U.S. District Court for the Northern District of California vacated the yelloweye rockfish rebuilding plan in the 2009-2010 harvest specifications (i.e., PFMC 2009) in response to a lawsuit filed by the Natural Resources Defense Council (NRDC) (NRDC v. Locke, Civil Action No. C 01-0421 JL; see Federal Register, 2010). The court was in agreement with NRDC for three overfished species: yelloweye rockfish, darkblotched rockfish, and cowcod. The lawsuit claimed NMFS violated National Standard 2 of the MSA by failing to use the best scientific information available on the economic status of fishing communities affected by the rebuilding plans in the 2009-2010 harvest specifications (i.e., PFMC 2009), and that rebuilding times for overfished species were not "as short as possible". The ruling in April of 2010 required the yelloweye rockfish OY to be reduced from 17 mt to 14 mt.

In the current cycle, the Council recommended a yelloweye rockfish ACT of 17 mt for both 2011 and 2012 (the recommended ACL was 20 mt; PFMC 2010a). Harvest levels for overfished species, including yelloweye rockfish, were analyzed in an integrated approach and associated economic-impacts were provided in the Proposed Harvest and Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery, Draft Environmental Impact Statement (PFMC 2010a), hereafter referred to as 2011-2012 DEIS. These analyses compared three ACL alternatives for yelloweye rockfish: 13 mt, 17 mt, and 20 mt (PFMC 2010a; Federal Register 2011) and provided justification for the Council's recommended ACL and ACT. However, the Council was informed just prior to the November 2010 PFMC meeting that the 2011-2012 DEIS was not well justified. Implementation of the Harvest Specifications and Management Measures for 2011 would be delayed. Furthermore, NMFS would provide the Final Environmental Impact Statement (FEIS) by March 2011 (Agenda Item H.2.a, Supplemental NMFS Power Point, November 2010).

It is ODFW's assertion that there is no justification of an ACL (or ACT) lower than 17 mt for yelloweye rockfish. As stated previously, ODFW supports the Council's FPA for yelloweye rockfish ACL (20 mt) and ACT (17 mt), as well as the Council's FPA for trawl, non-trawl, and recreational allocations (PFMC 2010a). This alternative is favored because it is projected to rebuild the yelloweye rockfish stock 10 years earlier than the targeted rebuild date of the "ramp down" strategy (2084) while preventing severe impacts to Oregon coastal communities that are already economically depressed (see below). The remainder of this comment provides specific reasons that ODFW supports the FPA of 17 mt ACT for yelloweye rockfish and describes projected impacts to Oregon fisheries and coastal communities in the event a lower ACL or ACT is mandated in the FEIS.

Rebuilding Times and Use of Best scientific Information

In contrast to the opinion of NRDC (discussed previously), we believe that the best scientific data were used for both the economic analysis (PFMC 2010a) and the 2009 yelloweye rockfish stock assessment (Stewart et al. 2009). Although the 2011-2012 DEIS utilized 2000 census data, which was the most recent and best decennial data available when the 2011-2012 DEIS was prepared, that DEIS also utilized inter-decennial estimates (1-year, 3-year, and 5-year estimates) using the American Community Survey (ACS). Hence, the ACS data provided updated information for the 2011-2012 DEIS. For example, 2006-2008 ACS data were used to identify the percentage of the population living below the poverty line (PFMC 2010a). Finally, other data included in the economic analysis represented the best and most recent data available when the 2011-2012 DEIS was composed. For example, 2008 and 2009 PacFIN data were used to describe current fisheries (number of vessels, ex-vessel revenue, and total number of buyers).

The 2009 stock assessment (Stewart et al. 2009) was endorsed by the SSC as "the best available science for the status determination and management Council process" (Federal Register, 2010). The Council's FPA, an ACT of 17 mt, which is effectively identical to Alternative 2 in the 2011-2012 DEIS, was projected to rebuild yelloweye rockfish by 2074 or 10 years before the current T_{target} (Federal Register, 2010). Although lower ACTs (or ACLs) are estimated to provide faster rebuilding times (e.g., a 13 mt ACL results in a median rebuilding time of 2065), the Washington Department of Fish and Wildlife (WDFW) (Agenda Item I.4.c, WDFW Report, September 2010) clearly demonstrated that fastest times to rebuild are not necessarily those that best achieve long-term conservation objectives. This report synthesized Groundfish Management Team (GMT) reports, MSA, and scientific literature to develop logical and scientifically based conclusions. These findings, along with the associated GMT reports should formally be included as part of the decision making record and seriously considered when deciding the 2011-2012 harvest level for yelloweye rockfish.

Misleading Interpretation of the No Action Alternative

Various alternatives for yelloweye rockfish annual catch limits (ACLs) are being considered for the 2011-2012 FEIS. Some of those alternatives are listed in Table 1. The three ACLs that were derived from the 2009 rebuilding analysis (Alternatives 1-3) were analyzed in the 2011-2012 DEIS, and in many cases, compared to the No Action Alternative. This comparison is misleading because (a) the 2010 season began under a yelloweye rockfish OY of 17 mt and (b) even though the OY was reduced to 14 mt following the decision of NRDC vs. Locke (Federal Register, 2010) fisheries remained essentially unchanged. This is due to the States of Oregon and Washington eliminating planned research projects in an effort to minimize disruption to commercial and recreational fisheries. Additionally, exempted fishing permits (EFP) approved for 2010 were eliminated or reduced in scope to further accommodate fisheries. Therefore, most fisheries performed at levels similar to those observed during 2009, when the ACL was 17 mt, largely because planned research and EFPs were eliminated.

Table 1. Alternatives considered for yelloweye rockfish rebuilding plans and for 2011-2012 integrated and economic analyses (PFMC 2010a). Alternative, median time to rebuild (year) and the ACL (or ACT) analyzed are shown. Associated recreational harvest guidelines for Oregon are also shown.

Alternative	Median Time to Rebuild (year)	2011-2012 ACL (mt)	OR Rec. Harvest Guideline (HG)
No Action Alt.	---	14	2.3
Final Preferred Alt.	---	20 (17 ACT)	2.4
Alt. 1 Low	2065	13	1.5
Alt. 2 Intermediate	2074	17	2.4
Alt. 3 High	2084	20	3.0

It is important to clarify that elimination of research projects and EFPs, resulting in a savings of 2.1 mt of yelloweye rockfish, prevented severe restrictions for commercial fisheries that would have been needed during 2010 (Agenda Item B.5.b, GMT Report, June 2010; Agenda Item B.7.a, Supplemental Attachment 3, June 2010). It is misleading to assume that the "No Action Alternative", or a 14 mt ACL, will allow 2011 and 2012 fisheries to be prosecuted at levels observed in 2009. We cannot assume that research projects and EFPs will be continuously postponed or eliminated, as this information is needed to improve stock assessments and to better predict rebuilding parameters for overfished species. In addition, the Council does not have the authority to prevent research activities from occurring, should other entities wish to conduct projects that impact overfished species (e.g., NMFS or International Pacific Halibut Commission research).

The following sections describe potential impacts to Oregon recreational and commercial fisheries and associated communities for 2011 and 2012 under two alternatives for yelloweye rockfish ACLs (or ACTs; PFMC 2010a): 17 mt (Alternative 2 and the Final Preferred Alternative) or 13 mt (Alternative 1). Even though Alternative 1 examined impacts of a 13 mt ACL, those analyses serve as the proxy for a 14 mt ACL. Alternative 1 assumes full implementation of research projects and EFPs, whereas the "no action alternative" does not.

Impacts to Oregon Recreational Groundfish Fisheries

A 17 mt ACL (or ACT) would result in a 2.4 mt harvest guideline (HG) (2010=2.3 mt HG) for the 2011 and 2012 Oregon recreational groundfish fishery. A 13 mt ACL would reduce the HG to 1.5 mt (Table 1).

Depth restrictions are the preferred management strategy to reduce recreational angler catches of yelloweye rockfish. Depth restrictions allow anglers to fish for healthy stocks in depths shallower than where yelloweye rockfish are more commonly found (50-100 fathoms; Love et al. 2002). Angler catch rates of yelloweye rockfish decrease as depth restrictions increase; therefore, managers can use depth restrictions to keep groundfish seasons open throughout the year and stay within the yelloweye rockfish HG. In-season closures are not preferred management strategies because anglers can rapidly exceed the yelloweye rockfish HG, resulting in increasingly shorter seasons and fewer angler opportunities. Although greater depth restrictions may extend the season while limiting impacts to the yelloweye rockfish stock, these restrictions will result in reduced groundfish angler trips and associated negative socio-economic impacts to Oregon's coastal communities. A 1.5 mt HG would require much greater depth restrictions than a 2.4 mt HG in order to keep the recreational groundfish fishery open throughout the year (Figure 1).

13 mt ACL depth restriction Options (1.5 mt HG)

Option	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YE projected impacts (mt)
1	Open all depths			Open < 20 fm						Open all depths			1.45
2	Open < 40 fm			Open < 20 fm						Open < 40 fm			1.15
3	Open < 30 fm			Open < 20 fm						Open < 30 fm			1.14
4	Open < 25 fm			Open < 20 fm						Open < 25 fm			1.11
5	Open < 20 fm												1.04

17 mt ACL depth restriction Options (2.4 mt HG)

Option	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YE projected impacts (mt)
1	Open all depths			Open < 25 fm						Open all depths			1.9
2	Open all depths			Open < 30 fm						Open all depths			2.1
3	Open all depths			Open < 40 fm						Open all depths			2.1

Figure 1. Pre-season depth restriction options for the Oregon recreational groundfish fishery that would be necessary under a 13 mt ACL and a 17 mt ACL. (YE=yelloweye rockfish)

A reduction in the ACL from 17 mt to 13 mt is projected to decrease the percentage of groundfish angler trips for all ports except for Astoria and Pacific City; reduce coast wide groundfish angler trips by 8%; and reduce groundfish trips for Garibaldi and Winchester Bay by up to 35-45% (Figure 2). These projections were determined by applying the 13 mt ACL depth restriction options (Figure 1) to 2009 groundfish angler interview data to determine the percentage of angler trips in 2009 that would have occurred in prohibited waters. The 2009 scenario is consistent with an ACL or ACT of 17 mt.

The coast-wide projected percent decreases of groundfish anglers trips in Figure 2 (8%) is consistent with the 2011-2012 DEIS projection (6.2%) (PFMC 2010a). However, the 2011-2012 DEIS underestimates the percent decrease to Garibaldi (Tillamook County) by 20-35%.

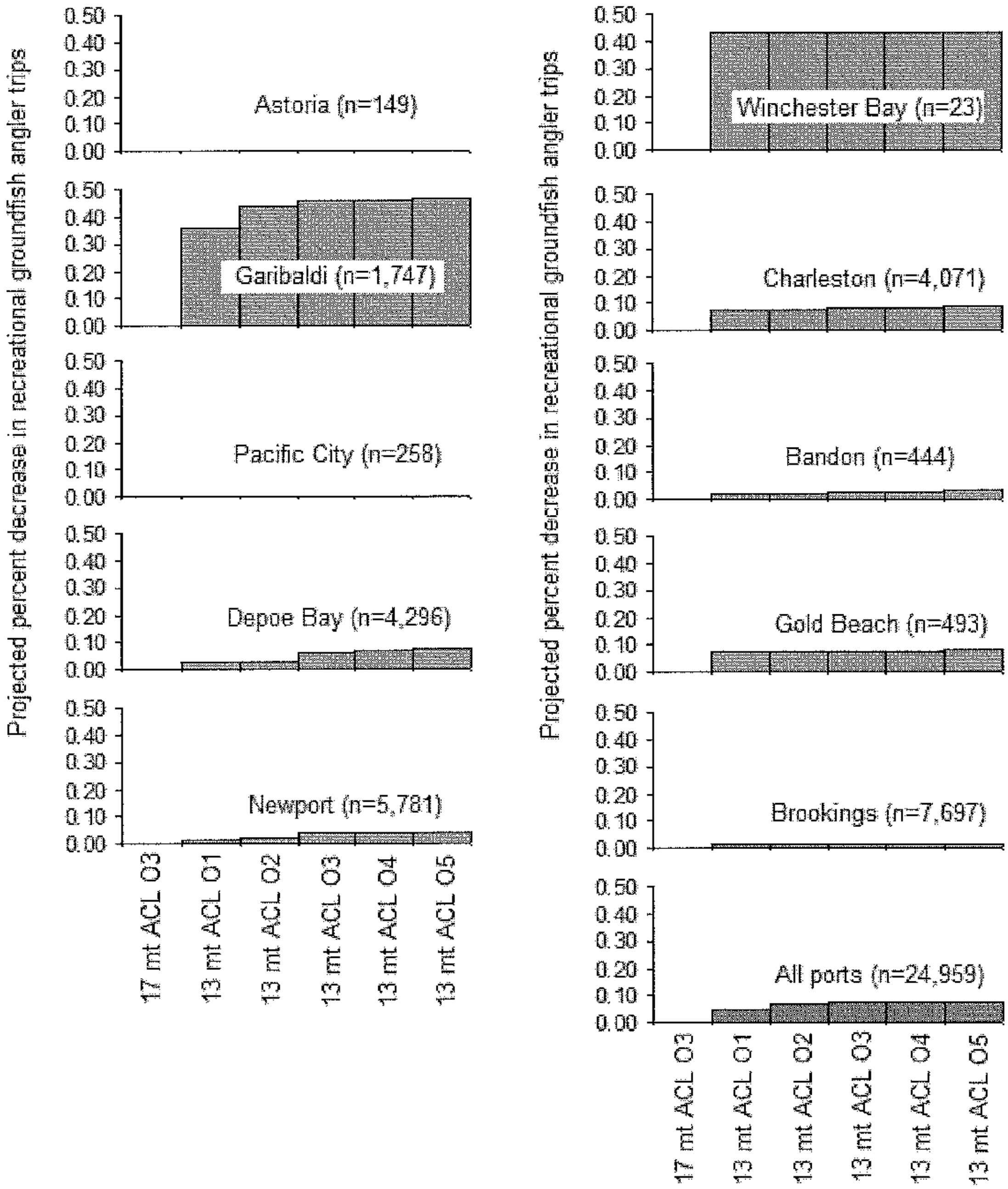

Figure 2. Projected percent decreases in recreational groundfish angler trips for Oregon ports if the ACL for 2011 and 2012 is 13 mt instead of 17 mt. n=number of interviews with depth data, O=depth restriction option

Differences in projected angler trip decreases among ports are due to differences in the amount of available fishing area by depth for each port (Figure 3). Ports with greater percentages of fishing area inside 20 fathoms, such as Newport and Depoe Bay, would be less affected by 20 fathom closures than ports, such as Garibaldi, that have greater percentages of fishing areas deeper than 20 fathoms.

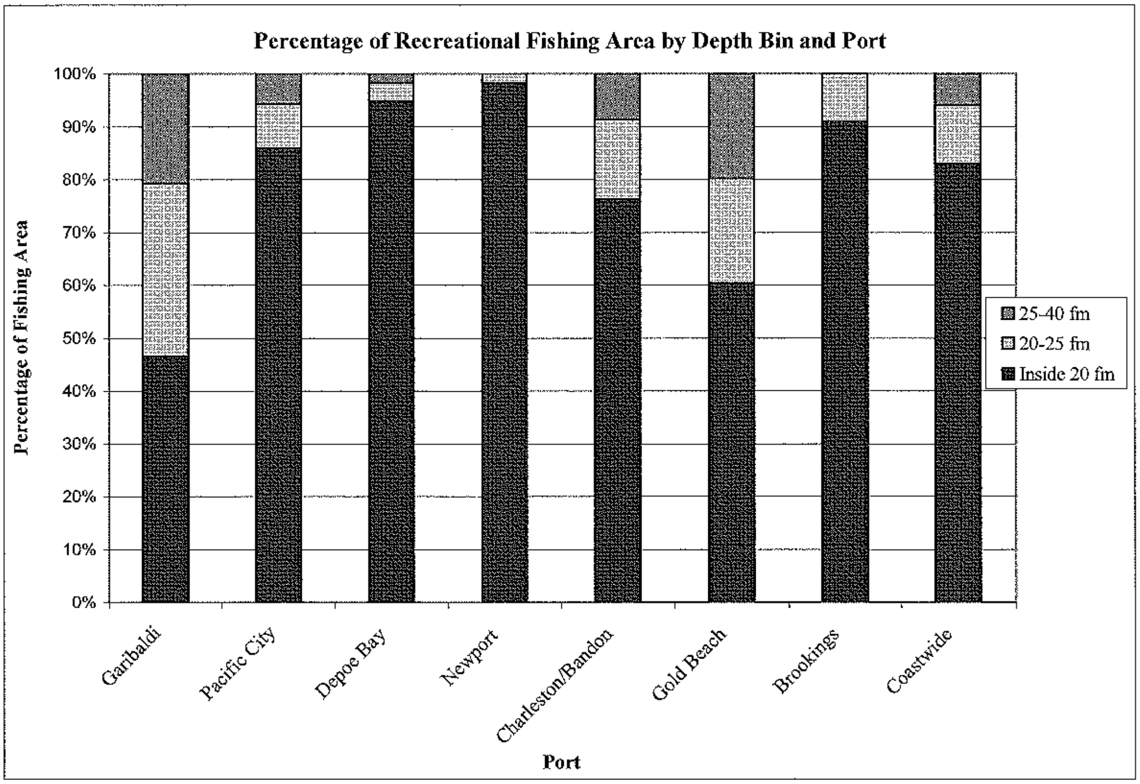

Figure 3. The percentage of recreational fishing area by depth for selected Oregon ports.

The projected percent decreases in angler trips under a 13 mt ACL compared to a 17 mt ACL (Figure 2) are based on the best and most recent available data. It is noted that anglers would have the option of fishing shallower water, if desired. To better understand how the greater depth restrictions of a 13 mt ACL would affect the number of groundfish angler trips, charter captains and sport anglers from various Oregon ports were asked if and how these restrictions would affect their groundfish fishing efforts.

To summarize angler input, everyone is opposed to the greater depth restrictions that would be necessary under a 13 mt ACL (13 mt ACL options 1-5, Figure 1). The anglers stated that they are already severely restricted to where they can fish due to marine reserves and depth restrictions that were implemented previously to reduce yelloweye rockfish catches. They believe additional depth restrictions will reduce the number of groundfish fishing trips throughout the coast, resulting in negative effect to the economies of coastal towns. The interviewed anglers stated also that the projected angler trip percentage reductions in Figure 2 seemed plausible. Additionally, the interviewed anglers believe that some ports (Newport, Charleston, and Depoe Bay) may be less affected by additional depth restrictions than other less resilient ports, such as Garibaldi and Winchester Bay. These ports could be devastated because they have fewer shallow water (< 20 fathoms) groundfish fishing areas than the other ports along the Oregon coast (Figure 3).

Charter input was collected from captains from Newport (Mike Sorensen), Garibaldi (Joe Ockenfels), Charleston (Bill Whitmer), and Winchester Bay (Casey Howard). All charter captains agree that groundfish fishing is vital to their businesses because the groundfish fishery is consistent and dependable, unlike the tuna and salmon fisheries, which are highly variable on an annual basis. The captains believe that adjusting the April-September depth restrictions from 40 fathoms (17 mt ACL) to 20 fathoms (13 mt ACL) will devastate the economy of Garibaldi, which has few shallow water groundfish opportunities. Mr. Sorensen and Ms. Howard note that a similar situation has already occurred in Winchester Bay. Winchester Bay was once a popular port for charter groundfish fishing before the 40 fathom depth restrictions were enacted (all groundfish fishing reefs near Winchester Bay are deeper than 50 fathoms). Ms. Howard stated that her charter operation is almost out of business because of lost groundfish opportunity and because she now has to rely on salmon trips; poor salmon seasons cause her considerable debt. Mr. Ockenfels is very fearful that greater depth restrictions will cause the Garibaldi charter fleet also to become solely dependent on the salmon and tuna fisheries.

Charter captains and recreational anglers also agree that Garibaldi would have significant reductions in sport groundfish angler trips if greater depth restrictions occur. John Holloway, a sport angler and ODFW Sport Advisory Committee (SAC) member who travels from his home in Portland to Garibaldi to fish for groundfish, and Mr. Ockenfels believe greater depth restrictions will cause Portland area groundfish anglers that would normally fish out of Garibaldi to move to other ports, such as Newport or Depoe Bay, that have better fishing opportunities in shallow water (< 20 fathoms). Ms. Howard notes that the same situation has already occurred at Winchester Bay; recreational anglers are highly mobile, and moved to ports with more groundfish fishing opportunities. Mr. Ockenfels is highly concerned that that the hotels, restaurants, and other businesses in Garibaldi will suffer from decreases in groundfish anglers trips. Eugene Tish, who owns a hotel in Garibaldi and is on the Garibaldi Tourism Commission, says recreational groundfish trips are essential to the economy of Garibaldi and many businesses, including his own, would close with greater depth restrictions in the groundfish fishery. "The economy of Garibaldi is dependent on recreational groundfish anglers and the city is trying to transition to other forms of tourism. This transition will take time and will not occur if recreational groundfish angler trips decrease significantly in the near future." said Mr. Tish. "Until the schools are out of session, recreational groundfish dollars are the lifeblood of this economy."

Mr. Tish's assessment of Garibaldi having a fishing based economy that is vulnerable to restrictive fishing regulations is consistent with the findings of the 2011-2012 DEIS (PFMC 2010, Appendix E). Tillamook County, of which Garibaldi is the major port, is classified as a vulnerable county due to high community engagement in fishing, medium dependence on groundfish fisheries, and low socioeconomic resilience.

The estimated loss in revenue for Garibaldi, a city of less than 1,000 people (2000 Census data), is projected to be up to 3.3 million dollars with an ACL of 13 mt instead of 17 mt*. This estimate is based on the estimated recreational saltwater angler expenditure for Tillamook County in 2008 (Dean Runyan Associates 2009) and clearly shows that the economy of Garibaldi could be devastated by up to multi-million dollar losses under a 13 mt ACL.

Revenue of other Oregon costal economies would also be expected to decrease if the recreational yelloweye rockfish ACL decreases to 13 mt. However, the disproportionate projected impact to Garibaldi is of greatest concern and would be in direct violation of the MSA requirement that restrictions made to rebuild overfished fisheries must fairly and equitably impact sectors of the affected fishery (Sec 304; 104-297(e)(B)). The projected multi-million revenue loss for Garibaldi under a 13 mt ACL also violates the MSA requirement that overfished stocks must be rebuilt as quickly as possible while taking into account the needs of fishing communities (Sec 303; 104-297(e)(A)(i)).

Impacts to Oregon Commercial Fixed Gear Fisheries

The economic/community analysis in the 2011-2012 DEIS primarily describes impacts by license type (limited entry versus open access fixed gear fisheries), whereas the integrated analysis (PFMC 2010a) determines impacts to overfished species by fishing strategy (non-nearshore versus nearshore fixed gear fisheries). This disconnect between analyses creates confusion and uncertainty regarding the impact to communities when choosing among alternatives and associated management measures to reduce overfished species impacts by individual fisheries. The following text pulls together projected impacts to overfished species (by fishing strategy) and economic/community impacts (by license type) to predict how a reduction from a 17 mt to a 14 mt yelloweye rockfish ACL or ACT may affect Oregon commercial fixed gear fisheries and the associated coastal communities.

Components of the Magnuson-Stevens Fishery Conservation and Management Act that emphasize the needs of the fishing community when making management decisions were highlighted at the beginning of this document. As the potential impacts of more restrictive management measures to commercial fixed gear fisheries and their associated communities are described, it is important to reflect on a general definition that the Council adopted at its April 2006 meeting:

> "Fishing Communities need 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 (PFMC 2006)."

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* $3.3 million=the fraction of groundfish trips in Tillamook County that are from Garabaldi (.82; ODFW, unpublished data) multipled by the expected reduction in groundfish trips for Garabaldi under Alternative 1 (.45; Figure 2) multipled by the fraction of saltwater trips that are groundfish trips in Tillamook County (.46; PFMC and NMFS 2010, Appendix E) multiplied by the estimated revenue generated from saltwater fishing trips in Tillamook County ($20 million; Dean Runyan Associates 2009).

Non-nearshore Fixed Gear Fisheries:

The non-nearshore fixed gear sector is comprised of limited entry and open access vessels targeting species seaward of the non-trawl rockfish conservation area (RCA). These groundfish vessels operate on the shelf and slope, primarily targeting sablefish, shortspine thornyhead, and slope rockfish species. Sablefish comprise the bulk of the landings and associated revenue for these fisheries, making them highly valuable to the fisheries and to coastal economies. Coast-wide sablefish landings for limited entry and open access fixed gear vessels during 2009 totaled 3,457 mt, resulting in an ex-vessel value of $18,094,000 (DEIS 2010); these values are higher than those associated with trawl-caught sablefish (3,010 mt and $12,433,000). Overfished species catch projections for non-nearshore fixed gear fisheries are made using a model that assumes total attainment of the sablefish allocation coupled with depth-specific bycatch rates provided by the West Coast Groundfish Observer Program (Bellman et al. 2010). The management measures available for limiting yelloweye rockfish catch are therefore depth management or reducing sablefish catch (see PFMC 2010a).

Under the assumption of a 17 mt ACL (or ACT) for yelloweye rockfish, the Council's FPA (Agenda Item H.6.b, Supplemental GMT Report 3, November 2010) allocated 0.9 mt of yelloweye rockfish to the non-nearshore fixed gear fishery. At this level, the non-nearshore model projected that the 2011 sablefish allocation could be fully harvested with a seaward RCA of 100 fathoms throughout the Oregon coast (Figure 4; PFMC 2010a). The associated yelloweye rockfish impacts were projected to be 0.8 mt.

Seaward RCA Boundary	**36°- 40° 10'**	**40°10'- Col/Eur 43°**	**Col/Eur 43°- Cascade Head 45.064°**	**Cascade Head 45.064°- Pt. Chehalis 46.888°**	**North of Pt. Chehalis 46.888°**
Shoreward boundary to 100 fathoms					
100 fathoms					
125 fathoms					
150 fathoms					
>150 fathoms					

Figure 4. Non-trawl RCA seaward configuration that would result in full attainment of the sablefish ACL and limit yelloweye rockfish projected impacts to 0.8 mt (Alternative 2; PFMC 2010). Grey shading indicates areas closed to fishing. Copied from Figure C-15 (Appendix C Detailed Analysis of Integrated Alternatives, 2011-2012 DEIS, PFMC 2010a).

Moving the seaward RCA to 125 fathoms between 43° and 45.064° N. latitude (Figure 5), provided an additional savings of < 0.1 mt yelloweye rockfish. Hence, even more restrictive seaward RCAs than those shown in Figure 5 may be necessary to reduce yelloweye rockfish impacts by this fishery to levels lower than 0.8 mt. This reduction may be recommended by the Council in the event that a 14 mt ACL or ACT is permanently adopted for 2011 and 2012.

Seaward RCA Boundary	**36°- 40° 10'**	**40°10'- Col/Eur 43°**	**Col/Eur 43°- Cascade Head 45.064°**	**Cascade Head 45.064°- Pt. Chehalis 46.888°**	**North of Pt. Chehalis 46.888°**
Shoreward boundary to 100 fathoms					
100 fathoms					
125 fathoms					
150 fathoms					
>150 fathoms					

Figure 5. Non-trawl RCA seaward configuration that would result in full attainment of sablefish ACL and limit yelloweye rockfish projected impacts to 0.8 mt (Alternative 2; PFMC 2010a). Grey shading indicates areas closed to fishing. Copied from Figure C-14 (Appendix C Detailed Analysis of Integrated Alternatives, 2011-2012 DEIS, PFMC 2010a).

In this section, the integrated alternative 1 (Low Overfished Species Impacts) is not referred to when attempting to elucidate the effects of reducing the yelloweye rockfish ACL or ACT from 17 mt to 14 mt for several reasons. First, the integrated alternative analysis (PFMC 2010a) assumes not only a low yelloweye rockfish ACL (13 mt) for alternative 1, but also an extremely low canary rockfish ACL (49 and 51 mt) relative to the Council's FPA (17 mt ACT for yelloweye rockfish and 102 mt ACL for canary rockfish). [Note: at the beginning of 2011, harvest levels of 102 mt will be set for canary rockfish (FPA which is similar to alternative 2 in the integrated analysis) and 14 mt for yelloweye rockfish (less than the Councils FPA and most similar to alternative 1 in the integrated analysis; PFMC 2010a)] The necessary management measures described in the alternative 1 of the integrated analysis were driven by the low canary rockfish ACL, which included area closures off Washington and restricted access to sablefish. Results of these severe actions resulted in projected yelloweye rockfish landings as low as 0.1 mt. The analysis of alternative 1 for the non-nearshore model is therefore not relevant to the current situation, which is a 102 mt ACL for canary rockfish and either a 14 or 17 mt ACL (or ACT) for yelloweye rockfish.

New information provided by the most recent Total Mortality Report (Bellman et al., 2010) may require management measures that are more restrictive than previously anticipated by the 2011-2012 DEIS. The Total Mortality Report shows that the 2009 yelloweye rockfish mortality by the non-nearshore fixed gear fishery was 1.3 mt, or 0.4 mt higher than projected for 2009 using the RCA structure shown in Figure 5. This new information suggests that more restrictive management measures may be required to maintain yelloweye impacts below 0.8 mt in the non-nearshore fixed gear fishery than shown in the figures above.

The remainder of this section describes potential impacts to Oregon communities under the assumption that the seaward RCA is moved to 125 fathoms throughout Oregon waters for the fixed gear non-nearshore fishery, which may be the least restrictive measure that would be required to reduce impacts to yelloweye rockfish to acceptable levels under the 14 mt ACL scenario. More restrictive measures, such as 150 fathom seaward RCAs (PFMC 2010a) or restricting sablefish harvest below the current 2011 and 2012 allocations may be required to ensure even lower yelloweye rockfish impacts if the 14 mt ACL (or ACT) is permanently adopted for 2011 and 2012, especially given the results of the most recent Total Mortality Report (see above).

Economic and Safety Impacts: In 2009, there were 55 limited entry and 243 open access fixed gear vessels that participated in Oregon groundfish fisheries (PFMC 2010a); the 2011-2012 DEIS did not differentiate between non-nearshore and nearshore fixed gear vessels. Since 140 fixed gear vessels landed nearshore species in Oregon during 2009 (A. Dauble, ODFW, unpublished data), we can assume that there were at least 158 vessels that participated in the Oregon non-nearshore fixed gear fishery during 2009.

Moving the seaward RCA from 100 fathoms to 125 fathoms (or possibly 150 fathoms) may affect at least 158 Oregon fixed gear sablefish vessels in regards to both economics and safety. Dialogue with fixed gear sablefish fishermen indicate that moving the seaward RCA deeper results in poorer catches (much of the productive sablefish grounds are between 100 and 125 fathoms, especially during the late summer and fall in southern Oregon). Additional costs will be accrued such as increased time required to set and retrieve gear, greater fuel and equipment costs, and additional running time (vessels must travel farther off shore). These factors result in increased expenses and increased exposure to risks (such as injury).

The problems associated with the additional expense caused by increasing the seaward depth of the non-trawl RCA will be magnified by the recent large reduction of sablefish OY/ACL north of 36° N. latitude (PFMC 2010a). The amount of harvestable sablefish allocated to fixed gear fisheries north of 36° N latitude was reduced from 3,012 mt in 2009 to 2,327 mt in 2011 (23% reduction). The ex-vessel value of fixed-gear caught groundfish landed in Oregon ports during 2009 was $6,857,000 (DEIS 2010). Approximately $1,023,000 of this ex-vessel value included landings of nearshore species (see below; A. Dauble, ODFW, unpublished data), leaving approximately $5,834,000 ex-vessel value for groundfish landed by the non-nearshore fishery. We anticipate, therefore, that the 23% reduction in the sablefish ACL will result in a loss of approximately $1,341,820 (ex-vessel value) for Oregon vessels that participate in the non-nearshore fishery. These reductions in sablefish harvest, coupled with the additional expense incurred if seaward the RCA is moved deeper than 100 fathoms, may be devastating to the fishery participants and the supporting communities. The potential restrictions described above would likely result in increased expenses, lower harvest, and reductions in the number of participating vessels.

Oregon Communities Impacted: Coastal communities throughout Oregon will be impacted by additional restrictions for this non-nearshore fixed gear fishery. Fixed gear sablefish fisheries occur in all port groups (Astoria, Tillamook, Newport, Charleston, and Brookings port groups; PFMC 2006). It is important to note, however, that only up to two trawl vessels operate out of the Tillamook port group whereas none operate out of Port Orford and Gold Beach, which are part of the Brookings port group (PFMC 2006, 2010a). Even though 10 non-whiting trawl vessels were reported to land groundfish in Brookings during 2009, trawl deliveries to Brookings are low relative to trawl-contributions in Newport and Coos Bay, where deliveries were made from 26 and 23 trawl vessels during 2009, respectively (PFMC 2010a). Hence, potential restrictions described above impact not only individual fishermen, but also infrastructure within Tillamook, Port Orford, and Gold Beach because fish buyers associated with those ports have few other options for year-around groundfish product. Any further reductions in sablefish landings to reduce yelloweye rockfish impacts may also impact local economies in the Newport, Charleston, and Brookings port groups, even though each of those port groups exhibit relatively strong trawl components (PFMC 2006). Limited Entry Fixed Gear represents 20.5%, 16.8% and 23.9% of the landings within the Newport, Charleston, and Brookings port groups (PFMC 2010a).

Tillamook, Newport and Brookings port groups exhibited three of the highest poverty ratings along the entire U.S. West coast (17.6%, 16.8% and 15.3%, respectively, which represents the 3rd, 4th, and 7th highest poverty ranks along the coast; PFMC 2010a). Counties associated with Tillamook, Newport, and Brookings port groups were also described as vulnerable and low resilience. These assessments illustrate that increasing expenses (i.e., moving the seaward RCA deeper) and restricting harvest for non-nearshore fixed gear fisheries will likely result in additional negative economic impacts to specific Oregon coastal communities that are already economically depressed. The fixed gear sablefish fishery will already experience drastic reductions in 2011 relative to 2009 due to the reduced sablefish OY (see above). Restricting this fishery further to reduce yelloweye rockfish impacts lower than the 17 mt ACL will clearly have a detrimental impact to Oregon's coastal communities.

Nearshore Fixed Gear Fisheries:

The nearshore fixed gear fishery consists of limited entry and open access vessels targeting species shoreward of the non-trawl RCA. These groundfish vessels operate on the shelf shoreward of 30 fathoms, primarily targeting black and blue rockfish, cabezon, greenling, lingcod, and other nearshore rockfish. Overfished species catch projections are made using a model that applies bycatch rates (supplied by the West Coast Groundfish Observer Program) to landed catch stratified by depth (see PFMC 2010a).

Under the FPA ACT for yelloweye rockfish of 17 mt, 1.1 mt were apportioned to the nearshore fixed gear fishery. Under this option, the shoreward RCA restrictions for the Oregon nearshore fixed gear fishery would range from 20 fathoms (40°10' to 43° N latitude) to 30 fathoms (43° to the Washington border). The FPA would allow Oregon to achieve landings of target species that were near 2007 – 2009 averages (see Table C-14, PFMC 2010a).

Reducing the yelloweye rockfish ACT from 17 mt to 14 mt may result in severe impacts to the nearshore fishery. Under alternative 1 of the integrated analysis (yelloweye rockfish ACL = 13 mt), projections showed that landings of target species may be reduced by as much as 73% for the Oregon nearshore fixed gear fishery relative to the 2007 – 2009 average landings. In other words, it may be necessary to reduce the average annual landings of target species for this Oregon fishery from 218 mt to 59 mt. Potential impacts to Oregon communities under such a drastic potential reduction are described below.

Economic and Community Impacts: One hundred forty vessels made nearshore landings in Oregon during 2009 (A. Dauble, ODFW, unpublished data). Most Oregon vessels that fish for nearshore species do not target sablefish seaward of the RCA, so the nearshore represents their primary source of fishery-related income. The ex-vessel value of landings for selected nearshore species (black, blue, and nearshore rockfish, greenling, cabezon, and lingcod) in Oregon during 2009 totaled $1,023,000 (A. Dauble, ODFW, unpublished data).

Many nearshore fixed gear fishermen indicate that they would not be able survive restrictions that are more severe than what they are currently operating under. Some statements from nearshore fishermen include:

> "We have been cut back with quota so we can make very little money. To further restrict us would be a disaster financially", "We simply cannot survive with a 25% reduction, as proposed. Fuel prices, quota reductions, buyer problems, and the new Yelloweye proposal, would simply make this a losing battle", and "For the past eight years I and many others have had to adjust to reductions of catch for one reason or another. Each reduction has been and is detrimental to my livelihood" (Agenda Item B.3.c, Public Comment, June 2010).

Some of these nearshore fishermen would simply stop fishing and get into another business, which may require leaving the community. These fisheries have already experienced increasingly restrictive regulations to reduce overfished species impacts (e.g., additional shoreward RCA and catch restrictions). Any additional restrictions, and in particular further reductions in harvest, would be dire for participants in this commercial fishery and the associated communities.

Although the fixed gear nearshore fishery operates along most of the Oregon coast, most nearshore landings (76% of selected nearshore species by weight) occur in the Brookings port group (Brookings, Gold Beach, and Port Orford; Figure 6). Tillamook represents

14% of the nearshore landings, followed by Newport (7%), Charleston (3%) and Astoria (<1%). Ninety seven vessels landed nearshore species in the Brookings port group and 26 vessels made nearshore landings in the Tillamook port group during 2009 (A. Dauble, ODFW, unpublished data). Hence, 88% of the Oregon nearshore fleet operates out of the Tillamook (19%) and Brookings (69%) port groups. Note that 45% of the Oregon nearshore fleet, or 63 vessels, delivered catches to Port Orford during 2009.

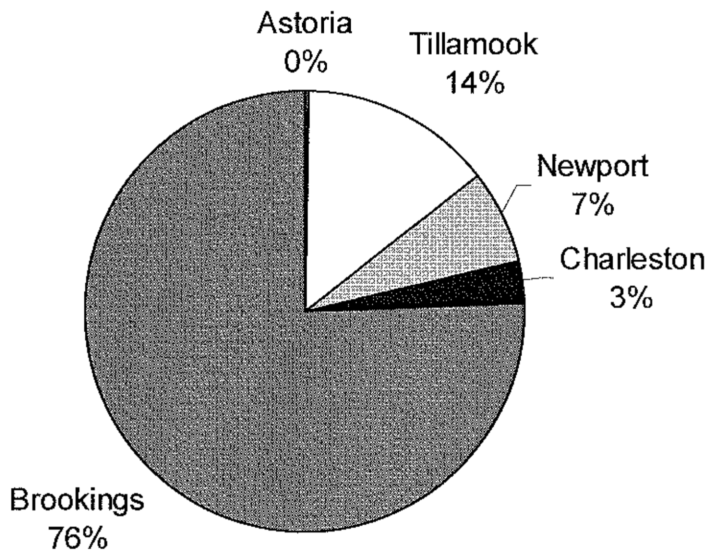

Figure 6. 2010 landings of selected nearshore species by port group (percent of landed weight; through November 29, 2010) for the nearshore fixed gear fishery (G. Krutzikowsky, ODFW, unpublished data). Species included were black, blue, tiger, vermillion and nearshore rockfish, greenling, and cabezon. Port groups were Astoria, Tillamook (Garibaldi, Tillamook, and Pacific City), Newport (Newport and Depoe Bay), Charleston (Winchester Bay, Charleston, Coos Bay and Bandon), and Brookings (Brookings, Port Orford and Gold Beach).

Communities that are most affected by restrictions to the nearshore fixed gear fishery (Brookings and Tillamook port groups) are communities that have no or limited trawl fisheries (PFMC 2010a). Zero to two trawl vessels delivered groundfish in Tillamook during recent years and no trawl fisheries exist in Gold Beach and Port Orford (PFMC 2006, 2010a). The trawl fishery in Brookings is limited to10 vessels that landed groundfish in 2009; PFMC 2010a). The ports of Charleston (and Coos Bay), Newport, and Astoria each took landings from more than 20 non-whiting trawl vessels during

2009; PFMC 2010a). Furthermore, there are no large-scale processing plants remaining in Brookings or Tillamook port groups. Impacts of reduced groundfish deliveries to the infrastructure within Tillamook and Brookings port groups may be severe because groundfish landings and the infrastructure needed to accept landings is already limited. Fish buyers require constant and sufficient supply of product. With the planned reductions of sablefish landings (see above) and the potential severe restrictions for the nearshore fishery, it is possible that fish buyers will no longer purchase groundfish from these ports. For example, one nearshore fisherman stated "We have to be able to supply an ample amount of fish to our buyers in order to keep them in business as well" (Agenda Item B.3.c, Public Comment, June 2010). If these restrictions come to fruition, many fishermen may deliver to other ports where infrastructure exists, move to a different port, or get out of the business all together, subsequently impacting the full economy of the port left behind.

The nearshore fixed gear fisheries within the Brookings port group provides live fish for the special live-fish market. Live fish are provided primarily by small vessels fishing in nearshore waters. The Brookings port group provides more live-fish landings than any other port group along the U.S. west coast (DEIS 2010). Not only does this live product provide high ex-vessel value to nearshore fishermen (2010 average ex-vessel values were as much as $7.00 per pound for some species; G. Krutzikowsky, ODFW, unpublished data), but it also provides the freshest and most specialized product for local and non-local restaurants and farmers markets. A much reduced or infrequent supply of this live product would have community impacts reaching much deeper than the significant loss of income for the individual fishermen and their crew. These potential management restrictions would affect the infrastructure (buyers and local processing), restaurants, shipping companies, and tourist industry within these communities. The limited entry nearshore fixed gear fishery in southern Oregon is primarily for live fish (G. Krutzikowsky, ODFW, personal communication), and these fish buyers are different than those for sablefish (= non-nearshore fishery). It is quite probable that if nearshore landings were severely restricted, that the primary live-fish buyer in Oregon would leave the state. The loss of this single fish buyer could put an end to live-fish deliveries for these southern Oregon ports.

As described above, Tillamook and Brookings port groups are among the most impoverished ports along the entire U.S. west coast, are vulnerable, and have low resiliency to changes in fishery regulations (PFMC 2010a). One hundred twenty three fixed gear vessels landed nearshore species in Tillamook and Brookings port groups during 2009 (A. Dauble, ODFW, unpublished data). It is our assessment that any additional management measures to further reduce yelloweye rockfish impacts for the nearshore fixed gear fishery will result in disproportionate and dire impacts to the communities of Tillamook, Brookings, Gold Beach, and Port Orford.

Conclusion

This report shows that maintaining a yelloweye rockfish ACL (or ACT) of 14 mt results in impacts much more detrimental to Oregon fisheries and communities than described in the 2011-2012 DEIS. Reasons that the impacts may be more severe than shown are:

(1) The No Action Alternative does not adequately portray the impacts to fisheries and communities that would be experienced under a 14 mt ACL for yelloweye rockfish. The No-Action Alternative described in the 2011-2012 DEIS includes reduction or elimination of research and EFPs to remain under 14 mt for yelloweye rockfish. The Council has no control over research catch (i.e., Federal and International), and it is not advisable for the States to continue forgoing the collection of research data that is needed by the Council and Federal Government to improve stock assessments and detect changes in abundance (increases or decreases) of overfished species.

(2) A recent WCGOP Total Mortality Report (Bellman et al. 2010) indicates that yelloweye rockfish mortality by the non-nearshore fixed gear fishery during 2009 exceeded the projected mortality, even under a restrictive RCA design (i.e., Figure 5). Therefore, management measures shown by the 2011-2012 DEIS may not be enough to achieve described goals for this fishery under a 14 mt yelloweye rockfish ACL (or ACT).

(3) Impacts to communities shown by the 2011-2012 DEIS were described by fix-gear license (limited entry versus open access), and not by fishing strategy (non-nearshore fixed gear versus nearshore fixed gear). Both open access and limited entry landings are dominated by sablefish, and are therefore most reflective of the non-nearshore fishery. Hence, impacts to nearshore fisheries are severely under-represented in the community/economic analysis of the 2011-2012 DEIS.

(4) Models used to project impacts and management measures cannot adequately project or control landings of overfished species under low ACL scenarios. Management measures and models are not designed to control fisheries at such low levels and the probability of being wrong (exceeding allocations and ACLs) increases as the ACL decreases. Under the new NS1 guidelines, the cost of being wrong is great, and reducing the yelloweye rockfish ACL (or ACT) below 17 mt will result in more frequent, "unanticipated" overages.

Even though all Oregon ports and all fisheries would be impacted by a 14 mt ACL (or ACT), the impact is disproportionate among ports and fisheries. For the recreational fishery, Garibaldi, the main recreational fishing port in Tillamook County, would be most affected because of the likely elimination of the majority of the fishing grounds caused by the associated requirement of a 20 fathoms RCA. The nearshore fixed gear fishery (primarily Tillamook, Brookings, Gold Beach, and Port Orford) may experience up to a 72% reduction in landings, which could ultimately eliminate this fishery altogether. The non-nearshore fishery may seem to be less impacted by a reduction in yelloweye rockfish

ACL than the other fisheries; however, any additional restrictions to this fishery will be magnified by the large reduction in the sablefish ACL north of 36^{0} N. latitude that will be effective January 1, 2011.

The economies of cities that are dependent on commercial fixed gear fisheries (Tillamook, Brookings, Gold Beach, and Port Orford) or recreational groundfish fisheries (Garibaldi) would likely be devastated by further management restrictions because they lack other sources of fishery-related income (i.e., trawl fisheries). The counties where these ports are located, Tillamook County (Garibaldi and Tillamook) and Curry County (Gold Beach, Brookings, and Port Orford), were shown to be vulnerable to adverse socio-economic impacts and least likely to respond to severe decreases in landings (i.e., low resiliency). Tillamook and Curry counties already have some of the weakest economies among the U.S. West Coast, with high unemployment levels (Curry=8%; Tillamook=5.4%) and high poverty levels (Curry=15.3%; Tillamook=17.6%). Additional job losses would be expected with greater management restrictions, which would result in wide-spread and far-reaching economic devastation for these counties.

It has been clearly demonstrated that the "fastest rebuilding times to rebuild overfished species are not necessarily those that best achieve our long-term conservation objectives" (Agenda Item I.4.c, WDFW Report, September 2010). The Councils final preferred alternative for yelloweye rockfish (17 mt ACT) was lower than that necessary to reach T_{target} (= 20 mt ACL). Reducing the ACT to a lower level (e.g., 14 mt) in hopes of achieving a faster rebuilding time will be devastating to Oregon communities, will be difficult if not impossible to predict and track (due to imprecise models), will not be manageable (due current management tools available), and will not achieve long-term conservation objectives.

Given the uncertainty and imprecision of rebuilding a species such as yelloweye rockfish to a T_{target} date that is more than 50 years away, and given that the fastest rebuilding times may not achieve long-term conservation objectives, it is highly questionable whether the severe impacts to communities under a 14 mt ACL for yelloweye rockfish is justified. Rebuilding plans predict that a 14 mt ACL would reduce the rebuilding time for yelloweye rockfish by only 7 years relative to a 17 mt ACL, from 2074 to 2067. Clearly the onerous management measures required to achieve this small and uncertain improvement in rebuilding time would not "take into account needs of fishing communities", as required by MSA, nor would they provide for a "safe, well managed and profitable fishing community", which was part of a definition provided by the Council at the April, 2006 meeting (PFMC 2006). The best scientific data and analyses (e.g., 2009 Stock Assessment, Stewart et al., 2009) should not be discounted due to misunderstanding by the courts, or to poor justification shown by the 2011-2012 DEIS; an ACL (or ACT) for yelloweye rockfish should not be lower than 17 mt.

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Agenda Item H.2.c
ODFW Letter 2
March 2011

Oregon
Theodore R. Kulongoski, Governor

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TO:	William Stelle, Administrator Northwest Region, National Marine Fisheries Service
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CC:	Frank Lockhart, Assistant Regional Administrator Northwest Region, National Marine Fisheries Service
FROM:	Stephen Williams, Deputy Administrator Fish Division, Oregon Department of Fish and Wildlife
RE:	RIN No. 0648-BA01
Date:	January 4, 2011

This comment is in response to a recent Proposed Rule concerning 2011-2012 Biennial Specifications and Management Measures (50 CFR Part 660: Federal Register /Vol. 75, No. 212 /Wednesday, November 3, 2010 / Proposed Rules, pages 67810 – 67896). Please refer to RIN No. 0648-BA01. The purpose of this comment is to propose amending the preamble and sections 50 CFR 660.112(b)(1)(xii) and 50 CFR 660.60(h)(5) of the Federal Pacific Coast Groundfish Regulations and recommend increasing amount of yellowtail rockfish set-aside for exempted fishing permits (EFP).

Processing At-Sea

Current federal regulations (50 CFR Part 660, Subpart G, Federal Pacific Coast Groundfish Regulations for Commercial and Recreational Fishing 3-200 Nautical Miles off Washington, Oregon, and California, October 1, 2010) do not prohibit processing fish at sea onboard non-whiting limited entry trawl vessels. Processing is defined to include freezing (glazing) but does not mean heading and gutting unless additional preparation is done.

New Federal Pacific Coast Groundfish Regulations, that may become effective on January 11, 2011, will prohibit vessels from landing frozen product. This action was first proposed to be prohibited under 50 CFR Part 660 in the Federal Register on August 31, 2010 (Federal Register /Vol. 75, No. 168 / Tuesday August 31, 2010 /Proposed Rules, see page 53414) and became final on October 1, 2010 (see Federal Register /Vol. 75, No. 190 / Friday, October 1, 2010 / Rules and Regulations, Pages 60868 – 60999). The language in the referenced proposed rule is: "**§ 660.112 Trawl fishery—prohibitions, (b) Shorebased IFQ program,** (xii) *Process groundfish at-sea* (''at-sea processing'') by vessels in the Shorebased IFQ Program regardless of the type of gear used, with the following exceptions: (A) A vessel that is 75-ft (23-m) 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, and (B) A vessel that has a sablefish at-sea processing exemption, defined at § 660.25(b)(3)(iv)(D), subpart C may process sablefish at-sea."

At the time these regulations were finalized, the Council was unaware that the activity had been planned for in 2008/2009 and occurred in 2010, when processing groundfish onboard non-whiting trawl vessels was permitted by regulation. Public comment received at the November 2010 meeting revealed that one individual had legally installed and operated the necessary equipment to process groundfish onboard his non-whiting trawl vessel under the guidance of the current regulations. There is great expense associated with the infrastructure required to perform this activity. This individual began delivering groundfish as a frozen product in 2010 with the purpose of providing the public with a product of highest quality and maximizing the value. This vessel has since made a number of landings of frozen groundfish in Oregon. The State of Oregon adopted a process for converting landed weight of glazed fish into round weight for fish ticket accounting. This process may be implemented in federal rule for use in quota pound tracking. Language for this process is provided below.

It is important to note that similar considerations have been made in the past. During the process of approving Amendment 14 to the Groundfish Fishery Management Plan (Permit Stacking, Season Extension, and Other Modifications to the Limited Entry Fixed Gear Sablefish Fishery; http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-14/), at-sea processing of sablefish caught in the limited entry primary season was prohibited. A vessel was identified as active in glazing sablefish at sea. A permit was developed to allow this activity to continue for those who had demonstrated to do so already. This is a similar situation. We therefore respectfully propose amending 50 CFR Part 660 to allow an exception for this vessel to continue delivering frozen product.

We are aware that other procedures may be available to make this regulation change; however, we feel this is the most appropriate and timely venue. There are no trailing amendments that are appropriate for the inclusion of this requested change. The only other mechanism available is to make the regulation change through the 2013-2014 Harvest Specifications and Management Measures. These vessels invested substantial resources to conduct this process legally, and making them wait for two years before resuming their operations is unreasonable. We therefore ask that this regulation change be made via this public comment to the Proposed Rule concerning the 2011-2012 Biennial Specifications and Management Measures.

Proposed Changes

We offer potential language for our proposed changes under sections 50 CFR 660.112(b)(1)(xii) and 50 CFR 660.60(h)(5) that are shown in the Proposed Rule for 2011-2012 Biennial Specifications and Management Measures (see Federal Register / Vol. 75, No. 212 /Wednesday, November 3, 2010 / Proposed Rules / pages 67810 – 67896). These proposed changes are:

(1) Amend 50 CFR 660.112(b)(1)(xii) by adding a new clause (C) as follows: **"(C) A trawl vessel that has legally processed Pacific groundfish (other than Pacific whiting) at sea prior to July 20, 2010 and that is operating under the Shorebased IFQ Program regardless of the type of gear used."** This exception would pertain only to the single vessel that has been carrying out this activity. Exceptions for at-sea processing are already in regulations for a shoreside whiting vessel (A) and for a limited entry fixed gear vessel delivering sablefish (B).

(2) Amend 50 CFR 660.60(h)(5) by adding a new clause (xii) as follows: **"(xii) The following conversion applies to vessels landing sorted catch that is frozen (glazed) in the Shorebased IFQ Program. A conversion factor of 0.95 must be applied when there are fewer than 60 individuals of any species or species group in a single landing. Conversion factors must be calculated for each landing for each species or species group when there are 60 or greater individuals of a category (=species or species group) in a single landing as follows: Weigh a sample of at least 20 glazed fish to obtain the glazed weight; Completely remove glaze from individual fish making up the sample; Re-weigh the sample to obtain the non-glazed weight; Divide the non-glazed weight by the glazed weight to obtain the conversion factor; A separate conversion factor may be calculated for each size grade of a species, but may only be applied to landings of that size grade; Documentation of this calculation must be retained with the dock receiving ticket. "**

Preamble Errors

In reviewing the above referenced document, Oregon Department of Fish and Wildlife (ODFW) staff noticed discrepancies in the sector specific harvest guidelines listed in the preamble portion of the document for bocaccio, canary rockfish, and yelloweye rockfish. The regulatory text beginning on page 67849 contains sector specific harvest guidelines recommended by the Pacific Fisheries Management Council at their June 2010 meeting.

While it is understood that the regulatory text is the legal portion of the document, having differing values may lead to confusion by the public, fisheries managers, or enforcement personnel.

Proposed Changes

We recommend the following changes beginning on page 67829:

For bocaccio, from page 67829, in the third column:

ACL allocations were also considered by the Council. The following are the Council's recommended allocations for Bocaccio in 2011: Limited entry nonwhiting trawl, ~~**29.6**~~ **[60]** mt; limited entry and open access non-nearshore fixed gears, 57.9; limited entry and open access nearshore fixed gear, ~~**0.3**~~ **[0.7];** California recreational ~~**161.8**~~ **[131]** mt. The following are the Council's recommended allocations for bocaccio in 2012: Limited entry non-whiting trawl, ~~**30.9**~~ **[60]** mt; limited entry and open access non-nearshore fixed gears, ~~**60.4**~~ **[57.9];** limited entry and open access nearshore fixed gear, ~~**0.3**~~ **[0.7]**; California recreational ~~**168.9**~~ **[131]** mt. The recreational portion of the non-trawl allocation of bocaccio would accommodate a potential increase in bocaccio impacts in the recreational fishery as a result of allowing retention of shelf rockfish within the 30 fm (55 m) depth restriction in the CCA.

For canary rockfish, from page 67830, in the third column:

The Council also considered the allocation of the canary ACL among fishery sectors. The following are the Council's recommended allocations for canary rockfish in 2011: Limited entry non-whiting trawl, 19.3 mt; limited entry Pacific whiting 14.1 mt (catcher/processor 4.8 mt, mothership 3.4 mt, and shorebased 5.9 mt); limited entry and open access non-nearshore fixed gears, 2.3; limited entry and open access nearshore fixed gear, 3.3; Washington recreational, ~~**4.4**~~ **[2.0];** Oregon recreational ~~**14.5**~~ **[7.0]** mt; and California recreational ~~**22.9**~~ **[14.5]** mt. The following are the Council's recommended allocations for canary rockfish in 2012: Limited entry nonwhiting trawl, 19.3 mt; limited entry Pacific whiting 14.8 mt (catcher/processor 5 mt, mothership 3.6 mt, and shorebased 6.2 mt); limited entry and open access non-nearshore fixed gears, 2.3; limited entry and open access nearshore fixed gear, 3.3; Washington recreational ~~**4.4**~~ **[2.0]**;; Oregon recreational ~~**14.5**~~ **[7.0]** mt; and California recreational ~~**22.9**~~ **[14.5]** mt.

For yelloweye rockfish, from page 67834, first column:

The following are the Council's recommended allocations for yelloweye rockfish in 2011 and 2012: Limited entry non-whiting trawl, 0.6 mt; limited entry and open access non-nearshore fixed gears, 1.3; limited entry and open access nearshore fixed gear, ~~**0.7**~~ **[1.1];** Washington recreational, 2.6; Oregon recreational, 2.4 mt; andCalifornia recreational, ~~**2.6**~~ **[3.1]** mt.

Yellowtail Rockfish Exempted Fishing Permit Set-Aside

The National Marine Fisheries Service (NMFS) issued an EFP at the end of August 2010 for a project by the Recreational Fishing Alliance of Oregon (RFA-OR) that is valid for 12 months, through August of 2011. This EFP was approved for 2010 by the Pacific Fisheries Management Council (PFMC) at their November 2009 meeting. Due to this permit being issued by NMFS late in the 2010 fishing season, all activity under this EFP will occur in 2011. At the current yellowtail rockfish set-aside level (or "off-the-top" deduction) for 2011, less than 1/3 of the proposed trips would be accommodated; the target species, yellowtail rockfish, would be the most constraining to the project. This small sample would prevent RFA-OR, in conjunction with ODFW and PFMC, from determining the success of this project and the viability of this gear type for future use in the recreational fishery. ODFW does not believe that increasing this set aside will impact any other fisheries or sectors. Total mortality for this species has been less than 20% of the allowable biological catch (ABC) and associated optimum yield (has equaled the ABC) (16% in 2009, 10% in 2008, 9% in 2007 and 13% in 2006; NMFS total mortality reports http://www.nwfsc.noaa.gov/research/divisions/fram/observer/index.cfm).

Proposed Changes

We request the 2011-2012 yellowtail rockfish set-aside be increased in the final 2011-2012 harvest specifications and management measures to accommodate at least 10 mt of EFP catch so that this underutilized species can be harvested in an experimental fishery during 2011, and perhaps beyond.

GROUNDFISH ADVISORY SUBPANEL REPORT ON PROCESS FOR IMPLEMENTING 2011-2012 SPECIFICATIONS AND MANAGEMENT MEASURES

The Groundfish Advisory Subpanel (GAP) received a report from Ms. Mariam McCall and Mr. Frank Lockhart on the process for implementing 2011 harvest specifications and management measures. The GAP offers the following comments.

Regarding the record building process, the GAP is concerned that it appears that neither oral testimony without written comment, nor spoken answers to questions before the Council after providing written testimony make it into the record. In this litigious environment, a robust record is critical. As we have seen, even well reasoned decisions reached by the Council are vulnerable if the record is not adequately documented. The GAP is frustrated that much of the necessary information was actually provided and hopes the Council and National Marine Fisheries Service (NMFS) will explore ways to get that valuable information into the record in the future. We ask that the entire transcript be placed on the record rather than continuing the current process of relying on written minutes.

Broadly speaking, the GAP has grave concerns about NMFS' preferred harvest specification alternatives for cowcod and yelloweye. Reducing the cowcod annual catch limit (ACL) from 4 to 3 metric tons (mt), and the yelloweye ACL from 20 to 17 mt will result in significant hardship for individual fishermen, processors, fishing communities, and seafood consumers. The cowcod reduction represents an immediate 25 percent decrease in the ACL and the yelloweye reduction represents 15 percent over what the Council approved - major reductions for species that already drive (or choke) the management engine due to low allocations and interactions with target species. In exchange, rebuilding timelines are reduced insignificantly decades from now by percentages that amount to statistical noise.

Yelloweye

Speaking specifically to the issue of yelloweye, the GAP would prefer a 20 mt ACL. At 20 mt, most sectors of the fishery have enough yelloweye to at least have a chance of harvesting their target species without being forced so far inside or having trip limits reduced to such an extent that fishing becomes an exercise in futility. At 17 mt the constraints will continue to result in loss of jobs both at sea and shoreside. At 14 mt, we will be faced with disaster because there is simply not enough yelloweye in the system for many fisheries to continue to operate at all.

For example, at 17 mt of yelloweye there are 13 boats in the northern California charter boat fleet. At 14 mt, we would expect to see the fleet reduced to 3 boats with consequent negative impacts on the fishery sector and the fishing communities of northern California. CDFG projections suggest $7 million per month would be lost in northern California as a result of a reduction in the yelloweye ACL from 17 to 14 mt.

Likewise, a 14 mt ACL has many negative effects on Oregon recreational fisheries. These are economic, biologic, and social in nature.

Economically, Oregon has some ports that have already lost all of their access to groundfishing due to depth closures from 17 mt yelloweye constraints. This has resulted in the collapse of many fishing and supporting businesses in those ports (e.g. Winchester Bay). With a 14 mt ACL, even more communities would be subject to this outcome with ancillary losses to supporting businesses such as tackle shops, motels, restaurants, fuel stations and the ports or harbors.

Biologically, the Oregon recreational groundfish fishery consists of a variety of species. A 14 mt ACL would create even more limiting depth restrictions. A 50 percent reduction of fishing area would result. There would be less diversity of species creating more fishing pressure on nearshore species with the potential for localized depletion.

Socially, a 14 mt ACL creates issues of conflict between users from different fishing sectors. The crowding in the small remaining areas open to fishing would place harvesters in closer proximity and unable to avoid impacting one another.

Garibaldi, OR is an example where predicted economic impacts resulting from loss of infrastructure and fishing-related business could have a magnitude of $3.3 million (Dean Runyan Associates, 2009) if an ACL of 14 mt was implemented. Coastwide impacts in Oregon are estimated at approximately $54 million (Dean Runyan Associates, 2009).

As in California and Oregon, 14 mt in the WA recreational sector would result in exceedingly restrictive fathom lines (30 fathoms in area 2 and 20 fathoms in area 4). This puts pressure on nearshore stocks and prevents access to abundant stocks (e.g. yellowtail rockfish is abundant but wouldn’t be accessible at 14 mt), and harms charter businesses and other recreational infrastructure.

In the northern California nearshore commercial fishery, we saw the loss of a fish buyer as a result of the reduction in yelloweye ACL to 14 mt at the end of last year. That reduction forced the open fishing area to inside of 20 fathoms making it impossible to continue to land benthic species in the volumes necessary to maintain a buyer. As a direct result of the loss of that market, one long-time fisherman in that fishery lost his house and was forced to move back in with his parents.

In the Oregon nearshore commercial fishery, a similar result will occur. Reducing the ACL from 17 mt to 14 mt would force fishermen inside and severely restrict the fishery for lingcod and China rockfish. The sablefish fishery will feel similar effects, although its line will have to be moved far to the outside rather than inside. North of 40°10’ N. lat., the open access sablefish fishery would be moved far outside of their current fishing areas resulting in significantly increased costs, as well as safety concerns for the smaller boats that make up the bulk of this fleet. That fishery is the bread and butter for many fishermen and therefore for many fishing communities on the coast, and increased costs and safety concerns reducing participation in the fishery would create widespread impacts on jobs.

In 1980, there were six fish processing plants on the Seattle waterfront employing over a thousand jobs shoreside and four to seven vessels delivering fish to each plant. Those 30 vessels operating off of the Washington coast were employing four to five crew each. The decline in critical fishery species such as yelloweye rockfish has contributed to the loss of all of these processing plants and jobs on the Seattle waterfront over the past 30 years. Similar losses have occurred in the communities of Neah Bay, Westport, Bellingham, and Ilwaco, and other fishing communities in the State of Washington. The loss of shore-based jobs and harvesting vessels that delivered to shore-based plants has significantly eroded the economic infrastructure of fishing communities in Washington.

The difference in allowing a harvest of 20 mt of yelloweye versus harvesting 17 or 14 mt results in an almost immeasurable shortening of the time to rebuild this long-lived species. However, the reduction to 17 or 14 mt will seriously jeopardize the success of the new catch share program and the ability to harvest the many healthy fishery resources off the coast. The inability to harvest the healthy stocks of fish will result in those fishing communities that remain losing critical infrastructure such as fuel docks, ice plants, and processing plants. Without the collective activities of all the above elements of commerce, a fishing community will lose its economic viability – vessels, processing plants, other infrastructure and jobs. Moreover, groundfish landings have long been the backbone of infrastructure for other west coast fisheries. If it goes, those fisheries will soon follow.

At 17 mt, the trawl sector has roughly 1200 pounds of yelloweye – less than 10 pounds for each permit. At 14 mt, the trawl sector sees its yelloweye allotment reduced by half resulting in allocations of less than 5 pounds (less than one fish) per permit if the fish was distributed evenly. Because it is not distributed evenly, many fishermen are left with fractional fish and will simply not be able to fish the shelf. This will impact not only the fishermen and crews, but also processing facilities, processing employees, communities and consumers.

In the National Resources Defense Council (NRDC) lawsuit, much was made of the fact that revenues are up over the past several years. That is not a good measure of harm for several reasons. First, we have still not recovered from the 2000 disaster declaration. We have been in a slow moving disaster since then. Second, this formulation fails to account for increased costs – fuel, insurance, and other operating costs are up dramatically. This formulation also doesn't take into account the dramatically increased value of the whiting fishery. The remainder of the groundfish fishery has remained relatively stagnant in the face of the increased costs mentioned above. Most importantly, that formulation doesn't take into account effects on different fishery sectors, either by fishery and gear type or geographically. As illustrated above in the trawl example, a roughly 20 percent reduction in yelloweye ACL would be a 50 percent reduction for the trawl fishery completely eliminating the opportunity for a shelf fishery. Reduction of the yelloweye ACL could also lead to the failure of the trawl catch share program.

In their public comment letter under Agenda Item H.1, the NRDC claims that yelloweye rockfish rebuilding is behind schedule according to the 2009 assessment and a lower ACL with a shorter rebuilding period should therefore be implemented. The SSC noted yelloweye rockfish rebuilding is three years behind schedule. However, the probability of recovering by the current T_{TARGET} of 2084 is well above 40 percent under status quo (i.e., the rebuilding plan prior to Amendment 16-5 considerations). This was not a cause of undue concern to the SSC who stated that progress towards rebuilding was considered adequate for yelloweye. They recommended no modification of T_{TARGET} or adjustment to the rebuilding harvest rate was necessary.

Nevertheless, the Council's preferred alternative was to reduce the spawning biomass per recruit (SPR) harvest rate in the rebuilding plan to increase the probability of successfully rebuilding yelloweye by 2084 to 50 percent.

Lastly, the emerging Quileute tribal whiting fishery and the proposed modifications to the International Pacific Halibut Commission (IPHC) survey will both require additional yelloweye, limiting the amount available for other fisheries. Implementing a reduction in the ACL, while at the same time increasing impacts due to new fisheries and survey techniques will merely exacerbate the hardship mentioned above.

Cowcod

In their public comment letter under Agenda Item H.1, the NRDC claims that the 2009 assessment indicates cowcod is not rebuilding. Cowcod is rebuilding, albeit slowly, according to the 2009 assessment as evidenced in Figure 1. NRDC makes this claim based on the difference in the rebuilding outlook from the 2005 assessment relative to the 2009 assessment. This is a disingenuous statement that violates the best available science standard mandated in the MSA. The 2007 cowcod assessment corrected a model mis-specification in the 2005 assessment. The Council's use of the best available science in the last management cycle did not change the optimum yield (OY), but rather the target year, which was inappropriately set under Amendment 16-4 based on the results of the incorrectly specified 2005 assessment model. The Council's Preferred Alternative for 2011 and 2012 maintained the 4 mt ACL and the SPR harvest rate in the status quo rebuilding plan, while changing T_{TARGET} from 2072 to 2071.

Like yelloweye, a reduced ACL for cowcod has the potential to jeopardize the groundfish trawl catch share program. Trawl catch of cowcod represents the greatest variability bin catch for that species and in 2004, the trawl sector alone caught 3 mt. Of course, this variability in the trawl catch also has the potential to shut down other sectors.

CCA Management Measures

Two measures concerning nearshore fisheries in the Cowcod Conservation Area (CCA) adopted by the Council last June were disapproved under the NMFS Preferred Alternative. Currently, recreational fishing inside of 20 fm is allowed in the CCA and retention of shelf rockfish is prohibited while fishing in these waters. The Council Preferred Alternative would allow fishing opportunities inside 30 fm within the CCA and would also allow retention of shelf rockfish while fishing within this zone. The GAP understands that NMFS would like to see further research within the 30 fm zone in the CCA to ensure this change would not result in increased impacts to cowcod. However, the GAP believes the retention of shelf rockfish should still be allowed while fishing within the 20 fm zone that is currently open to fishing.

Retention of shelf rockfish in this area will not negatively impact cowcod nor is it likely to increase fishing effort in this area. Recreational fishermen in this area target nearshore rockfish, lingcod, cabezon, scorpionfish, and non-groundfish species such as California sheephead. Fishermen targeting these species are encountering shelf rockfish such as vermilion rockfish that are discarded with some consequent mortality. Allowing retention of shelf rockfish will not draw more effort into the nearshore fishery within the CCA, but will turn wasted discards into landings. Effort will not likely be affected since the CCAs are far enough off the mainland coast that only the vessels that currently fish the area will continue to fish. Allowing retention of shelf rockfish will enable those vessels currently fishing the area to attain bag limits sooner, which reduces wasteful discards and decreases mortality of rockfish encountered when fishing those waters.

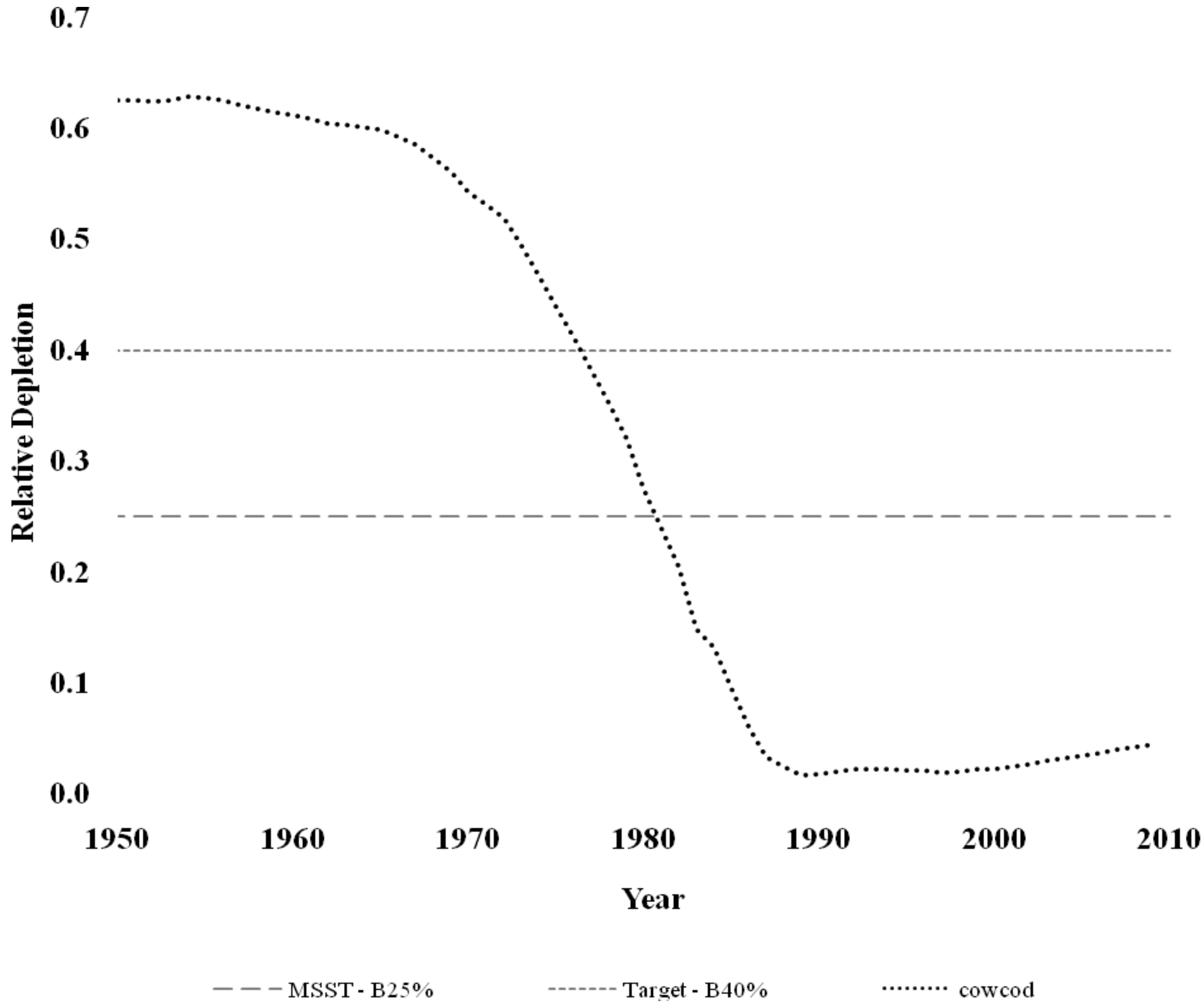

Figure 1. Cowcod spawning biomass time series estimated in the 2009 updated assessment.

Darkblotched Rockfish

The GAP is pleased that the NMFS Preferred Alternative darkblotched harvest specifications maintain the Council Preferred Alternative ACLs adopted last June. The GAP believes that specifying ACLs lower than the Council Preferred Alternative would result in significant negative impacts to the at sea and shoreside trawl fisheries and the west coast fishing communities that depend on those fisheries.

Finally, the GAP wishes to highlight the great letters on this topic by Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, and California Department of Fish and Game included in the briefing book. One important point made in those letters is that one of the goals of a rebuilding timeline is to maximize long term economic outcomes. We note that there will be no long term gain to rebuilding if the short term pain eliminates the fleet.

The GAP also wishes to incorporate by reference our past statements and past Harvest Specification Environmental Impact Statements. Those documents contain a wealth of information regarding impacts of reduced ACLs for critical overfished species on the various segments of the groundfish fishery.

PFMC
3/7/11

GROUNDFISH MANAGEMENT TEAM REPORT ON THE NMFS PREFERRED ALTERNATIVE FOR 2011-12 HARVEST SPECIFICATIONS FOR YELLOWEYE ROCKFISH AND COWCOD

A. Implications of the Delay in the Approval and Implementation of 2011 Regulation for Recreational Fisheries

1. California

The 2011-2012 recreational management measures that were approved in June 2010 by the Council included modifications to: lingcod size limit and spawning closure, scorpionfish depth restrictions, cabezon bag limits, and depth restrictions and species retention within the Cowcod Conservation Area (CCA). Although these regulation changes have also been approved by the California Fish and Game Commission, they cannot be implemented into state regulations prior to their adoption in Federal rule.

The delayed approval of the 2011-2012 Final Environmental Impact Statement (FEIS) has caused confusion among recreational anglers who were expecting regulations to be in effect for the 2011 season. California Department of Fish and Game (CDFG) has informed the Groundfish Management Team (GMT) that the delay has increased the agency's workload from the need to respond to public inquiries, conduct outreach and education efforts, and revise state regulation booklets. In the event that the National Marine Fisheries Service (NMFS) adopted management measures differ from the Council recommendations, future inseason actions and revised state regulatory packages may be necessary.

2. Oregon

The only regulatory change to the Oregon recreational bottomfish fishery for 2011 and 2012 that was approved by the Council in June of 2010 was a seasonal one fish sub-bag limit for cabezon, from April 1 through September 30. The Oregon Fish and Wildlife Commission has already taken action to include this regulation in state regulations. This is possible since the state regulation is more restrictive than the current federal regulation.

3. Washington

Recreational management measures approved by the Council in June 2010 include a reduced aggregate groundfish daily limit from 15 to 12, a sub-limit for cabezon of two per day, a shortened-time period for the 20 fm depth restriction in the north coast management area and allowance for rockfish retention seaward of 30 fm in the south coast management area.

Inseason changes effective March 1, 2011 implemented the reduced aggregate groundfish daily limit and corrected the opening date for the lingcod season in Marine Areas 1-3 so it conforms to the analysis in the FEIS.

The delay in the adoption of the final harvest specifications for 2011 will result in a delay of the provision to allow rockfish retention seaward of 30 fm in Washington's south coast management area beyond the expected effective date of March 15, 2011. Washington Department of Fish and Wildlife (WDFW) will notify the fishing community of this delay. Regulations implementing the 20 fathom depth restriction in the north coast management area will be implemented on schedule following adoption of regulations based on the FEIS for 2011-2012. Washington

Department of Fish and Wildlife implemented the cabezon sub-bag limit through emergency regulation because it is more restrictive than current federal rules.

B. General Comments on the NMFS Alternative

Mr. Frank Lockhart, Ms. Mariam McCall, and Mr. Kevin Duffy gave a joint briefing to the Groundfish Management Team (GMT) and Groundfish Advisory Subpanel (GAP) on the NMFS preferred alternative. Mr. Lockhart also came to the GMT to answer follow-up questions. We appreciate his time. We have not had time to review the FEIS in any detail.

We cannot provide the Council with analysis on the question of whether the 2074 T_{Target} for yelloweye associated with the NMFS alternative is too far out in time or not because we are unclear on the legal standard that determines that question.

Some of us are also unclear on how the NMFS alternative does or does not depart from the constant harvest rate approach that the Council has followed when setting and adjusting rebuilding plans based on updates of stock status and biology. At NMFS' request, the discussion has focused primarily on differences between 14 mt and 17 mt on how the "needs" of communities are affected by that difference. The 14 mt originated with the Council's ramp-down strategy, which itself was based on the previous assessment. The most recent stock assessment differed from the previous assessment in that it estimated the stock to be larger in scale (i.e., absolute size) by ~35 percent, improved in status (i.e., size relative to its the estimated unfished size) because of estimated progress in rebuilding and on account of scientific uncertainty, and slightly less productive (i.e., expected to rebuild at a slightly lower pace at a given harvest rate).

Lastly, some on the team point to the significance of the comments that we raised to the Council in June 2010 on the evaluation of long-term conservation in the Council's rebuilding plans. There was not sufficient time to brief the Council in detail or have the analyses reviewed by the SSC because the Council was asked to respond to the court decision at the June meeting. We do hope to have opportunity to explore these analyses with the Council and SSC in the future.

C. Value of an ACT

One important difference between the Council's final preferred alternative and the NMFS alternative is that there is no ACT for yelloweye. The GMT sees benefit in the buffer between the annual catch limit (ACL) and ACT. Higher than expected catch from within any fishing sector or elsewhere can create the need for an inseason adjustment. The annual catch target (ACT) buffer reduces the probability that the management measures set for a sector have to be changed inseason. The buffer also provides opportunity for research, as described below.

We note that the ACT benefit can be had for a buffer less than 3 mt. The difference is one of degree and risk, which is difficult to quantify. As we understand it, NMFS has expressed concerns with the T_{Target} associated with the ACL of 20 mt, which is 2084. A 1 mt buffer (i.e., an ACT of 17 mt and ACL of 18 mt) would correspond to a T_{Target} of 2077 if based on the same logic of the 20 mt ACL corresponding to 2084 (i.e., the T_{Target} is estimated based on the constant harvest rate associated with the ACL). Again, we do not know how to aid the Council in weighing the benefit of a 1 mt ACT buffer against the 3 year difference in T_{Target} between the NMFS preferred ACL and an ACL of 18 mt.

The Council's Final Preferred Alternative (FPA) for cowcod did not specifically include an ACT, yet management measures were set for a harvest level of 3 mt and a 1 mt buffer was left unallocated. In effect, this served the same purpose as an ACT buffer. Under the NMFS preferred alternative, that 1 mt buffer has been eliminated.

D. Yelloweye

1. General Comments on Yelloweye

Our understanding from the briefings we received, NMFS is still looking for input on the difference between the 17 mt ACL and the 14 mt optimum yield (OY) that was in place in 2010 by court order and remains in place now. The question, again, is how the 3 mt difference affects the "needs of fishing communities" during 2011-2012.

The Council's judgment of how well a particular ACL addresses the "needs of fishing communities" is based in large part on the GMT's projections of catch. Yelloweye is encountered in several sectors and a full explanation of the difference between a 14 mt and 17 mt ACL involves a look at the projections for each sector. It also involves consideration of how the Council chooses to apportion the ACL between sectors. We discuss the sectors most affected by yelloweye rebuilding below, sector-by-sector, trying to keep to a summary of the salient points.

We would first like to make a couple of general points that apply across all sectors. Both relate to the general point that the Council's assessment of the "needs of fishing communities" involves awareness of catch variability and the risk that this variability poses to planned catch limits (e.g., harvest guidelines) in each sector. The Council makes a judgment on how a certain level of catch might affect a given sector based on a projection knowing full well that catch might come in above or below that projection. The question is what level of risk to plan for in each sector. The imprecision of our projection models makes it a difficult question to answer.

Catch variability applies to all sectors and all stocks, yet yelloweye has been highly variable and this variability has been enough to affect management. In response, the Council has taken a precautionary approach to catch uncertainty in each sector, although the degree of risk aversion is different from sector to sector.

The first point we draw from this is that this precautionary planning approach makes it likely that yelloweye catch will come in lower than the sum of the individual projections. However, the imprecision of GMT impact projection models does lead to occasional circumstances, such as seen in 2007, where the sum of sector impact projections are exceeded by the unexpected overage in one sector. This underscores the benefit of an ACT for a stock like yelloweye, as discussed briefly below. Illustrative of these points is catch has remained below the OY since 2003, and considerably so in all but one year. In 2009, the official estimate of catch was 11 mt even though the Council had management measures targeted at the 17 mt OY.

A natural question to such a result is why do fishing communities "need" 17 mt, or 14 mt for that matter, if catch came in so much lower? The same question can be asked of individual sectors that came in lower than the amounts the Council planned for. The answer is that we do not have much confidence that the result will be the same in future years. Catch variability means that catch could come in high based on the same management measures. The 2009 and 2010 California recreational catch provides an example of this. In 2009 catch was above the projection enough to exceed the harvest guideline. In 2010, with identical management measures in place, the catch came in at 1.2 mt (preliminary estimate), well below the harvest guideline.

The ramp-down for yelloweye meant that we had little data on which to base catch projections. The Council achieved reductions in catch with changing management measures, or at least with management measures for which we had little to go on in terms of predicting fishing effort and catch. As management measures stabilize, the data should improve and our projections should become more precise.

2. California Recreational

Approval of harvest specifications lower than those adopted by the Council may require reductions in season lengths to keep catch within the revised limits for California. Shallower depth restrictions North of Point Arena where the majority of yelloweye impacts originate is no longer possible as they are already constrained to a 20 fm depth restriction and further reductions would be considered a risk to vessel safety. If NMFS adopts a yelloweye ACL lower than 17 mt, seasons even shorter than the already extremely limited lengths (e.g., three months in the Mendocino Management Area) may be necessary to keep catches under the revised limits (2011-2012 SPEX EIS). This would include a one and a half month season in the Mendocino Management under a 14 mt ACL. Imposing further restrictions due to a lower ACL would cause further economic impacts to communities north of Point Arena, particularly Fort Bragg and Shelter Cove.

In total, the reductions in fishing opportunity in terms of reduced season lengths under a 14 mt ACL is equivalent to a coast wide combined loss of six and a half months of fishing season 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. These communities have already lost millions of dollars over the last decade due to the management measures taken to rebuild overfished species. A 14 mt ACL for 2011-2012 further exacerbates these economic effects. CDFG submitted public comments to NMFS on the 2011-12 Biennial Specifications and Management Measures (RIN 0648-BA01) which further discusses the economic impacts to these communities over the last decade as a result of management measures taken to protect overfished species.

3. Oregon Recreational

With regard to the delay in the approval of ACLs and ACTs for yelloweye rockfish, approval of harvest specifications lower than those adopted by the Council may require changes to season and depth restrictions to keep catch within the revised limits for Oregon. If an ACL (ACT) less than 17 mt is approved by NMFS, actions such as shallower depth restrictions, decreased bag limits or full fishery closure, may be necessary on the part of the state to prevent adjusted harvest guidelines from being exceeded. This will likely cause economic impacts to coastal Oregon communities, particularly Garibaldi and Gold Beach, which rely heavily on the recreational bottomfish and halibut fisheries. Oregon Department of Fish and Wildlife (ODFW) provided a document to NMFS via public comment, included in the briefing book under Agenda Item H.2., on the "Proposed 2011–2012 harvest specifications and management measures for Pacific Coast Groundfish Fishery" that outlines these impacts. As an example, the estimated loss of revenue from the decreased number of angler trips projected under a 13 mt yelloweye ACL, rather than 17 mt, for Garibaldi, a city of less than 1,000 people, is projected to be up to $3.3 million.

4. Washington Recreational

If the final harvest specifications for yelloweye rockfish result in a lower ACL and ACT than what the Council approved, additional changes to Washington recreational management measures may be necessary to stay under lower harvest guideline amounts. If NMFS adopts an ACL less than 17 mt it is likely that more constraining depth restrictions and rockfish retention allowances would be necessary to keep the recreational harvest under revised limits. More restrictive management measures will negatively impact local communities that are dependent on sport fishing. These communities are mostly remote areas that rely on the economic benefits created by recreational harvest opportunities. WDFW discussed these impacts in more detail in public comments submitted on the proposed rule to implement the 2011-2012 Biennial Specifications and Management Measures.

Washington's recreational yelloweye impacts are also tied very closely to the halibut fishery. Between 75 percent and 85 percent of the yelloweye impacts occur during the primary recreational halibut fishery. In 2011, the International Pacific Halibut Commission (IPHC) Area 2A Pacific halibut quota for 2011 is approximately 12 percent more than in 2010 and will likely result in more fishing days for recreational halibut fishing and could potentially increase yelloweye impacts in 2011. Impacts resulting from changes in halibut quotas are difficult to incorporate into pre-season projections because the quotas are announced annually and not available at when projections are developed. Economic factors such as fuel prices can also have an impact on the effort level in recreational fisheries. Coastal fishing grounds are hundreds of miles from urban centers and increases in fuel prices can influence whether or not someone chooses to plan a fishing trip.

5. Trawl

The GMT has heard concern from fishery participants and others that the interim yelloweye trawl allocation of 0.3 mt (recommended by the Council in November of 2010) may be too small for the individual fishing quota (IFQ) fishery.

We have also heard anecdotal reports that the limited yelloweye quota pounds (QP) available has limited trawling effort on the shelf. We cannot analyze whether the effect is truly occurring or not, as we do not yet have depth information available and the fishery has only been open for less than two months, yet the risk averse reaction sounds plausible, given that the dominant species landed so far have been mainly Dover sole-thornyhead-sablefish (DTS) and petrale sole, as of March 2. IFQ participants respond to individual incentives. So even if the 0.3 mt reflects the annual catch in the trawl sector, catch variability among individuals could be enough to cause risk-averse behavior.

Yelloweye bycatch is also a concern for fixed gear longline vessels targeting sablefish north of 40° 10'. Some on the team raised the risk that IFQ gear switching poses to the sector as a whole under the 0.3 mt allocation. The 2009 Total Mortality Report shows that the limited entry (LE) non-nearshore fixed gear sector took 1.3 mt of yelloweye rockfish, substantially more than the LE non-whiting trawl sector (0.1mt). Fixed gear participation in the IFQ program may also be experiencing a similar “chilling effect” because of risk aversion to the yelloweye QP.

The NMFS alternative in the final SPEX EIS describes an ACL for yelloweye rockfish of 17 mt, and an IFQ allocation for yelloweye rockfish of 0.6 mt. Whether this amount would be enough to improve upon the risk-averse situation, we cannot say with certainty. The effect of the low yelloweye allocation is something that will have to be analyzed over the long-term.

6. Nearshore Fixed Gear Fishery

The GMT notes that the nearshore fishery off California and Oregon was restrained in 2009 when the OY was reduced to 17 mt. At that time, the shoreward RCA was moved from 30 fm to 20 fm off both California and Oregon to limit access to areas of high yelloweye bycatch and reduce impacts. We point out, therefore, that this fishery was already constrained significantly beginning in 2009. As illustrated below, opportunities in this fishery were further reduced in June 2010 as a direct result of the court ruling to reduce the yelloweye ACL to 14 mt (e.g., higher trip limits). However, impacts were temporarily reduced after the states of Oregon and Washington voluntarily rescinded research projects to allow prosecution of commercial and recreational fisheries for the remainder of 2011. We point this out to illustrate that the concept of “status quo” is not static and should be addressed with caution (see ODFW 2011).

<u>Impacts under a 14 mt ACL</u>

Under a 14 mt ACL, and assuming the prosecution of research and exempted fishing, few management measures are available to reduce yelloweye catch relative to levels described in the 2011-2012 FEIS. Available options include total closure in certain areas (vessel safety concerns prohibit implementing a depth restriction shallower than 20 fm) and/or trip limit reductions that are so severe they may not be economically viable (e.g., up to 75 percent reductions relative to recent average landings – see 2011-2012 FEIS).

The nearshore fishery is a specialized fishery of small to medium vessels that focus fishing operations only in certain regions along the coastline in both California and Oregon (CDFG 2011; ODFW 2011). For example in Oregon, 76% of nearshore species occur in the Brookings port group (Brookings, Gold Beach, and Port Orford; ODFW 2011). This fishery provides the sole income for many nearshore fishers or represents a significant component in many fishermen's fishing strategy (CDFG 2011; ODFW 2011). The severe reductions in landings that would be required for this fishery under a 14 mt yelloweye rockfish ACL (see 2011-2012 FEIS) would potentially result in disproportionate impacts along the coasts of Oregon and California, destabilize the fishery, and be in direct conflict with the Magnuson-Stevens Act (MSA).

The states of Oregon and California described impacts of a 14 mt ACL to not only the fishermen but also the affected communities (CDFG 2011; ODFW 2011). The nearshore fishery in many of these 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 (2011-2012 FEIS). Note that fish buyers are different for this fishery than those for other commercial fisheries. It is quite probable that if nearshore landings were severely restricted, the primary live-fish buyers in some of these specialized ports would leave. The loss of a single fish buyer could put an end to live-fish deliveries for these specialized fishing communities. Since many of these affected ports exhibit little or no trawl landings (2011-2012 FEIS), they lack the infrastructure to compensate for fish buyers leaving the area.

Impacts under a 17 mt ACL

Under a 17 mt ACL, the current management measures (76 FR 11381, March 2, 2011) are expected to remain in effect assuming the yelloweye allocation to the nearshore remains at 1.1 mt. The restrictive RCAs will still remain in place to reduce yelloweye encounters and trip limits will be held at reduced levels to keep yelloweye impacts within the nearshore allocation. If the nearshore allocation is reduced either as a result of an overage in another sector or due to re-allocation by the Council, few if any management measures exist with the nearshore to find any savings (see discussion under 14 mt).

Impacts under a 20 mt ACL

Under a 20 mt ACL, the amount of opportunity available to the nearshore fishery is dependent upon their allocation. There may be the potential to relax some of the restrictive management measures implemented in 2009 depending on the amount of yelloweye allocated to this fishery. For example, landing limits may be increased relative to the current fishery (76 FR 11381, March 2, 2011) and historical fishing grounds may be reopened by moving the 20 fm Rockfish Conservation Area (RCA) back to 30 fm in some areas. Liberating the RCA to 30 fm may reduce gear conflicts, increase fishing efficiency, and reduce the likelihood of local depletions.

7. Non-Nearshore

The non-trawl RCA mitigates yelloweye bycatch in this sector. The Council's FPA would move the one management area in the north with a 125 fm in place back to 100 fm.

As reported in the 2009 Total Mortality report, this sector experienced bycatch rates in the LE non-primary and open access daily trip limit (DTL) subsectors estimated to be double what we use to project bycatch. Yet with the 2009 bycatch rates updated into the model, the projected impact remains unchanged from what was in the DEIS. The Council's preferred management measures can remain in place under either the 14 mt or 17 mt ACL, yet there is no room for higher than projected catches under the 14 mt scenario. Despite the lack of change in projected impact, we do recognize that there is some probability that catch will exceed the projected impact again in 2011 or 2012. We will discuss this more tomorrow under inseason.

8. Research

The GMT has been notified that IPHC will be doing a pilot project in Area 2A, expanding their stock assessment survey from 20 fm to 10 fm, and from 275 fm to 400 fm, with the goal of reducing bias and the coefficient of variance of the survey. The GMT has not had the opportunity to analyze what additional impacts to yelloweye rockfish might result from the survey expansion. Dr. Leaman advised the Council when speaking to Agenda Item F.1 at this meeting, that IPHC staff is projecting yelloweye impacts from the survey expansion to be similar to what has occurred when WDFW and ODFW have added enhanced rockfish survey stations to the standard IPHC stock assessment survey in previous years. Due to the delay in SPEX and the disapproval of the yelloweye rebuilding plan, and the associated 14 mt yelloweye OY at the beginning of 2011, ODFW and WDFW cancelled these research projects for 2011.

We began 2011 with a 14 mt yelloweye OY, waiting on publication of the FEIS by NMFS with the final yelloweye ACL/ACT. Due to the possibility of a 14 mt ACL for 2011, ODFW and WDFW cancelled planned rockfish research and ODFW withdrew an exempted fishing permit (EFP) application for a project designed to obtain biological data. While this was done to allow the recreational fishery to attain a longer season length and commercial fisheries to attain a larger fraction of their target species allocations under 14 mt, this is not sustainable in the long term. No research means no new data to inform stock assessments which means improvements in our knowledge of stock status will be forgone.

9. Other Set Asides

The GMT notes that other fishery set asides such as tribal and incidental open access are also not directly managed through Council and NMFS regulatory controls (see Agenda Item I.4.b, Supplemental GMT Report, April 2010). These are commonly referred to as "unchangeable" for purposes of allocation decisions during the biennial specifications and management measures process as they do not change based on the harvest level chosen.

E. Cowcod

The NMFS preferred alternative reduces the ACL for cowcod from 4 mt under the Council Final preferred alternative to 3 mt and does not include the 30 fm depth restriction and retention of shelf rockfish in the CCA adopted by the Council in June. The following is a summary of the implications of the differences in the NMFS preferred alternative for each sector relative to the information provided for consideration by the Council in the SPEX process.

1. Trawl Fishery

The current take of cowcod consists of research catches and unavoidable bycatch in the trawl and recreational fisheries south of 40°10' N lat (Cape Mendocino). The WCGOP Total Mortality Reports from 2004-2009 indicate that cowcod bycatch in the trawl fishery is the most variable (ranging from 0.2 mt to 3.0 mt annually, CDFG 2011). Cowcod bycatch varies considerably year to year and small changes to cowcod bycatch allowances can have a large effect on this fishery. The Council's recommended trawl bycatch allowance of 1.8 mt (under their FPA) cannot completely account for historical variability of bycatch and could still restrict this fishery. The bycatch needs in this fishery are unknown as the trawl rationalization program gets underway and fishermen learn to access healthy species while avoiding bycatch species. Despite all attempts to avoid cowcod, the potential for disaster tows is concerning.

Under the NMFS preferred alternative (3 mt), the cowcod allocation to the trawl fishery remains at 1.8 mt.

2. California Recreational Fishery

<u>Projected Recreational Cowcod Impacts with 30 fm Depth Restriction and Retention of Shelf Rockfish in the CCA</u>

Cowcod impacts are not expected to increase as a result of the 30 fm depth restriction or allowing retention of shelf rockfish in the CCA making the proposed action risk neutral (2011-2012 SPEX). Cowcod impacts are modeled for the entire region south of 34° 27' N. lat. including the CCA, based on a 60 fm depth restriction outside the CCA despite the shallower depth restriction within the CCA. As a result, the RecFISH model overestimates cowcod impacts.

The projected non-trawl impacts on cowcod include the 0.17 mt for the coast wide recreational impacts which are rounded up to 0.2 mt. The fixed gear fisheries are expected to have negligible impacts and as a result the total projected impacts for the non-trawl fishery is 0.2 mt. Even with a 3 mt ACL for cowcod, any unanticipated increase in cowcod impacts resulting from Council adopted management measures could be accommodated by the 0.7 mt buffer between the projected impacts and the non-trawl allocation of 0.9 mt. The catch of cowcod is tracked with a one week lag in the California recreational fishery. In the event that catch is tracking high, emergency action can be taken to prevent the non-trawl allocation from being exceeded. Thus the buffer between projected impacts and the allocation to the non-trawl fishery is sufficient to cover management uncertainty, even with a 3 mt ACL.

Shelf Rockfish Retention

The proposal to retain shelf rockfish within the CCA can be considered independent from any changes to depth restrictions. Under the current regulations, shelf rockfish cannot be retained while fishing in 20 fm or less within the CCA. Public comment provided to the Council, the California Fish and Game Commission, and NMFS indicate wastage of discarded shelf rockfish had a detrimental impact on the fishing experience and preventing wastage of discarded fish by allowing retention of shelf rockfish in the open depths of the CCA was a high priority for anglers.

Allowing retention of shelf rockfish within the CCA would reduce wastage by converting discard mortality into retained catch. In addition, under the status quo regulations, shelf rockfish are subject to discard mortality while anglers pursue the 10-fish rockfish, cabezon and greenling bag limit of nearshore rockfish species, cabezon and greenlings while discarding shelf rockfish. Allowing retention of shelf rockfish would further reduce wastage by decreasing the number of rockfish encountered in attaining the 10 fish bag limit.

Cowcod impacts are not expected to increase as a result of allowing retention of shelf rockfish in the CCA (2011-2012 SPEX). Any increase in other shelf rockfish impacts are expected to be primarily composed of the fraction of discarded fish that would have survived after being discarded. Access to shelf rockfish has been limited due to overfished species, and as a result, the total mortality of the minor shelf rockfish complex has been far less than the ACL. Any small increase in shelf rockfish as a result of turning discarded fish into landed catch would result in total impacts that are still far below the ACL and does not pose any conservation risks. Wastage of discarded shelf rockfish in the CCA would continue under the NFMS preferred alternative. Reduction of waste and increased opportunity are a high priority for anglers in the Southern California bight fishing from Santa Barbara, Port Hueneme, Los Angeles, Long Beach, Dana Point, and San Diego among others. Given that the proposed actions are risk neutral, improvements to the quality of fishing opportunity are worth implementing.

Changes to CCA Depth Restrictions

The proposal to increase the depth restriction from 20 fm to 30 fm within the CCA was excluded from the NMFS preferred alternative in the revised SPEX EIS, citing a lack of new data since implementation of the CCA to justify the action and concerns regarding increased interaction with juvenile cowcod. The GMT notes more data is available than when the analyses was conducted in 2000 to establish the CCAs in 2001. New data or analyses from submersible surveys, commercial trawl data, and recreational data indicate that both adult and juvenile cowcod are exceedingly uncommon within 30 fm (2011-2012 SPEX EIS, Appendix B). Juvenile cowcod do occur at depths greater than 30 fm (Love and Yoklavich, 2008). However, data from the trawl fishery and submersible surveys (Butler et al. 2003) as well as MRFSS/CRFS recreational survey data from 1999 to 2009 from south of Point Conception (34° 27’ N. lat.) indicate that adult and juvenile cowcod are extremely uncommon in depths shallower than 40 fm.

Thus new data are now available that indicate encounters with cowcod within the Council adopted 30 fm depth restriction are likely to be so infrequent that impacts are not expected to increase appreciably because of the deeper depth restriction. When the CCA was established, the intent was to prevent the OY (now supplanted by the ACL) from being exceeded. Should NMFS choose to reduce the cowcod ACL to 3 mt from the Council adopted 4 mt, the proposed management measures are still expected to keep the recreational impacts well below the non-trawl allocation (0.9 mt). Analysis provided in the 2011-2012 biennial regulatory specifications indicate that the depth restrictions in the CCA could be increased to expand fishing grounds without appreciable increases in impacts on cowcod.

This increased and improved fishing opportunity is of great importance to recreational anglers south of Point Conception as evidenced by public comments received by the Council, the Fish and Game Commission and NMFS regarding the proposed changes to depth and retention regulation in the CCA. Fishing for species such as yellowtail or white seabass is legal in depths greater than the 20 fm groundfish depth restriction and anglers fishing for these species sometimes encounter rockfish species which are discarded. Allowing retention of rockfish within 30 fm would result in a reduction of waste of discarded rockfish currently encountered as bycatch. Such regulatory discards are not popular with anglers, especially since rockfish at this depth are likely to suffer mortal injury from barotrauma or hooking mortality. The increased fishable area would also provide greater fishing opportunity for those fishing for rockfish after failing to catch tuna offshore. As noted above, reduction of waste and increased opportunity are a high priority for anglers in the Southern California and this risk neutral improvement to the quality of fishing opportunity is worth implementing. Improvements in fishing opportunity would be forgone and reduced wastage due to discard mortality would continue under the NMFS preferred alternative.

F. Review of the FEIS

As stated above, the 2011-2012 SPEX FEIS was published on Friday. The GMT has not yet had the opportunity to review the contents of this document thoroughly and will likely have comments in a later statement**.** We did have time to note some differences between the NMFS preferred alternative and the Council alternative, as captured in the tables that follow.

Overfished species allocations and harvest guidelines under Alternative 4 (NMFS final preferred), from Table 2-119, page 203 of the FEIS

<table>
<tr><th colspan="9">2011</th></tr>
<tr><th>Sector</th><th>Bocaccio</th><th>Canary</th><th>Cowcod</th><th>DKB</th><th>POP</th><th>Petrale</th><th>Widow</th><th>Yelloweye</th></tr>
<tr><td>Off the top ACL deductions [a/]</td><td>13.4</td><td>20.0</td><td>0.3</td><td>18.7</td><td>12.9</td><td>65.4</td><td>60.9</td><td>5.9</td></tr>
<tr><td>Fishery Harvest Guideline</td><td>249.6</td><td>82.0</td><td>2.7</td><td>279.0</td><td>144.0</td><td>911.0</td><td>539.0</td><td>11.1</td></tr>
<tr><td>Limited Entry Non-Whiting Trawl</td><td>60.0</td><td>20.0</td><td>1.8</td><td>240.0</td><td>107.0</td><td>871.0</td><td>235.0</td><td>0.6</td></tr>
<tr><td colspan="9">Non-nearshore[b/]</td></tr>
<tr><td>LE FG</td><td rowspan="2">57.9</td><td rowspan="2">2.3</td><td rowspan="6">0.9</td><td rowspan="6">14.0</td><td rowspan="6">7.0</td><td rowspan="6">35.0</td><td rowspan="6">49.0</td><td rowspan="3">2.4</td></tr>
<tr><td>OA DTL</td></tr>
<tr><td>Nearshore Fixed Gear[b/]</td><td>0.7</td><td>4.0</td></tr>
<tr><td>Washington Recreational[b/]</td><td>--</td><td>2.0</td><td>2.6</td></tr>
<tr><td>Oregon Recreational[b/]</td><td>--</td><td>7.0</td><td>2.4</td></tr>
<tr><td>California Recreational[b/]</td><td>131.0</td><td>14.5</td><td>3.1</td></tr>
<tr><td colspan="9">Limited Entry Whiting Trawl</td></tr>
<tr><td>Catcher Processor</td><td>--</td><td>4.8</td><td>--</td><td>9.0</td><td>10.0</td><td rowspan="2">5.0</td><td>87.0</td><td>--</td></tr>
<tr><td>Mothership</td><td>--</td><td>3.4</td><td>--</td><td>6.0</td><td>7.0</td><td>61.0</td><td>--</td></tr>
<tr><td>Shoreside</td><td>--</td><td>5.9</td><td>--</td><td>11.0</td><td>13[c/]</td><td>[c/]</td><td>107.0</td><td>--</td></tr>
</table>

[a/] Assumes that the application of new Amendment 21 allocation structure specified at 50 CFR 660.55

[b/] Values represent HGs which may be adjusted within the non-trawl allocation

[c/] Under trawl rationalization, the allocation is included as part of the bottom trawl and not in addition to.

Overfished species allocations and harvest guidelines under Council FPA, from Table 2-66, page 146 of the DEIS

<table>
<tr><th colspan="9">2011</th></tr>
<tr><th>Sector</th><th>Bocaccio</th><th>Canary</th><th>Cowcod</th><th>DKB</th><th>POP</th><th>Petrale</th><th>Widow</th><th>Yelloweye</th></tr>
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</table>

[a/] Assumes that the application of new Amendment 21 allocation structure specified at 50 CFR 660.55.

[b/] Values represent HGs which may be adjusted within the non-trawl allocation.

[c/] Under trawl rationalization, the shoreside whiting trawl allocation is included as part of the entire shoreside trawl sector allocation.

G. References

Butler J.L., Jacobson L.D., Barnes J.T. and H. Moser. 2003. Biology and population dynamics of cowcod (Sebastes levis) in the southern California Bight. Fishery Bulletin 101(2): 260-280.

CDFG. 2011. Pacific Fishery Management Council, Agenda Item H.2.c, CDFG Letter, March 2011.

FEIS. 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 Managmenet Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole. Final Environmental Impact Statement. The Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, OR, 97220 and National Marine Fisheries Service, 7600 Sand Point Way NE, BIN C15700, Seattle, WA 98115-0070. February 2011.

Love, M.S and M. Yoklavich. 2008. Habitat characteristics of juvenile cowcod, Sebastes levis (Scorpaenidae), in Southern California. Environ Biol Fish (2008) 82:195–202.

ODFW. 2011. Pacific Fishery Management Council, Agenda Item H.2.c., ODFW Letter 2, March 2011.

State of Washington
Department of Fish and Wildlife
48 Devonshire Road, Montesano, Washington 98563-9618 PHONE (360) 249-4628 FAX (360) 664-0689

January 4, 2011

William Stelle, Administrator
Northwest Region, National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115–0070
Attn: Sarah Williams.

Re: RIN No. 0648–BA01

Dear Regional Administrator Stelle:

The Washington Department of Fish and Wildlife (WDFW) submits the following comments on the proposed rule to implement the 2011-2012 Biennial Specifications and Management Measures and Amendments 16–5 and Amendment 23 to the Pacific Coast Groundfish Fishery Management Plan (PCGFMP). We urge approval of the Council's final preferred harvest specifications and management measures for 2011-12, including the 17 mt annual catch target (ACT) and 20 mt annual catch limit (ACL) for yelloweye rockfish.

As to Amendment 23, we received notice of the partial disapproval of yesterday. We support Amendment 23 as a solid first step in addressing the ACL amendments to the Magnuson-Stevens Act that we can build upon in coming cycles to better address scientific and management uncertainty in the conservation and management of the groundfish fisheries. We do not view the disapproval of removing dusky and dwarf red rockfish from the PCGFMP as a significant conservation or management issue. Our expectation is that the Council will examine the vulnerability of all fish stocks encountered by the groundfish fishery using the Groundfish Management Team's (GMT) productivity and susceptibility approach in preparation for the 2013-14 biennial cycle.

The remainder of this letter focuses on Amendment 16-5 and the 2011-12 harvest specifications and management measures. In November, NMFS informed the Council that the Draft Environmental Impact Statement (DEIS) supporting these actions was inadequate in their judgment to warrant approval. As an initial matter, we see these differing views on the adequacy of the DEIS as concerning given the time and effort that was put into the DEIS and see the situation as cause to re-examine many aspects of the Amendment 16-4 analysis framework. We support the Council's Groundfish Process Improvement Committee as the appropriate forum to begin such an evaluation and hope that improvements can be made in time for the 2013-14 biennial process. We include a few areas of suggested focus for this evaluation in our comments below.

At the November meeting, NMFS and NOAA General Counsel expressed particular concern to the Council about the harvest specifications for yelloweye. We therefore focus this comment letter on addressing what we understand of those concerns. As maker of the motion setting the yelloweye ACT and ACL, we also wish to make clear our view of how the ACT and ACL achieve consistency with the Council's authority to set rebuilding times under the Magnuson-Stevens Act and represent an improvement over the course set by the Council with Amendment 16-4 to the Groundfish Fishery Management Plan.

NMFS specifically requested comments on how impacts to fishing communities differ between the Council's final preferred ACT and ACL for 2011-12 and the 13 mt and 14 mt ACL alternatives. We provide our perspective on those differences to fishing communities in Washington and stress the importance of maintaining the management uncertainty buffer between the ACT and ACL. This buffer represents an important innovation this cycle. If NMFS finds cause that the Council's preferred buffer is too large to be consistent with law, then we suggest that the buffer be adjusted to a level that NMFS determines would be reasonable. We include a discussion of the important advantages of the management uncertainty buffer below, not the least of which is increased flexibility for research activities.

Importantly however, as underscored in the white paper and cover letter that we submitted to the Council in September, the economic impact to fishing communities is only one piece of the underlying rationale for the rebuilding plans.[1] The courts have instructed the Council to examine the broader context—i.e. the long-term conservation purposes that rebuilding is meant to achieve— and to ensure that the weight given to short-term concerns doesn't come at too high of a cost to that purpose. Although not intuitive to most, the yelloweye harvest specifications remain weighted heavily toward conservation despite the lengthy rebuilding period.

The Groundfish Management Team (GMT) gave us a basic approach for analyzing the long-term conservation performance of a rebuilding plan, first for petrale sole and then in response to findings in the court order that the yelloweye, darkblotched, and cowcod rebuilding plans were overemphasizing short-term economics over long-term economic return and the marine environment. Using the GMT's suggested metrics of conservation, it is difficult to see how a 14 mt ACL in 2011-12 performs significantly better than the Council's final preferred ACT and ACL. The difference to fishing communities for 2011-12, in contrast, seems clear.

With Amendment 16-4 the Council began a very complicated approach to analyzing rebuilding plans. This approach has been effective at minimizing bycatch, at recognizing the interconnectedness of the fishery sectors, and at achieving equitable sharing of rebuilding restrictions among states, fishing communities, and fishery sectors. It has not been so successful, however, in communicating the larger conservation picture. We urge NMFS and the Council to give closer attention to that conservation picture and to how rebuilding serves National Standard 1 and National Standard 8.

[1] PFMC September 2010 Briefing Book, Agenda Item I.4.c, WDFW Report: Washington Department of Fish and Wildlife White Paper on the Setting of 2011-2012 Harvest Specifications for Stocks Managed Under a Rebuilding Plan.

I. Adjusting the course set by Amendment 16-4

Before discussing the impact of yelloweye rebuilding to Washington fishing communities, we connect the 2011-12 harvest specifications back to the Council's original rationale in Amendment 16-4. The 2009 stock assessment and rebuilding analysis affected that rationale with a changed understanding of stock status and biology. The court order in April also gave us guidance and further insight with which to revisit and evaluate the course the Council set with Amendment 16-4.

A. Revisiting the Rationale for the Amendment 16-4 Ramp-Down

The Council receives new information on its rebuilding plans each biennial cycle, from the updated estimates of status and biology provided by the stock assessments and rebuilding analyses and from feedback on the efficacy and impact of management measures. New information on either end can bring cause for the Council to revisit a rebuilding plan. Rebuilding plans are designed around three quantities:

a) the *year targeted for rebuilding* (T_{Target});
b) the *SPR harvest rate* under which the stock is expected to reach that T_{Target}; and,
c) *annual catch amount*, in metric tons, corresponding to that SPR rate, demarcated by the optimum yield (OY) in past cycles and the ACL or ACT beginning with 2011-12.

The way that each ties to the Council's rationale for why a particular rebuilding plan best meets the requirement to rebuild stocks in as short a time as possible while taking into account the needs of fishing communities can be difficult to track across management cycles

For yelloweye, Amendment 16-4 established transition to a constant SPR harvest rate of 71.3%, with the transition scheduled for completion in 2011. The 14 mt OY for 2010 was the last step in this ramp-down to the SPR harvest rate. The Council revised this last step to 17 mt as part of the 2009-10 biennial harvest specifications, yet the court order restored it to 14 mt in April. The SPR harvest rate of 71.3% was associated with a T_{Target} of 2084. This SPR harvest rates described a trajectory of increasing catches over that full rebuilding period, with that trajectory starting at an annual catch of 13 mt in 2011.

The latest stock assessment changed the estimates of yelloweye stock status and biology considerably. The SPR harvest rate of 71.3% now corresponds to a T_{Target} that is slightly farther out than 2084. The Council reacted to this change by decreasing the harvest rate slightly to an SPR of 71.9% so as to maintain the T_{Target} of 2084. The harvest rate was decreased and the T_{Target} maintained, yet the annual harvest amount corresponding to that rate increased with the 2011 ACL being 20 mt.

In other words, the best available scientific estimates of yelloweye status and biology now show that the stock can rebuild on the Amendment 16-4 timeframe with slightly higher catches. We explain why this is so in more detail below. The point we wish to emphasis here is that Amendment 16-4 was not a determination from the Council that a 13 mt or 14 mt ACL would best rebuild the stock in as short a time as possible while taking into account the needs of fishing communities. The ramp-down to 13 mt was recognized as severe yet the Council thought it necessary for reaching the T_{Target}. The new stock assessment changed the Council's view of the necessity and changed the very conservation dynamic at the center of the rebuilding law. It is the relationships between the annual catch, SPR harvest rate, and T_{Target} estimates that determines the Council's policy judgment for a particular rebuilding plan, not the annual catch alone.

The enclosed WDFW report articulates our view in June 2006 that the ramp-down was necessary.[2] It also still accurately captures the community impacts we expect if management measures are restricted further.

B. Changes in Estimates of Yelloweye Status and Biology

In June, the GMT advised the Council that estimates of stock status and biology can change in three fundamental ways from stock assessment to assessment:

(1) **Status** or abundance *relative* to unfished abundance: the current stock size relative to unfished stock size, which describes how far the stock has to rebuild;
(2) **Productivity**: the stock's inherent capacity to grow, which describes how quickly the stock can rebuild; and,
(3) **Scale** or *absolute* abundance: which describes the overall size of the stock typically expressed in biomass.[3]

A rebuilding plan's T_{Target}, SPR harvest rate, and stream of expected annual allowable catches that result from the SPR rate are all functions of these three fundamental estimates. They change as the estimates change. As the GMT advised the Council, estimates of a stock's status and biology can change from the previous assessment in ways that cannot simply be described as "worse off" or "better off" than previously thought. Given that these changes arise as much, if not more, from scientific uncertainty than from true changes in the stock, it is important that the Council rely on the most recent assessment and rebuilding analysis as the best available estimates of a stock's status, biology, and progress in rebuilding.

The most recent yelloweye stock assessment changed our understanding of the stock's status and biology in all three dimensions. We compare the 2009 and 2007 assessments to illustrate exactly how our perception has changed. Such comparisons are not always straightforward because of differences between stock assessment models. We therefore suggest that NMFS verify the following analysis for the record.

With respect to status, the yelloweye stock looks improved based both on changed estimates of relative abundance and estimated progress in rebuilding (i.e. the stock started rebuilding at a higher

[2] Also available at: PFMC June 2006 Briefing Book, Agenda Item F.2.b, Supplemental WDFW Report.
[3] PFMC June 2010 Briefing Book, Agenda Item B.3.b, Supplemental GMT Report 2.

starting point than we thought and also increased in total biomass by more than 17% since rebuilding began). This means that the stock has less far to rebuild than we thought in 2007.

The stock's productivity, in contrast, is now estimated to be slightly lower. The 2009 rebuilding analysis projections show the stock increasing at an expected 1.7% per year to T_{Target} under zero fishing mortality (i.e. the maximum rebuilding rate possible). The 2007 projections showed an expected 1.9% growth per year under zero fishing.[4] This change explains how the Amendment 16-4 SPR harvest rate of 71.9% no longer corresponded to the same T_{Target} despite the higher estimate of relative abundance. Although the stock doesn't have as far to rebuild, the rebuilding projections expect the stock to grow at a slightly lower rate.

The most substantial change in the new assessment comes in the scale of the stock. The new assessment estimates the stock to be roughly 35 percent larger in recent years and larger in the past as well (Figure 1). To clarify, this difference is not from a change in the stock but from scientific uncertainty in the stock's true overall size. This change in scale is the source of the somewhat counterintuitive fact that the new, more conservative SPR rate produces a larger ACL. Although counterintuitive for many, the principle is simple: larger populations produce a larger annual harvest amount for a given rate of harvest. This is why the ACL corresponding to the Amendment 16-4 SPR harvest rate of 71.9% is now 21 mt instead of the 13 mt anticipated in the 2007 stock assessment and rebuilding analysis. This increase in scale is central to our view that the drop to a 13 mt or 14 mt or ACL is no longer warranted.

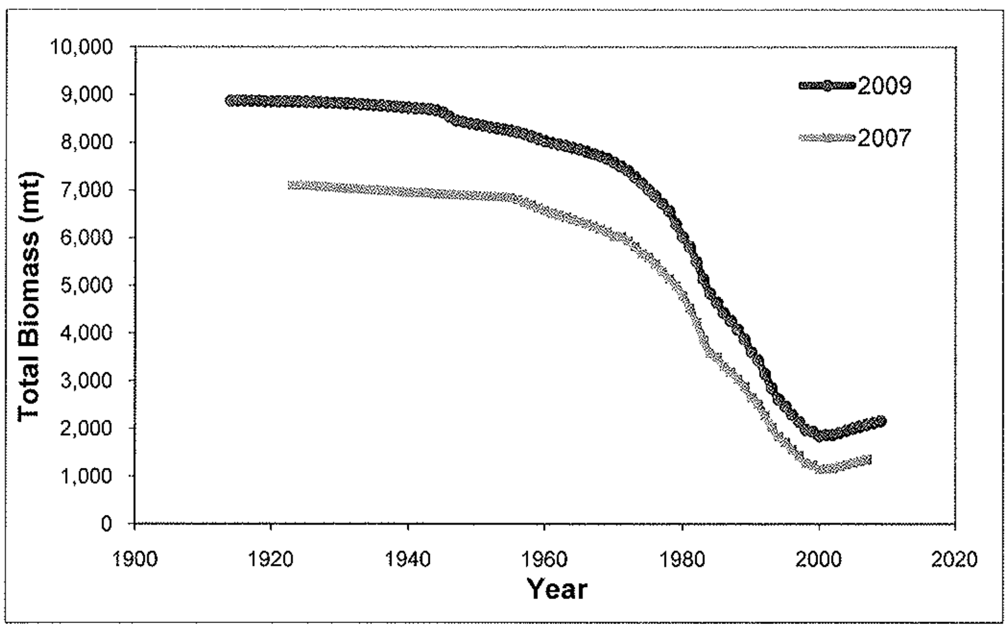

Figure 1. Trend in yelloweye stock biomass from the 2009 (top) and 2007 (bottom) stock assessments. The estimate of overall biomass in the 2009 assessment is larger than in the 2007 assessment.

[4] These estimates of the annual rate of increase are based on the formula: $r = (\text{BMSY target/Current stock status})^{1/n} - 1$, where n is the number of years to T_{Target}.

C. Considering Estimated Times to Rebuild

Part of the feedback NMFS gave the Council in November focused on the T_{Target} of 2084 for the 20 mt ACL. Describing the T_{Target} in this manner is in step with the Council's standard practice yet does not describe the complete picture. To get that complete picture, the effect of the ACT must be considered.

To elaborate, the 2084 T_{Target} estimate assumes that catch exceeds the ACT by the full management buffer every year, or at least on average, over the full rebuilding period. Such a result would be entirely contrary to the Council's intent of the ACT. That intent is to keep catch *below* the ACT using the same management approach that the Council has taken with OYs in the past. The main advantage of the ACT buffer comes in years in which catches exceed what was expected. We discuss this point in more detail below. The point we emphasize here is that based on recent experience with the rebuilding plans, we should expect that years in which the ACT is exceeded to be the exception, not the norm. If this expectation bears out, then the T_{Target} associated with the ACT would more accurately describes the projections from the rebuilding analysis.

This point also relates to another fundamental —and perhaps overlooked—aspect of rebuilding estimates. In short, the pace of rebuilding is set by the catches that actually occur, not by the catches that are planned for. At the same time, rebuilding projections are based on planned catches. With the management uncertainty involved with a bycatch species like yelloweye, the planned and actual catches are often different.

As reported in the 2009 rebuilding analysis, yelloweye catches have only been 65 percent of the planned catch since 2002. The catch in 2009 was right at that average, with catch coming in at 11 mt instead of the planned for 17 mt. This performance has not been unexpected because the Council takes a precautionary approach to management uncertainty and plans high for many fishery sectors, especially with yelloweye. The Council is very risk-averse to exceeding the annual catch limit. Yelloweye catch is particular rare and variable and requires more risk-aversion than a stock where catches are larger and more steady.

Although the track record to date is that yelloweye catch will come in less, and in some years substantially less, than what was planned for, the Council still estimates $T_{Targets}$ based on the assumption that the full catch is taken every year, or on average, throughout the rebuilding period. This decades-long stream of assumed and increasing catch heavily influences the T_{Target} estimates. There are a few important implications to consider related to this practice. For one thing, the decrease in rebuilding time from the better than expected catches since 2002 goes mostly unnoticed. Their impact on the T_{Target} is hardly noticeable compared to the decades of catches assumed for the future and the way in which estimates of status and biology can jump around.

Perhaps more significantly, we are becoming concerned that this stream of increasing catches is overshadowing the importance of catches to communities now. In other words the difference between 17 mt and 14 mt in 2011-12 becomes greatly amplified by the differences in the stream of future catches. The T_{Target} for 14 mt becomes 2067, 17 mt becomes 2074, and 20 mt becomes another "decade later" at 2084. Yet as the Groundfish Management Team noted to the Council in June, if catch averages 20 mt over rebuilding then the T_{Target} projection is 2067 is as well. To us, this suggests we may be over-reading the science and not paying enough attention to the T_{Target} estimates as probabilistic estimates.

The Council assumes a stream of future catches based on the presumption that the needs of fishing communities—i.e. the encounter rate with rebuilding stocks—will grow directly proportionally to the abundance of the stock. This may be a reasonable approach, yet it must be recognized for what it is. The reality is that several adjustments to the rebuilding parameters will be necessary over the course of rebuilding. The options that future Councils will have for such adjustments are bound only by the catches that have occurred. It may be that current management measures will suffice to adequately control bycatch for the foreseeable future and that automatic increases in the ACL are not needed.

The evaluation of our rebuilding policies and analyses should take a close look at how we represent the estimates of times and probabilities of rebuilding. For now, we request that NMFS be mindful of the assumption underlying $T_{Targets}$ when reviewing whether the Council's preferred ACT or ACL give appropriate weight to the needs of fishing communities during this 2011-12 biennial management period.

4. The Broader Perspective: Consistency with National Standard 1 and National Standard 8.

Whether yelloweye rebuilds in the 2060s, 70s, or 80s the rebuilding timeframe cannot be described as anything but long. And the first impression of many is that it is simply too long to be conservation-oriented. This is an understandable perception. Yet when examined under the best available scientific estimates of the stock's status and biology and evaluated against the standards and principles embodied by the Magnuson-Stevens Act's National Standard 1, National Standard 8, and definition of the terms optimum and conservation and management; the reasonable basis for the long rebuilding time becomes clear.

We quickly highlight some of the inconsistencies that became apparent to us over the past few years of experience with the Council's rebuilding and harvest policies that call into question the overall coherency of these policies. First, consider that the purpose of the minimum stock size threshold (MSST) used to delineate overfished status is to prevent the stock from dropping below levels that jeopardize the stock's capacity to produce MSY on a continuing basis. This is a yield-based objective. The National Standard 1 (NS1) guidelines advise that the MSST can be set as low as half of the abundance expected to produce maximum sustainable yield (B_{MSY}). Had the Council done so, the overfished threshold for rockfish would be $B_{20\%}$.

The current status of yelloweye puts the stock above this mark. Assume that the stock had never dropped below $B_{20\%}$ and therefore never been declared overfished. In such a hypothetical, the Council would set the ACL based on the FMP's 40:10 adjustment to the allowable biological catch (ABC) control rule and the ACL for 2011 would be set somewhere in the lower-to-mid 30 mt range. The 40:10 harvest policy would be expected to increase stock biomass gradually yet the stock's status would not be expected to reach $B_{40\%}$ until at least the year 2182. Despite not rebuilding, the cumulative yield provided by the stock would exceed any of the harvest rates expected to rebuild the stock by the T_{MAX} outer limit on rebuilding.[5]

This hypothetical piece about never being declared overfished may seem improbable yet it represents the very situation the Council faces with widow rockfish, although the estimate of widow rockfish status puts the stock on the brink of reaching the $B_{40\%}$ rebuilding target. The widow rockfish ACLs for 2011-12 are not set according to the 40:10 policy but instead sits at somewhere around 7% of the harvest rate that would normally be used for a stock of its status that had never been declared overfished. We must recognize that our rebuilding policies lead the Council to treat widow much differently from stocks like sablefish and whiting that are both currently at lower status than widow yet have never been declared overfished.

The last aspect of yelloweye we will highlight here focuses on the estimates showing the overfishing limit (OFL) for yelloweye in 2011—i.e., the best available estimate of the harvest rate that prevents overfishing and maximizes long-term yield from the stock—to be 48 mt. The objective of rebuilding is to rebuild the stock back to $B_{40\%}$, to the point at which the annual yield is expected to be maximized. The estimated OFL at $B_{40\%}$ is estimated to be 56 mt, a mere 8 mt more. In other words, the annual yield that can be sustainably harvested from the stock is already more than 80 percent of what can be expected after successful rebuilding.

We do not raise these issues to challenge the merits of rebuilding. WDFW remains committed to rebuilding yelloweye and will continue to advocate for keeping rebuilding plans weighted toward higher degrees of success and stocks at higher abundances. We have advocated and will continue to advocate for minimizing bycatch of rebuilding rockfish. With cowcod, yelloweye, and darkblotched, however, the Council has reached a point where the question of how far to minimize and at what cost to fishing communities has to be confronted directly. And the answer to that question must be grounded in long-term conservation to be meaningful. Otherwise we cannot know whether the weight given to the needs of fishing communities is disproportionate in comparison to conservation or if it is perhaps the opposite. The question is not simply how much harvest to fishing communities need now. Fishing communities will have to adjust to what long-term conservation can support. We must look at benefit to fishing communities now against the cost of that benefit to the future.

To close this section, we read the instruction to "take into account the needs of fishing communities" to say that the Council does not need to rebuild stocks as quickly as possible without regard to the cost of doing so. We also read that instruction in the light of National Standard 8, which requires the Council to achieve the conservation objectives of rebuilding while providing for the sustained participation of fishing communities and with the aim of minimizing negative economic impact of rebuilding measures. Put another way, we read it to say that the Council should take care to ensure that

[5] We refer NMFS to the white paper and Appendix G in the DEIS for more explanation of this statement.

the cost of conservation is not disproportionate to the benefits that conservation is expected to produce. We believe that the 17 mt ACT and the 20 mt ACL for 2011-12 appear very reasonable in this light. We also view pushing harvest lower as raising risks to fishing communities in a way that is unjustified by the conservation benefits. With the stock stable and increasing in abundance and already producing 80 percent of the estimated maximum sustainable yield, the basis for pushing fishing communities any closer to some critical economic threshold is not well grounded in conservation policy.

II. Assessment of Need and Impact to Fishing Communities

The analyses in the DEIS serve many purposes. The Council is rebuilding multiple stocks and the rebuilding plans affect several fishery sectors and fishing communities that dependent differently on the groundfish fisheries. The Council uses these analyses to assess how far bycatch can be minimized for each stock and at what consequence to fishing opportunity. The Council must also consider how to equitably distribute rebuilding restrictions among fishing communities, fishery participants, and the three states while also providing for research, tribal fishing, and bycatch in fisheries not managed under the PCGFMP. It all amounts to a very complicated set of decisions with many moving parts. The Council could not have formulated rebuilding plans without these analyses, yet their complexity can obscure some of the finer points of management. We focus below on what see as some of the finer points relevant to the Council's rationale for the 17 mt ACT and 20 mt ACL for yelloweye.

A. The Difference between 14 mt and 17 mt

As we understand it, a major concern of NMFS on the Draft EIS is that it does not make clear the differences in management measures and impact between the Council's final preferred ACT and ACL and the 14 mt OY for 2010 or the 13 mt ACL also analyzed in the DEIS. Those differences are, again, clear to us. We are at a point where the projections of catch and effort used by the Council—and in turn, the economic analyses that are based on these projections— are just not capable of capturing many of the nuances involved with management. Although these nuances do not lend themselves to quantification, they are nonetheless significant and essential the underlying rationale for the 17 mt ACT and 20 mt ACL.

The major benefits of the 17 mt ACT and 20 mt ACL that we see are related to management uncertainty and the risk that bycatch will exceed our projections. The ramp-down, true to its rationale, was a learning experience for the Council. The effectiveness of various management measures was unknown when the ramp-down was begun. As described above, the Council approached this uncertainty with precautionary projections of catch. Actual catches bore this out by coming in substantially lower in many sectors than had been planned for.

The ramp-down should be recognized as successful in many regards. In addition to achieving reductions in bycatch rates, the Council has also become more confident in the effectiveness of certain management measures and in the reliability of catch projections. In the analysis of the 2011-12 harvest specifications and management measures, it turned out that many sectors could be managed with less restrictive management measures or less bycatch than anticipated in Amendment 16-4.

It is also important to recognize that the ramp-down was occurring within the holistic, integrated approach where the needs of fishing communities have been examined with respect to all rebuilding stocks. Yelloweye is more important to certain fishery sectors more than others and so the Council has treated some sectors preferentially. The Washington recreational fishery, for example, isn't much affected different between a 14 mt and a 17 mt ACL because the Council was able to achieve reductions in sectors that are less dependent on yelloweye.

Yet key to understanding the Council's rationale is the fact that reductions in the ACL decrease the margin of error for management uncertainty across several sectors. The lessons learned during the ramp-down have not eliminated the variability and uncertainty in catch and fishing effort, and the ramp-down provides us with only a short-time series to be used for predicting catch. Again, the 2009 catch was telling, with management measures set to an OY of 17 mt and actual catch 11 mt. The uncertainty and variability in catch means that 2010 will likely be different with catch possibly even exceeding 17 mt.

With smaller margins for error, the Council sees an increased risk that catch will exceed the projections and necessitate inseason adjustment. Drastic inseason changes are undesirable for several reasons, which we touch on in the following section.

B. The Significance of the ACT

As explained above and during Council discussion on this matter, the intent of the ACT was to limit harvest to stay within the 17 mt ACT. The purpose of the 3 mt difference between the ACL and ACT is to provide a buffer for management uncertainty associated with all harvest sources, including commercial, recreational, tribal, and research catches. This buffer provides a greater level of comfort to fishery managers that the measures they have adopted, and upon which the needs of fishing communities were evaluated, will effectively keep catch at the planned levels.

When unexpected catches occur and the Council must make adjustments to reduce projected catch inseason, options are often limited. Options are limited by catch that has already occurred and by the different management controls available in the various fishery sectors. For example, when the court order required the Council to reduce the yelloweye OY from 17 mt to 14 mt mid-year, there were few options for doing so. The elective research projects of WDFW and the Oregon Depart of Fish and Wildlife were consequently cancelled. The Council may not have made that same decisions had the full set of options been available.

Inseason adjustments also involve inequities that arise from the different timing and inseason management capabilities of each sector. When the inseason adjustments arise for yelloweye, the Council has little choice but to look to recreational fisheries first, not out of preference, yet because the recreational fisheries can be managed inseason and often track low against their respective harvest guidelines. The Council has factored this in somewhat to the recreational harvest guidelines, but again, margins for error have decreased during the ramp-down and decrease further as the ACL decreases. The non-nearshore fixed gear fisheries, in contrast to the recreational fisheries, cannot be managed very effectively for yelloweye bycatch inseason and the impact of any inseason management change would largely be speculative.

The other point to recognize is that the Council evaluates the needs of fishing community based on projections of fishing opportunity available under a set of management measures and the catch and effort that might occur under that opportunity. In some years catch is lower based on a number of reasons, such as fishing opportunity elsewhere, global and national economic conditions, lower than average bycatch encounters, etc. In other years, the effort and catch might be higher than expected and require inseason change in the sector, and often, in other sectors as well. Many times these changes occur and eliminate the very benefit the fishing opportunity it was meant to provide. In other words, the Council can choose a rebuilding plan based on an assessment of the needs of fishing communities with that assessment then going out the window in light of actual events inseason.

The non-nearshore fixed gear fisheries provide an impending example of this. The Council went through discussion on the 2011-12 management measures believing that this fishery sector would be accommodated by even the lowest yelloweye ACLs analyzed. Projections showed the sector needing only 0.9 mt of yelloweye to fully harvest the 2011-12 sablefish ACLs. In June the Council, planned for a 1.3 mt harvest guideline under the 17 mt ACT to accommodate some risk of unexpected catch. When the 2009 catch projections were released in November, that sector was estimated to have caught that 1.3 mt with bycatch rates double what was projected in the open access and non-primary limited entry portions of the fishery. If the ACL is left at 14 mt for 2010, the Council will face a much different decision than was contemplated during the development of the 2011-12 management measures. The 125 fm line remains in place off Oregon instead of being moved back to 100 fm, and the assessment of need faced by the fishing communities affected by that RCA is now different, as are questions about equitable sharing of management restrictions between states and communities.

Fishery sectors and fishing communities are all connected. Catch in one sector can cascade into the rest. The 3 mt buffer between the ACT and ACL lessens these complications. The buffer improves the likelihood that the Council's assessment of fishing opportunity will hold true throughout the fishing season and that major adjustments can be handled during development of the biennial management measures. This buffer is a significant improvement over the way yelloweye has been managed to date, where the approach to management uncertainty has been different in every sector. It should not be overlooked that these different approaches have complicated the assessment of fishing community needs by mixing in questions of the equitable sharing of rebuilding restrictions. It is preferable to keep the two issues as distinct as possible.

We have so far discussed how the ACT buffer improves management. We close this section by emphasizing how the greater uncertainty given by management buffer benefits fishery participants. Like any business, fishing business prefer certainty for planning. And those dependent on fishing for their livelihoods would prefer more certainty that fishing income will be available as contemplated at the beginning of the season. Recreational anglers would likewise prefer to make travel and vacation plans knowing with reasonable certainty that they will enjoy the experience they expected. Uncertainty, on the other hand, creates perverse incentives to fish early instead of when most beneficial. Under uncertainty businesses are less likely to make investment in infrastructure and jobs that fishing communities depend on, and anglers reluctant to spend their recreational dollars in fishing communities where there is a chance the fishery may close suddenly.

The ACT buffer not only makes inseason action less likely, it also signals the Council's risk tolerance for taking inseason management action. Inseason action cannot be avoided completely, yet the buffer would mean major adjustments could be held off to the biennial management when there is more time for planning and public input. And as explained above, we expect these benefits to come at little to no cost to long-term conservation because we fully expect the Council's management measures to keep catches below the ACT.

C. The Trawl Fishery under Rationalization

We see the trawl sector as a key difference between the 17 mt ACT and 14 mt ACL scenarios. The trawl sector is not as dependent on yelloweye as other sectors and so the Council has held it to very low levels under the trip limit system. The shoreward closure north of Cape Alava remains in place largely because of yelloweye bycatch in that area. And in 2009, the catch estimate for the non-whiting trawl sector was a mere 0.1 mt of yelloweye.

The trawl rationalization program is set to go into effect one week from today. Under the ACT of 17 mt, the shoreside trawl sector is set to receive 0.6 mt, or roughly 200 fish. Many recipients of trawl quota pounds (QP) won't even receive enough to cover the catch of one fish. Under a 14 mt ACL, that number is cut in half to 0.3 mt. This 0.3 mt is based on the trawl bycatch projection model, where the dynamic is much different than will be seen in the IFQ program.

In the shoreside IFQ program, the impact of bycatch becomes individualized and the risk of experiencing a catch that exceeds an individual's quota holding is high. The Council's best judgment was to double the current best estimate of bycatch in light of this new dynamic. Yelloweye do tend to congregate in rocky areas; however, fishermen have also been known to catch them in muddy flat areas or over gravel or sandy bottom, which makes catching them unpredictable and avoidance not completely within the trawlers' control. Those that do exceed their individual quota of yelloweye may find it difficult, if not impossible, to find yelloweye quota pounds available on the market for sale or lease at a reasonable price. Some individuals may choose to not participate at all rather than face the risk.

The reality is that we do not know what the impact to fishing communities will be until we gain experience with the program. The program would undoubtedly benefit from higher catches, the Council fully recognizes this. Yet the 0.6 mt was what the Council saw as available given the needs of other sectors.

D. The Importance of Research

Research is another key difference between the ACT of 17 mt and an ACL of 14 mt. The additional 3 mt allows us to implement research projects to collect much needed data on yelloweye rockfish for inclusion in the stock assessment. The fact is that we have little information now to monitor actual progress in rebuilding.

The decision to conduct research projects is also tied to management uncertainty. Research catches have been highly variable for yelloweye. Because of the standardized survey designs, research surveys cannot simply be stopped when large catches do occur. The 3 mt buffer between the Council's final preferred ACT and ACL was intended to address research as well and to give management agencies more confidence that research projects could be carried out in full.

The low yelloweye ACL does not affect just the PCGFMP. There has been interest for a number of years in expanding the International Pacific Halibut Commission (IPHC) survey to address uncertainty in the stock assessment for halibut. However, the low amount of yelloweye available for research has made IPHC staff and the states of Washington and Oregon reluctant to add additional stations to the halibut survey because of the additional yelloweye rockfish mortality.

E. How Yelloweye Rebuilding Has Already Affected Washington

When discussing whether to increase restrictions further, it is important to remember the restrictions that have already been imposed and the reductions in catch that have been achieved. As reported in the 2009 rebuilding analysis, yelloweye catch has been reduced by 95% from historical levels.

Along these lines, we would like to reiterate comments we made to the Council regarding the needs of Washington's fishing communities in June 2006. As mentioned above, the original comments can be found in the report attached to this letter.

Since 2006, these coastal fishing communities have been adversely affected by conservation measures to ensure our commercial and recreational harvests stay within the rebuilding parameters for yelloweye rockfish. We have implemented large area closures for commercial groundfish fisheries including a year-round non-trawl rockfish conservation area (RCA) that extends from the shore to 100 fm, a trawl RCA that extends from the shore to 150 fms north of Cape Alava and from 75 fm to 150 fm south of Cape Alava, and a year-round bottom contact gear closure off Cape Flattery commonly known as the "Tabletop" (Olympic 2). Forcing fishermen to fish further offshore is not only costly in terms of fuel and time, but poses safety concerns, particularly in adverse weather conditions typical off the northern Washington coast. With fewer fishing grounds available, gear competition becomes an issue as well.

Our recreational fisheries have been the most affected with a bottomfish fishing closure extending seaward of 20 fm off the north coast from mid-May through the end of September and a year-round offshore closure (C-shaped closure) that eliminates productive halibut fishing grounds for recreational fishers. Keeping our recreational fisheries close to shore in shallower waters against a shoreline with hundreds of islands and rocks also poses a safety risk to those who continue to fish.

Further south, we also adopted two, year-round area closures off Westport that were historically known to produce yelloweye rockfish catch, thereby forgoing targeted trips for healthy species such as lingcod and yellowtail rockfish that are abundant in these areas.

In close, the Washington coast is remote with communities sparsely populated and difficult to access. Fishing has been central to their local economies and alternative sources of employment are not widely available. Again, we see the Magnuson-Stevens Act build on the principles of conservation and sustainability. These principles are principally about the relationship between our activities today and the consequences for the future. Our rebuilding plans must be grounded in those principles and recognize that the well-being of fishing communities in the future cannot be separated from the well-being of those communities today. We believe the yelloweye stock should be rebuilt in a manner than remains tilted toward successful rebuilding without disproportionally impacting fishing communities now. And again, we view the 17 mt ACT and 20 mt ACL for 2011-12 as highly reasonable next steps toward doing so.

III. Conclusion

The above letter has attempted to capture the core of our reasoning for proposing the 17 mt ACT and 20 mt ACL to the Council in June. We hope the discussion has been useful and informative for your review. The past few years have been very challenging for all involved with management of the PCGFMP. Council and NMFS staff in particular have undertaken extraordinary workloads in developing, coordinating, and reviewing the analyses and activities that have guided the Council in development of Amendments 20, 21, 23, 16-5 and the 2011-12 biennial harvest specifications and management measures. We thank you for those efforts and look forward to continued dialogue and partnership in the stewardship of the fisheries of the west coast.

Sincerely,

Michele K. Culver

Michele Culver, Regional Director
Region 6

Enclosures (1)

cc: Philip Anderson, Director
Donald McIssac, Executive Director, Pacific Fishery Management Council

Subject: Recreational Rockfish Regulations for 2011 and 2012
From: Tim <reelsteel@humboldt1.com>
Date: Tue, 14 Dec 2010 16:26:01 -0800
To: pfmc.comments@noaa.gov
CC: JRSmith@co.humboldt.ca.us, Phil Glenn <celtic4@suddenlink.net>, Flatland@mcn.org, Tom & Mary Marking <tmmarking@sbcglobal.net>

Dear Sirs, I am a charter boat operator in Eureka Ca. I am concerned that the 2011 and 2012 regulations for California will not go into effect on January 1 because the PFMC has not completed their review. The new California rockfish regulations allow for a slightly longer season in parts of Northern California. This added season length will increase the number of trips that we can make next year. I am already seeing interest from customers. Depending on weather , the longer season should help the local charter boats see a revenue increase of 15 to 20%. It is very important to us to know what our season length is so that we can book trips during the Sportsman Shows in January and February. Since we don't know what the salmon season will be like, we need to know what will be open during the season. I have hope that the longer season and relaxed restrictions on ling cod will provide increased business opportunities for recreational fishing based businesses like mine. Thank you, Tim Klassen REEL STEEL SPORTFISHING Eureka Ca 707-499-5509

January 3, 2011

Mr. William Stelle
Northwest Regional Administrator
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115-0070
ATTN: Becky Renko
RIN 0648-BA01

Dear Mr. Stelle:

The following comments are submitted in response to the proposed rule to establish 2011 – 2012 Pacific groundfish harvest specifications and implement revised overfished species rebuilding plans under Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan. These joint comments reflect the views of several organizations representing commercial and recreational fishermen, seafood processors, and fishery-related businesses located in the states of Washington, Oregon, and California.

In the *Federal Register* notice announcing the proposed rule (75 FR 67810 – 67896) NMFS asked for specific comments on whether the proposed annual catch limits (ACLs) for several overfished species are consistent with the 2010 court order in *NRDC v. Locke*. In that ruling, the court found that 2010 catch limits were set too high because there was insufficient data available to demonstrate that those limits would allow rebuilding in as short a time as possible while taking into account other factors required by statute. Most contentious was the perceived lack of a record demonstrating the needs of fishing communities. While those needs were more than adequately demonstrated for the 2007 – 2008 fisheries, the court found them inadequately demonstrated for the 2009 – 2010 fisheries. Thus, NMFS has now requested additional comment relating to this issue before making a decision on approving catch limits for the 2011 – 2012 fisheries.

The attached documents clearly show that, at a minimum, the harvest levels identified as the preferred alternatives by the Pacific Fishery Management Council are required in order to meet community needs and thus pass the test laid out by the statute and the court. We believe the information presented here more than justifies those Council recommendations.

Sincerely,

Rod Moore
West Coast Seafood Processors Association

Robert Alverson
Fishing Vessel Owners Association

Dan Waldeck
Pacific Whiting Conservation Cooperative

John Holloway
Recreational Fishing Alliance / Oregon

Steve Westrick
Westport Charterboat Association

Roger Thomas, President
Bob Ingles, Member, Board of Directors
Golden Gate Fishermen’s Association

David Jincks
Midwater Trawlers Cooperative

Brad Pettinger
Oregon Trawl Commission

Introduction

This report provides information to bolster the Pacific Fishery Management Council's (PFMC) recommended 2011 - 2012 harvest levels for certain overfished species to demonstrate that some minimal harvest of those species is necessary to provide opportunity to catch healthy fish stocks. We firmly believe the PFMC recommendations balance the needs of fishing communities with the mandate to rebuild stocks in the shortest time frame possible.

While the comments briefly highlight scientific justifications for proposed harvest levels, the primary purpose of these comments is to describe how the PFMC preferred alternatives for overfished species in 2011-2012 take into account the needs of fishing communities. The comments further describe how lower Annual Catch Limits (ACLs) proposed in Alternatives 1 and 2 would negatively affect different sectors of the Pacific Coast Groundfish fishery as whole and/or individual west coast port communities who are dependent to some degree on groundfish fisheries.

These comments are patterned after the June 2006 Supplemental Groundfish Advisory Subpanel (GAP) report provided to the PFMC at the June 2006 meeting (Agenda Item F2.2.c Supplemental GAP Report) and include expanded community-specific information.

The report is divided into three parts. The first section includes general comments on current and future economic conditions in the Pacific Coast Groundfish fishery. The second section examines the effects of lower ACLs on a cumulative basis for all sectors. The last section summarizes the rationale for the preferred alternatives and contrasts the alternatives with lower ACL values to demonstrate the potentially negative impacts on fishery sectors as well as the west coast port communities that are affected.

A variety of sources were used to compile this report and include the Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery Draft Environmental Assessment; PFMC Briefing Book documents including Groundfish Management Team reports, GAP reports and public comments between 2006-2010; and the PacFIN data base. The generally accepted multiplier of 2.5 is used to generate community impacts from ex-vessel revenue amounts.

1. General Comments

Many of the comments presented in Agenda Item F.2.c Supplemental GAP Report from June 2006 are still appropriate and applicable today. The following comment rings true now more than ever:

"Taking into consideration the needs of fishing communities to avoid short and mid-term disastrous consequences has different meanings to different stakeholders. However, one fact is undisputable: short and long-term consequences to fishing communities are intrinsically linked. In order for there to be commercial and recreational fishing industries over the long term, short and mid-term management measures must help preserve fishing businesses. More plainly said, if no fishing industry exists into the future because of overly extreme cuts in harvest then the Council has not taken into account the economic needs of fishing communities. If individual businesses continue to become depleted, necessary infrastructure within fishing communities that support commercial and recreational industries also become depleted. Once boats are tied to the dock, doors are closed, [and] markets are lost, it isn't just one season's fishing foregone."

Consider yelloweye rockfish in the context described above. Yelloweye rockfish are incidentally taken by all sectors of the groundfish fishery except the commercial trawl whiting sector. If a zero harvest (zero impact) of yelloweye were imposed to meet the quickest time to rebuild we would eliminate virtually all commercial and recreational groundfish fisheries on the west coast. At the same time, the best available science tells us that even under a zero harvest of yelloweye the stock would not be rebuilt until 2047. Eliminating the "glue" (i.e. groundfish fisheries/sectors) that holds a majority of west coast commercial and recreational fishing business portfolios together and solvent will cripple the system and decimate businesses and coastal communities.

Allowing a trade-off in rebuilding time with a small impact on yelloweye stocks allows the fabric of west coast groundfish fisheries to remain whole. At 17 mt, the proposed Annual Catch Target equates to approximately 38,080 pounds of fish. At an average of 5-7 pounds per yelloweye this equates to just over 6,000 individual yelloweye that are necessary to keep our groundfish fisheries somewhat intact, albeit under severely reduced conditions and with numerous restrictions on the harvest of healthy species.

All sectors of the Pacific Coast Groundfish fishery have undergone severe restrictions in one form or another as a result of rebuilding plans. Rockfish Conservation Areas, depth restrictions, bycatch harvest caps, reduced trip limits, reduced bag limits, reduced seasons – all of these management measures are utilized to keep the groundfish fishery within a specified range of harvest. Many of these measures have eliminated or severely curtailed certain segments of the groundfish fishery resulting as well in closed and/or consolidated businesses. We hear again and again during public comments at the PFMC meetings that many participants are just barely hanging on and they fear the last "nail in the coffin" that finally destroys the fishing business that has long been their families' only livelihood.

For years we have been trying to get socioeconomic information included in PFMC decision making. While some progress has been made, available data does not adequately demonstrate the dire consequences of failed businesses and communities. Moreover, it is not just fishermen and their crew (and families) that suffer, or seafood processors and their workforce (and families) that suffer, but all the secondary and tertiary businesses which are affected by reductions in fishing opportunities. And it's not even just gear suppliers, ports, grocery stores, shoe stores and automotive dealers. It's the states who lose revenue from landings taxes, business taxes, and reduced revenues based on personal income reductions. It's a vicious cycle that is now exacerbated by the threat of litigation over approximately 6,000 individual yelloweye, a relatively small number of fish whose harvest can help stem the tide of despair while continuing to allow the yelloweye rockfish stock to rebuild.

The majority of hard-working people left in west coast fisheries want to continue fishing over the long term. They are working for sustainable fisheries within the system the law allows. Great strides have been made in the groundfish fishery in terms of improved gear, improved knowledge about stocks, improved cooperation and sharing of information between fishermen and fisheries, improved knowledge about the importance of all fisheries to the fabric of west coast communities, and innovative new ways to manage fisheries such as the Trawl IQ program. These are all the positive results of the hard work and collaboration of fishery participants. All overfished stocks are rebuilding. We are moving in a positive direction for the Pacific Coast Groundfish fishery. All participants ask is for the chance to allow all these positive initiatives to see continued and improved success, which requires a minimum amount of impact on species under rebuilding plans. Otherwise all the efforts at sustainability apply only to the biology of fish and not to sustaining our coastal communities and our fishing businesses.

It should go without saying that any loss of revenue to coastal communities during the current national and regional economic crisis should be avoided to the extent practicable. Many of the affected coastal communities have unemployment rates well above the national average of 9.8% Realty Trac reports that as of November, 2010, California had the 3rd highest foreclosure rate in the nation with one in every 233 households at some step in the foreclosure process. Many of the west coast counties described below as "vulnerable" or "most vulnerable" under the draft DEIS also are ranked as counties with "high" foreclosure rates. The Federal Deposit Insurance Corporation (FDIC) identifies the main tipping point that forces people into foreclosure as job loss. Eliminating jobs and revenue without meaningful gains in rebuilding times for overfished species should clearly be avoided. This is the delicate balance that managers must consider and the PFMC proposed ACLs will accomplish this goal.

2. Low ACL Options Cumulative Effects on Sectors

The nature of the west coast groundfish fishery requires a comprehensive approach to management necessitated by the multiple stocks and stock statuses and the multiple interactions between stocks and fishing strategies across all sectors. It is important to note that under Alternative 1 ACLs, all sectors would be hampered to some degree and there is always the chance that entire fisheries and seasons can be eliminated if an ACL is projected to be exceeded. All sectors of the groundfish fishery contributed more than $73 million in ex-vessel revenue in 2009 equating to over $182 million in revenue to affected communities. While this seems to be an impressive number, it is below the 5-year average of just over $85 million in ex-vessel revenue and significantly less than the $93 million dollars in ex-vessel revenue generated in the year 2000.

Any new restrictions occur on top of the cumulative effects of closed areas, gear changes and restrictions, restricted bag limits, seasonal closures, reduced trip limits and other restrictive management measures already in place.

All of the Alternative 1 ACLs (or ACTs) for 2011 are lower than initial 2009-2010 Optimum Yields sans widow rockfish. Closed areas in all three states (through state processes) and the rebuilding paradox alone exacerbate an already distressed fishery; implementing ACLs that are even lower than the current limited opportunities will negatively affect participants and fishing communities in a significant way and reduce ex-vessel revenue causing job loss and associated economic loss to affected communities.

<u>Limited Entry Trawl Non-whiting and Whiting</u>
In 2009 west coast trawl fisheries contributed over $46,000,000 in ex-vessel revenue - this equates to over $115,000,000 in positive economic impact to affected communities.

Alternative 1 ACLs result in the lowest trawl allocations for overfished species of all the available ACL alternatives and all ACLs equate to the possibility of lost revenue or a reduction in the $46,000,000 in ex-vessel revenue and $115,000,000 in economic impact to affected communities.

Species	Trawl Allocation under status quo fishery (2010)	Trawl Allocation under Alternative 1 ACL	Percent change from 2010
Canary rockfish	21 mt	8.0 mt	62% LESS
Yelloweye rockfish	0.6 mt	0.4 mt	33% LESS
Cowcod	1.5 mt	0.9 mt	40% LESS
Darkblotched rockfish	230 mt	175.8 mt	24% LESS
Bocaccio rockfish	16.1 mt	4.7 mt	71% LESS
Pacific Ocean Perch	100.8 mt	33.8 mt	66% LESS
Petrale Sole	1,111 mt	342 mt	79% LESS

In recent years the bulk of non-whiting landings (by weight) in the limited entry non-whiting trawl sector was made up of Dover sole, Arrowtooth Flounder, Petrale sole, sablefish, short spine thornyheads and longspine thornyheads. Under alternative 1 & 2 ACLs sablefish, petrale sole and Dover sole opportunities will be reduced for the limited entry non-whiting trawl fishery. Even under the PFMC's preferred alternative, there will be reduced catches for sablefish and petrale sole. There will be less opportunity to target healthy stocks because of low overfished species ACLs - all resulting in reduced annual catches and a reduction in the $46,000,000 ex-vessel revenue generated from the catch.

Species	Alternative 1	Alternative 2	Alternative 3	2010	Difference
Dover sole					
Projected catch a/	10,575 mt	12,492 mt	17,710 mt	13,829 mt	3,254 mt LESS to 3,881 mt more
Projected ex-vessel revenue b/	$7,784,638	$9,195,810	$13,036,968	$10,180,024	$2,395,386 LESS to $2,856,944 more
Sablefish					
Projected catch a/	2,187 mt	2,325 mt	2,538 mt	2,915 mt	728 mt – 377 mt LESS
Projected ex-vessel revenue b/	$9,269,144	$9,854,028	$10,756,785	$12,354,621	$3,085,477 - $1,597,836 LESS
Petrale Sole					
Projected catch a/	341 mt	632 mt	851 mt	1111 mt	770 mt – 260 mt LESS
Projected ex-vessel revenue b/	$962,753	$1,784,340	$2,402,648	$3,136,712	$2,173,959 - $734,064 LESS

a/ Projected catch values taken from DEIS Appendix C Trawl Projected Impact Tables
b/ Projected ex-vessel revenue utilizes average price per pound in 2010 from PacFIN

What's more, in order to stay within the ACLs for overfished species, the required management measures for all species result in projected catches that are significantly below the targets for many of the remaining trawl-caught species. In the table below projected catches and trawl allocations are from the DEIS, Appendix C. Revenue is based on average price per pound for each trawl species in 2010.

Species	Projected Catch compared to trawl allocation and projected ex-vessel revenue under Alternative 1	Projected Catch compared to trawl allocation and associated ex-vessel revenue under Alternative 2	Projected Catch compared to trawl allocation and associated ex-vessel revenue under Alternative 3	Projected Ex-vessel revenue for 2010 catch
Longspine	1,326 mt / 2000 mt $987,806	1,337 mt / 2,000 mt $996,000	1,341 mt / 1,971 mt $998,980	1,512 mt = $1,126,367
Shortspine	1,283 mt / 1,450 mt $1,693,811	1,418 mt / 1,450 mt $1,747,027	1,387 mt / 1,450 mt $1,708,833	1,335 mt = $1,762,461
Arrowtooth	3,447 mt / 14,166 mt $736,927	4,607 mt / 14,166 mt $883,383	5,524 mt / 12,441 mt $1,059,215	5,181 mt = $993,446
English sole	424 mt / 18,659 mt $290,628	439 mt / 18,659 mt $300,909	458 mt / 18,659 mt $313,933	598 mt = $409,895

The whiting fishery will also be hampered by the low ACLs for species of concern. The lower trawl allocations will likely result in more restrictive bycatch caps that could prevent one or all of the three sectors from achieving their whiting allocation – thus foregoing millions of dollars in revenue. In 2008 the whiting sectors combined to produce over $57 million dollars in ex-vessel revenue and over $144 million in economic contributions to affected communities.

Low ACLs also affect the flexibility managers will have when implementing the trawl IQ program and this affects both the non-whiting and whiting fisheries. An example of an unexpected consequence of the program came to light recently when Fort Bragg non-whiting trawl fishermen notified the Council they were not allocated enough yelloweye (in some cases zero) to prosecute healthy target fisheries. The lower the ACL, the less flexibility in dealing with unintended consequences of the IQ fishery during the first year of implementation.

Fixed Gear

Fixed gear fisheries contributed over $27,000,000 in ex-vessel revenue in 2009 which equates to over $81,000,000 in economic impact to affected communities. Any reduction in opportunities will lower the ex-vessel revenue and negatively affect communities.

The non-nearshore fixed gear fishery mainly targets sablefish. According to the DEIS, Alternative 1 ACLs, particularly for canary, "are so low that RCAs would have to be restricted to depths that are deeper than implemented since the inception of RCAs and sablefish allocations would have to be reduced by as much as 42 percent. " Obviously the results of the management measures could be catastrophic and include reduced annual catches, fewer areas to fish, longer-distance runs to fishing grounds, decreased revenue and catch rates, increased effort and costs, increased gear conflicts and increased safety concerns.

The 2010 OY/ACL for sablefish was 6,471 mt resulting in a fixed gear allocation of 2,140 mt. At an average price of $2.80 per pound this equates to projected ex-vessel revenue of $13,206,368 and an associated community impact of $33,015,920. A 42% reduction in the fixed gear allocation from 2010 would equate to 1,241.2 mt which results in a projected loss of over $5.5 million dollars to the fixed gear fishery and associated $11 million dollar loss to affected communities. These dollar projections are probably conservative as sablefish prices in the directed fishery versus the daily trip limit fishery are not separated out and an average price (from PacFIN) was used for the calculation.

The nearshore fixed gear fisheries in Oregon and California are severely affected under Alternative 1 & 2 ACLs. Neither state can maintain opportunities that are similar to the limited opportunities available in 2010 thus resulting in reduced annual catches and reduced revenue. Total catches include black rockfish, blue rockfish, cabezon, kelp greenling, lingcod, deeper nearshore rockfish, other minor rockfish, and shallow nearshore rockfish.

<table>
<tr><td>2010 projected catch</td><td colspan="2">Alternative 1</td><td colspan="4">Alternative 2</td><td>Alternative 3 (PPA)</td></tr>
<tr><td rowspan="4">456 mt</td><td>Option 1</td><td>Option 2</td><td colspan="2">Option 1</td><td colspan="2">Option 2</td><td rowspan="3">525 mt</td></tr>
<tr><td rowspan="2">226 mt</td><td rowspan="2">232 mt</td><td>1a</td><td>1b</td><td>2a</td><td>2b</td></tr>
<tr><td>413 mt</td><td>328 mt</td><td>420 mt</td><td>336 mt</td></tr>
<tr><td>50% LESS than 2010</td><td>49% LESS than 2010</td><td>9% Less than 2010</td><td>28% Less than 2010</td><td>8% Less than 2010</td><td>26% Less than 2010</td><td>115% of 2010</td></tr>
</table>

<u>Washington, Oregon & California Recreational</u>
All sectors of the recreational fishery in all three states are negatively affected under Alternatives 1 & 2 – all would require changes to fathom line fishing areas (all would be more restricted) as well as reductions to seasons in the order of magnitude of months. Any opportunities afforded the recreational sectors in all three states under ACLs in Alternative 1 will result in significant reductions in opportunity and revenue.

It is more challenging to estimate the social and economic value of recreational fishing than it is for commercial fishing purposes and different methods are used to equate potential affects from changes to regulations. For example, the DEIS from June 2006 noted that in 2005 California Recreational survey data for northern California recorded almost 57,000 angler trips for the months of September and October alone. To develop the economic value of these trips, local businesses, harbor masters, restaurants, motels, sports shops, marine mechanics and suppliers, fuel docks, harbors, and associated businesses that support the sport fishing community all must be considered and evaluated.

The Groundfish Advisory Panel (GAP) noted in 2010: “To-date loss of time on the water due to restrictions, closures, bag limit reductions and effort shift to other areas by tourists have already resulted in the loss of tens of millions of dollars to coastal communities.”

An illustration of these effects is the early closure of the groundfish season in 2008 in the northern coastal California region due to yelloweye impacts. In September and October of 2008, the season was closed in an emergency action resulting in the direct loss of more than $3.7 million dollars PER MONTH to the Humboldt County area alone. Attachment #1 to these comments describes the expenditures on a trip and annual basis that support these projected losses. Chapter 3 of the DEIS states that over 567,000 trips (charter plus private) were taken for groundfish in 2009. Using the $130 expenditure amount per angler per day, this equates to over $74 million dollars spent on sport fishing activities in 2009 and over $180 million in economic contributions to affected communities. Any reductions to current opportunities in California (as projected under Alternatives 1 & 2 ACLs) will result in reductions from this expenditure amount in 2011 and 2012.

Oregon has already suffered losses in the recreational charter fleet – down from 232 boats in 2001 to 76 businesses in 2008. Only seventy-five percent of these boats can operate on a full-time basis and many businesses have already gone under. Chapter 3 of the DEIS states that 71,822 trips (charter and private) for groundfish were taken in 2009. Using the $130 expenditure amount per angler per day, this equates to over $9 million dollars spent in Oregon on sport fishing activities and over $22.5 million in economic contributions to affected communities. Any reductions to current opportunities in Oregon (as projected under Alternatives 1 & 2 ACLs) will result in reductions from this expenditure amount in 2011 and 2012.

Washington businesses are struggling already due to recent restrictions, shorter halibut seasons, fathom restrictions, high fuel prices and in general a poor economy – all of this affects businesses in all sectors that support sport fishing. Walking down the streets of any Washington port and seeing vacant storefronts where thriving businesses used to operate is an ominous reminder of what has occurred in recent years. According to Chapter 3 of the DEIS, 17,682 trips (charter plus private) in Washington were associated with groundfish. Using the $130 expenditure per day per angler this equates to a conservative estimate of over $2 million dollars spent on sport fishing activities and over $5 million in economic contributions to affected communities. Any reductions to current opportunities in Washington (as projected under Alternatives 1 & 2 ACLs) will result in reductions from this expenditure amount in 2011 and 2012.

Research

Research opportunities could be curtailed or eliminated under Alternative 1 ACLs – both the annual surveys that inform management and stock assessments and the exempted fishing permits that research gear and fishing techniques to reduce bycatch while targeting healthy stocks.

3. Individual Species Impact Discussion

The following section details information specific to each species including the PFMC recommendation, the fisheries affected by the recommendation, the communities that are affected by changes to regulations and available limits for that species, scientific rationale for the recommendation, regained opportunities when applicable, and individual affects on sectors due to management measures to attain low value ACLs.

YELLOWEYE ROCKFISH

PFMC Recommendation

Annual Catch Limit of 20 mt in 2011 and 2012 with Annual Catch Targets of 17 mt for both years

Fisheries Affected

Yelloweye rockfish are currently caught in virtually all West Coast fisheries including:

- Research Fisheries
- Tribal Fisheries
- Washington Recreational Fisheries
- Oregon Recreational Fisheries
- California Recreational Fisheries
- Limited Entry Trawl Non-whiting Fisheries
- Limited Entry Fixed Gear Fisheries
- Open Access Directed Groundfish Fisheries
- Open Access Directed Fisheries With Incidental Groundfish Catch
    - Pink Shrimp

- Salmon Troll

Communities Affected

- There are at least 31 port communities affected by the amount of yelloweye rockfish available.
- These port communities are in counties with unemployment rates ranging from a low of 7.3% (Whatcom County, Washington) to a high of 13.3% (Winchester Bay, Oregon).
- Fifty-five percent of these communities have unemployment rates higher than the November 2010 national average of 9.8%
- Over 1/3 of the communities ranked as "highly" dependent on groundfish fisheries
- Just under 1/3 of the communities were ranked with a "medium" dependency on groundfish fisheries
- Sixty-five percent of the communities received a "vulnerable" rank with respect to changes in groundfish fisheries with 12 communities receiving the "most vulnerable" rating
  - 23% of Washington communities were rated "most vulnerable"
  - 33% of Oregon communities were rated "most vulnerable"
  - 75% of California communities were rated "most vulnerable"

State of Washington				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Aberdeen	Grays Harbor	8.5%	Medium	Most vulnerable
Bellingham	Whatcom	7.3%	Medium	
Blaine	Whatcom	7.3%	Medium	
Cathlamet	Wakiakum	11.9%	Not Ranked	
Chinook	Pacific	10.3%	Low	Most vulnerable
Everett	Snohomish	9.8%	Not Dependent	
Ilwaco	Pacific	10.3%	Low	Most vulnerable
La Push	Clallam	8.9%	Medium	Vulnerable
Mill Creek	Snohomish	9.8%	Not Dependent	
Neah Bay	Clallam	8.9%	Medium	Vulnerable
Port Angeles	Clallam	8.9%	Medium	Vulnerable
Port Townsend	Jefferson	8.3%	Not Dependent	
Seattle	King	8.5%	Not Dependent	
Tokeland	Pacific	10.3%	Low	Most vulnerable
Westport	Gray's Harbor	8.5%	Medium	Most vulnerable

State of Oregon				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Astoria	Clatsop	9.1%	Medium	Vulnerable
Bandon	Coos	11.8%	High	Most vulnerable
Brookings	Curry	11.7%	High	Vulnerable
Charleston	Coos	11.8%	High	Most vulnerable
Depoe Bay	Lincoln	10.3%	High	Most vulnerable

Florence	Lane	10.1%	Low	
Garibaldi	Tillamook	9%	Medium	
Gold Beach	Curry	11.7%	High	Vulnerable
Newport	Lincoln	10.3%	High	Most vulnerable
Pacific City	Tillamook	9%	Medium	
Port Orford	Curry	11.7%	High	Vulnerable
Winchester Bay	Douglas	13.3%	Low	

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Crescent City	Del Norte	12.6%	High	Vulnerable
Eureka	Humboldt	10.3%	High	Most vulnerable
Fields Landing	Humboldt	10.3%	High	Most vulnerable
Trinidad	Humboldt	10.3%	High	Most vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- Yelloweye rockfish are rebuilding, albeit slowly
- The SPR harvest rate under this alternative is more conservative then the SPR harvest rate in the ramp-down strategy for 2010
- This alternative represents a more conservative harvest rate than adopted in the FMP
- Rebuilds 3 years earlier than the median time to rebuild under the FMP SPR harvest rate
- Adds 37 years to T-target which is 2047 under a zero harvest level
- Includes an ACT level to ensure the ACL level is not exceeded and which reduces rebuilding time by 10 years from the ACL level
- Level allows for limited but increased research opportunity

Impacts of lower ACL values

- Alternative 1 ACL of 13 mt in 2011 and 2012; Alternative 2 ACL of 17 mt in 2011 and 2012

<u>Limited Entry Trawl</u>
The non-whiting trawl fishery would be negatively affected under ACL alternative 1 which results in a trawl allocation that is 33% less then what is available to the fishery in 2010. Alternative 2 would result in a trawl allocation approximately equal to the 2010 fishery. As described in the previous section, the lower ACL amount for yelloweye will affect the flexibility that managers have when dealing with unintended consequences during the first year of the trawl IQ program.

<u>Nearshore Fixed Gear</u>
Oregon and California would be severely constrained by yelloweye rockfish. Neither state would be able to maintain opportunities that are similar to 2009-2010 resulting in nearshore fishermen and communities being negatively affected by low ACL values for yelloweye rockfish. Oregon would require lower catches of the most

important near shore species (black rockfish and greenling) to stay within projected yelloweye impacts. Likewise in California, lower landings limits on black rockfish and cabezon would be imposed to stay within overfished species limits. In addition the shoreward boundaries of the RCA would be set at 20 fathoms (moved shoreward from 30 fathoms) for all areas except between 43° and 46°16':

Shoreward RCA Boundary	South 34° 27'	34°27'-40°10'	40°10'-42°	42°-Col/Eur 43°	Col/Eur 43°-46°16'	North of 46°16'
Shore						
20 fm						
30 fm						
60 fm						

(Grey areas are closed to fishing)

In addition to less access to target species resulting in lower annual catches, expanding RCA boundaries towards shore increases the opportunities for gear conflicts and reduces the area available for fishing. All of these reduce revenue to fishermen, processors and coastal communities.

Washington Recreational

The DEIS states "the most restrictive option for the Washington recreational groundfish fishery would be in place under Alternative 1." The bottom fish limit would be reduced from 15 to 12 fish per day and would include a new cabezon sub limit of two fish per angler per day. This sublimit would be in addition to sublimits for rockfish and lingcod at 10 and 2 fish, respectively. The 20 fathom depth restriction would be in place for a longer time period than in 2009-2010 in Management areas 3 and 4.

Oregon Recreational

An ACL of 13 mt could result in an Oregon recreational season which is open year-round but only in waters between shore and 20 fathoms. Any options considered to meet this alternative are more restrictive then fishing regulations in place during the 2009-2010 seasons. There is also an option to expand the Yelloweye RCA at Stonewall Bank.

California Recreational

To meet the 13 mt ACL a "reduction to the already highly constrained three month fishing season in the North-Central North of Point Arena Management Area would be needed". The reduction would equate to a 1.5 month season – a reduction of 50% of fishing time versus the already very limited status quo.
Reductions to the seasons in both the North-Central South of Point Arena Management Area and the South Central Management area would also be imposed at .5 months and 1 month, respectively.

It is important to note that maintaining yelloweye catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with yelloweye. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

DARKBLOTCHED ROCKFISH

PFMC Recommendation

Annual Catch Limit of 332 mt in 2011 and 329 mt in 2012.

Fisheries Affected

Darkblotched rockfish is currently taken in several West Coast fisheries including:

- Research Fisheries
- Tribal Fisheries
- Limited Entry Trawl Non-whiting Fisheries
- Limited Entry Trawl Whiting Fisheries
- Limited Entry fixed-gear Fisheries
- Open Access Directed Groundfish Fisheries

Communities Affected

- There are at least 13 port communities in Washington, Oregon and California that are affected by the amount of darkblotched rockfish available for harvest.
- These communities are in counties where the unemployment rate ranges from a low of 7.3% (Whatcom County, Washington) to a high of 12.6% (Del Norte County, California).
- Over half of these communities (7 or 54%) have unemployment rates higher than the November 2010 national average of 9.8%.
- Just under half of these communities (6 or 46%) are ranked as “highly” dependent on groundfish fisheries
- Five of these communities are ranked with a “medium” dependency on groundfish fisheries
- A majority of the communities received a “vulnerable” rank with regards to changes in groundfish fisheries with six of the communities receiving the “most vulnerable” rating
    - 40% of Washington communities were ranked “most vulnerable”
    - 50% of Oregon communities were ranked “most vulnerable”
    - 67% of California communities were ranked “most vulnerable”

State of Washington				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Bellingham	Whatcom	7.3%	Medium	
Blaine	Whatcom	7.3%	Medium	
Ilwaco	Pacific	10.3%	Low	Most vulnerable
Neah Bay	Clallam	8.9%	Medium	Vulnerable
Westport	Gray’s Harbor	8.5%	Medium	Most vulnerable

State of Oregon				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Astoria	Clatsop	9.1%	Medium	Vulnerable
Brookings	Curry	11.7%	High	Vulnerable
Charleston	Coos	11.8%	High	Most vulnerable
Newport	Lincoln	10.3%	High	Most vulnerable

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Crescent City	Del Norte	12.6%	High	Vulnerable
Eureka	Humboldt	10.3%	High	Most vulnerable
Fort Bragg	Mendocino	10.2%	High	Most vulnerable
Trinidad	Humboldt	10.3%	High	Most vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- Darkblotched rockfish continues to rebuild at a steady rate and is at 25% of the unfished biomass with an upward trajectory, according to the latest stock assessment
- Rebuilds one year faster than T-target
- Several currently restricted opportunities could be made available:
    - Trawl: darkblotched constrains slope rockfish, sablefish, whiting, shortspine and longspine thornyheads, Dover sole and all other fisheries seaward of the RCA – opportunities for increased harvest seaward of the RCA could be explored
    - Open access fisheries have been constrained due to the rebuilding paradox – an example is the shrimp fishery. During good years shrimpers tend to encounter more darkblotched rockfish – a higher ACL could accommodate that fishery more appropriately without constraining other fisheries.

Impacts of Lower ACL values

- The Alternative 1 ACLs of 222 mt in 2011 and 2012 result in a reduction of 33% from 2010 levels.

- The Alternative 2 ACLs of 298 mt in 2011 and 296 mt in 2012 result in a reduction of 10% from 2010 levels.

- The Alternative 3 (preferred) ACLs of 332 mt in 2011 and 329 mt in 2012 result in similar fishing opportunities for 2011.

Limited Entry Trawl

Darkblotched rockfish continue to constrain slope rockfish, sablefish, whiting, shortspine and longspine thornyheads, Dover sole and all other fisheries seaward of the RCA by allowing reduced opportunities to harvest these healthy stocks. Lower darkblotched ACLs will likely result in more restrictive bycatch caps for the whiting fishery with the potential for one or more whiting sectors forgoing a portion of their whiting allocation. In addition, the lower ACLs will affect the flexibility managers have when attending to unintended consequences during the first year of the trawl IQ program.

It is important to note that maintaining darkblotched catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with darkblotched rockfish. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and “stay alive” during recent years have “figured out how to make it work” and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

COWCOD

PFMC Recommendation
Annual Catch Limit of 4 mt in 2011 and 2012.

Fisheries Affected
Cowcod are caught in the following California fisheries south of 38°10’ N. Lat:

- Research Fisheries
- California Recreational Fisheries
- Limited Entry Trawl Non-whiting Fisheries
- Limited Entry Fixed-Gear Fisheries
- Open Access Directed Groundfish Fisheries

Communities Affected

- There are at least 31 port communities that are affected by the amount of cowcod available for harvest.
- These communities are all located in the state of California south of 38° 10’ N. Lat.
- All communities are in counties with an unemployment rate ranging from a low of 8% (Marin County) to a high of 15.7% (Fresno County).
- Twenty-one of the communities have unemployment rates higher than the November 2010 national average of 9.8%.
- One-third of California port communities (10 or 32%)are ranked as “highly” dependant on groundfish fisheries
- Over half of California communities (18 or58%) are ranked with a “medium” dependence on groundfish fisheries
- Over one-third of these port communities (35%) received a “vulnerable” score related to changes in groundfish fisheries and 5 of these communities received the “most vulnerable” rank.

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Albion	Mendocino	10.2%	High	Most Vulnerable
Avila	San Luis Obispo	9.4%	High	
Berkeley	Alameda	11%	Low	
Big Creek	Fresno	15.7%	Not Rated	
Bodega Bay	Sonoma	9.7%	Medium	
Dana Point	Orange	9.1%	Medium	
Elk	Mendocino	10.2%	High	Most Vulnerable
Fort Bragg	Mendocino	10.2%	High	Most Vulnerable
Half Moon Bay	San Mateo	8.5%	Medium	
Long Beach	Los Angeles	12.5%	Medium	Vulnerable
Mission Bay	San Diego	10.2%	Medium	
Monterey	Monterey	10.4%	High	Vulnerable
Morro Bay	San Luis Obispo	9.4%	High	
Moss Landing	Monterey	10.4%	High	Vulnerable

Newport Beach	Orange	9.1%	Medium	
Oceanside	San Diego	10.2%	Medium	
Oxnard	Ventura	12.5%	Medium	
Playa Del Rey	Los Angeles	12.5%	Medium	Vulnerable
Point Arena	Mendocino	10.2%	High	Most Vulnerable
Point Loma	San Diego	10.2%	Medium	
Point Reyes	Marin	8%	Low	
San Diego	San Diego	10.2%	Medium	
San Francisco	San Francisco	9.3%	Medium	
San Pedro	Los Angeles	12.5%	Medium	Vulnerable
San Simeon	San Luis Obispo	9.4%	High	
Santa Barbara	Santa Barbara	8.7%	Medium	
Santa Cruz	Santa Cruz	10.6%	Medium	
Shelter Cove	Humboldt	10.3%	High	Most Vulnerable
Terminal Island	Los Angeles	12.5%	Medium	Vulnerable
Ventura	Ventura	12.5%	Medium	
Wilmington	Los Angeles	12.5%	Medium	Vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- Cowcod is rebuilding, albeit slowly
- Most of the cowcod habitat is protected inside the Cowcod Conservation Area (CCA)
- Cowcod is extremely important to the recreational and trawl fisheries south of 40°10
- This level of catch is consistent with recent years
- Cowcod impacts have varied over the last five years and this ACL encompasses that variability

Impacts of lower ACL values

- The Alternative 1 ACL of 2 mt in 2011 and 2012 equate to a 50% <u>reduction</u> from 2010 levels. These levels could eliminate research activities in the area as well as require changes to the recreational fisheries in the Southern Management Area.

- The Alternative 2 ACL of 3 mt in 2011 and 2012 equate to a 25% <u>reduction</u> from 2010 levels. These levels could adversely affect or eliminate research activities in the area.

- The Alternative 3 (preferred) ACL of 4 mt in 2011 and 2012 is equal to 2010 levels.

See the cumulative effects of lower ACL values for individual sector affects described above.

It is important to note that maintaining cowcod catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with cowcod. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels.

This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

CANARY ROCKFISH

PFMC Recommendation
Annual Catch Limit of 102 mt for 2011 and 107 mt for 2012.

Fisheries Affected
Canary rockfish are caught in all the major fishery sectors, including:

- Research Fisheries
- Washington Recreational Fisheries
- Oregon Recreational Fisheries
- California Recreational Fisheries
- Tribal Fisheries
- Limited Entry Trawl Non-Whiting Fisheries
- Limited Entry Trawl Whiting Fisheries
- Limited Entry Fixed Gear Fisheries
- Open Access Directed Groundfish Fisheries
- Open Access Directed Fisheries with Incidental Groundfish Catch
    - California Halibut
    - Pink Shrimp
    - Salmon Troll

Communities Affected

- There are at least 46 port communities in Washington (15 or 33%), Oregon (12 or 25%) and California (19 or 41%) that are affected by the amount of canary rockfish available for harvest.
- These port communities are all in counties with unemployment rates ranging from a low of 7.3% (Whatcom County, Washington) to a high of 15.7% (Fresno County, California).
- Over half (61%) of these communities are located in counties that have unemployment rates higher than the November 2010 national average of 9.8%.
- Almost half of these communities (21 or 46%) are ranked as "highly" dependent on groundfish fisheries
- 13 communities (28%) are ranked with a "medium" dependence on groundfish fisheries
- Twenty-seven of these communities (59%) received a "vulnerable" score related to changes in groundfish fisheries with a majority of those communities (17) receiving the "most vulnerable" status
    - 5 most vulnerable communities in Washington (1/3 of Washington port communities)
    - 4 most vulnerable communities in Oregon (1/4 of Oregon port communities)
    - 8 most vulnerable communities in California (1/2 of California port communities)

State of Washington				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Aberdeen	Grays Harbor	8.5%	Medium	Most vulnerable
Bellingham	Whatcom	7.3%	Medium	
Blaine	Whatcom	7.3%	Medium	
Cathlamet	Wakiakum	11.9%	Not Ranked	
Chinook	Pacific	10.3%	Low	Most vulnerable
Everett	Snohomish	9.8%	Not Dependent	

Ilwaco	Pacific	10.3%	Low	Most vulnerable
La Push	Clallam	8.9%	Medium	Vulnerable
Mill Creek	Snohomish	9.8%	Not Dependent	
Neah Bay	Clallam	8.9%	Medium	Vulnerable
Port Angeles	Clallam	8.9%	Medium	Vulnerable
Port Townsend	Jefferson	8.3%	Not Dependent	
Seattle	King	8.5%	Not Dependent	
Tokeland	Pacific	10.3%	Low	Most vulnerable
Westport	Gray's Harbor	8.5%	Medium	Most vulnerable

State of Oregon				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Astoria	Clatsop	9.1%	Medium	Vulnerable
Bandon	Coos	11.8%	High	Most vulnerable
Brookings	Curry	11.7%	High	Vulnerable
Charleston	Coos	11.8%	High	Most vulnerable
Depoe Bay	Lincoln	10.3%	High	Most vulnerable
Florence	Lane	10.1%	Low	
Garibaldi	Tillamook	9%	Medium	
Gold Beach	Curry	11.7%	High	Vulnerable
Newport	Lincoln	10.3%	High	Most vulnerable
Pacific City	Tillamook	9%	Medium	
Port Orford	Curry	11.7%	High	Vulnerable
Winchester Bay	Douglas	13.3%	Low	

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Albion	Mendocino	10.2%	High	Most Vulnerable
Avila	San Luis Obispo	9.4%	High	
Big Creek	Fresno	15.7%	Not Rated	
Bodega Bay	Sonoma	9.7%	Medium	
Crescent City	Del Norte			
Elk	Mendocino	10.2%	High	Most Vulnerable
Eureka	Humboldt	10.3%	High	Most Vulnerable
Fields Landing	Humboldt	10.3%	High	Most Vulnerable
Fort Bragg	Mendocino	10.2%	High	Most Vulnerable
Half Moon Bay	San Mateo	8.5%	Medium	
Monterey	Monterey	10.4%	High	Vulnerable
Morro Bay	San Luis Obispo	9.4%	High	
Moss Landing	Monterey	10.4%	High	Vulnerable
Point Arena	Mendocino	10.2%	High	Most Vulnerable
Point Reyes	Marin	8%	Low	
San Francisco	San Francisco	9.3%	Medium	

Santa Cruz	Santa Cruz	10.6%	Medium	
Shelter Cove	Humboldt	10.3%	High	Most Vulnerable
Trinidad	Humboldt	10.3%	High	Most Vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- The latest assessment for canary rockfish demonstrates that the stock has been rebuilding since 2000
- This level of harvest equates to an additional 3 years to rebuild as compared to a zero-harvest alternative
- New information used to inform the 2009 assessment resulted in a new T-target for rebuilding – rebuilding has still been occurring since 2000
- Availability of some level of canary rockfish in the majority of fisheries is critical to prosecuting those fisheries – this option allows greater management flexibility for bycatch in all sectors and more equitably distributes bycatch to slow the loss of valuable fishing heritage
- Several cumulative management measures are already in place to support rebuilding of canary rockfish
- The majority of the 2010 OY of 105 mt is projected to be nearly fully utilized
- Several regained opportunities could include:
    - Recreational: liberalizing of RCA boundaries from 20 fathoms to 30 fathoms north of 40°10', a one-fish bag limit reducing regulatory discards, and reduction in impacts to other recreationally-caught species of concern (i.e. yellow-eye)
    - Trawl whiting: flexibility for the whiting fishery which has been constrained by canary in recent years
    - Trawl non-whiting: mid-water yellowtail rockfish opportunities, arrowtooth flounder opportunities, chilipepper rockfish opportunities and to a lesser degree an opportunity to regain lingcod, sanddabs, and a shallow-water English sole fishery.

Impacts of lower ACL values

- The Alternative 1 ACLs of 49 mt in 2011 and 51 mt in 2012 equate to a reduction of 53% and 51% from 2010 levels.

- The Alternative 2 ACLs of 94 mt in 2011 and 99 mt in 2012 equate to a reduction of 10% and 5% respectively from 2010.

- The Alternative 3 (preferred) ACLs of 102 mt in 2011 and 107 mt in 2012 are more in line with 2010 catches although there is a slight reduction between 2010 and 2011 (3%)

Limited Entry Trawl

The Alternative 1 ACL of 49 mt equates to a trawl allocation of 8 mt – 62% 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.

See the cumulative effects of lower ACL values for individual sector affects described above.

It is important to note that maintaining canary catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with canary rockfish. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

BOCACCIO

PFMC Recommendation
Annual Catch Limit of 263 mt for 2011 and 274 mt for 2012.

Fisheries Affected
Bocaccio is caught in the following fisheries occurring south of 40°10':

- Research fisheries
- California Recreational Fisheries
- Limited Entry Trawl Non-whiting Fisheries
- Limited Entry Fixed-Gear Fisheries
- Open Access Directed Groundfish Fisheries
- Open Access Incidental Fisheries
    - California halibut
    - California gillnet
    - Coastal pelagic species wetfish
    - Pink shrimp
    - Ridgeback prawn
    - Salmon troll

Communities Affected

- There are at least 31 port communities that are affected by the amount of bocaccio available for harvest.
- These communities are all located in the State of California, south of 40°10' North latitude.
- These communities are all located in counties with unemployment rates ranging from a low of 8% (Marin County) to a high of 15.7% (Fresno County).
- A majority of the communities (68%) have unemployment rates higher than the November 2010 national average of 9.8%
- Just under 1/3 of the communities are rated as "highly" dependent on groundfish fisheries
- Over half the communities were rated with a "medium" dependency on groundfish fisheries
- Just under 40% of the communities received a "vulnerable" ranking with regards to changes in groundfish fisheries with five communities receiving the "most vulnerable" ranking

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Albion	Mendocino	10.2%	High	Most Vulnerable
Avila	San Luis Obispo	9.4%	High	
Berkeley	Alameda	11%	Low	
Big Creek	Fresno	15.7%	Not Rated	
Bodega Bay	Sonoma	9.7%	Medium	
Dana Point	Orange	9.1%	Medium	

Elk	Mendocino	10.2%	High	Most Vulnerable
Fort Bragg	Mendocino	10.2%	High	Most Vulnerable
Half Moon Bay	San Mateo	8.5%	Medium	
Long Beach	Los Angeles	12.5%	Medium	Vulnerable
Mission Bay	San Diego	10.2%	Medium	
Monterey	Monterey	10.4%	High	Vulnerable
Morro Bay	San Luis Obispo	9.4%	High	
Moss Landing	Monterey	10.4%	High	Vulnerable
Newport Beach	Orange	9.1%	Medium	
Oceanside	San Diego	10.2%	Medium	
Oxnard	Ventura	12.5%	Medium	
Playa Del Rey	Los Angeles	12.5%	Medium	Vulnerable
Point Arena	Mendocino	10.2%	High	Most Vulnerable
Point Loma	San Diego	10.2%	Medium	
Point Reyes	Marin	8%	Low	
San Diego	San Diego	10.2%	Medium	
San Francisco	San Francisco	9.3%	Medium	
San Pedro	Los Angeles	12.5%	Medium	Vulnerable
San Simeon	San Luis Obispo	9.4%	High	
Santa Barbara	Santa Barbara	8.7%	Medium	
Santa Cruz	Santa Cruz	10.6%	Medium	
Shelter Cove	Humboldt	10.3%	High	Most Vulnerable
Terminal Island	Los Angeles	12.5%	Medium	Vulnerable
Ventura	Ventura	12.5%	Medium	
Wilmington	Los Angeles	12.5%	Medium	Vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- Bocaccio have displayed significant rebuilding since being declared overfished in 1999
- This level of harvest equates to an 86.8% chance of rebuilding four years ahead of schedule
- ACLs for both years are significantly less than the preferred Allowable Biological Catch (ABC) (2011 ACL is 36% of ABC and 2012 ACL is 37% of ABC)
- ACLs for both years are less than the 2010 OY (7% less in 2011 and 5% less in 2012)
- Restrictions on boccaccio availability have created significant restraints on several California fisheries over the last ten years including the spot and ridgeback prawn trawl fisheries, the California halibut fishery, sea cucumber fishery, overall California open access fisheries, the California limited entry trawl fishery and most notably, all of the California recreational fisheries.

Impacts of ACL Values

From 2005-2010 the annual OY for bocaccio has averaged 270 mt:

Year	2005	2006	2007	2008	2009	2010
Annual OY	307 mt	306 mt	218 mt	218 mt	288 mt	288 mt

- The Alternative 1 ACLs (53 mt in 2011; 56 mt in 2012) equate to an 80% and 79% <u>reduction</u> respectively from the average OY 2005-2010 and a dramatic 82% reduction between 2010 and 2011.

- The Alternative 2 ACLs (109 mt in 2011; 115 mt in 2012) equate to a 60% and 57% <u>reduction</u> respectively from the average 2005-2010 OY and a significant 62% reduction between 2010 and 2011.

- The Alternative 3 (preferred) ACLs (263 mt in 2011; 274 mt in 2012) equate to a 5% <u>reduction</u> between 2010 and 2011.

Alternatives 2 and 3 do not further constrain any sectors of the current fisheries but it is important to note that current fisheries have already been severely constrained. Alternative 1 adds additional levels of restrictions for the California recreational fishery with an economically damaging 5-month season reduction in the Southern Management Area and a 1-month season reduction in the Northern Management Area.

See the cumulative effects of lower ACL values for individual sector affects described in the previous section.

Maintaining bocaccio catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with bocaccio. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

<u>PACIFIC OCEAN PERCH</u>

PFMC Recommendation
Annual Catch Limit of 180 mt in 2011 and 183 mt in 2012

Fisheries Affected
POP is currently taken in several West Coast fisheries including:

- Research Fisheries
- Tribal Fisheries
- Limited Entry Trawl Non-whiting fisheries
- Limited Entry Fixed-Gear Fisheries
- Open Access directed Groundfish Fisheries

Communities Affected

- There are 12 port communities in Washington, Oregon and California that are affected by the amount of Pacific Ocean Perch available for harvest.
- These communities are in counties where unemployment rates range from a low of 7.3% (Whatcom County, Washington) to a high of 12.6% (Del Norte County, California).
- A majority of these communities (59%) are located in counties where the unemployment rate is above the November 2010 national average of 9.8%.
- 50% (6) of these communities were ranked "highly" dependent on groundfish fisheries
- Just under half of the communities were ranked with a "medium" dependency on groundfish Fisheries
- 83% of these communities (10) received a "vulnerable" rank with regards to changes in the groundfish fishery with a majority receiving the "most vulnerable" rating

- 40% of Washington communities ranked “most vulnerable”
- 50% of Oregon communities ranked “most vulnerable”
- 67% of California communities ranked “most vulnerable”

State of Washington				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Bellingham	Whatcom	7.3%	Medium	
Blaine	Whatcom	7.3%	Medium	
Ilwaco	Pacific	10.3%	Low	Most vulnerable
Neah Bay	Clallam	8.9%	Medium	Vulnerable
Westport	Gray’s Harbor	8.5%	Medium	Most vulnerable

State of Oregon				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Astoria	Clatsop	9.1%	Medium	Vulnerable
Brookings	Curry	11.7%	High	Vulnerable
Charleston	Coos	11.8%	High	Most vulnerable
Newport	Lincoln	10.3%	High	Most vulnerable

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Crescent City	Del Norte	12.6%	High	Vulnerable
Eureka	Humboldt	10.3%	High	Most vulnerable
Fort Bragg	Mendocino	10.2%	High	Most vulnerable

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- POP are rebuilding
- Current rate of exploitation is less than 1%
- This level adds 2 years to rebuilding time compared with a zero harvest option
- This alternative includes an ACT lower than the ACL to ensure catches do not exceed the ACL
- Regained opportunities:
  - Trawl – could provide greater access to the slope complex, especially during summer months on the north coast

Impacts of Lower ACL Values

- The Alternative 1 ACLs of 80 mt in 2011 and 2012 result in a 40% reduction from 2010

- The Alternative 2 ACLs of 111 mt in 2011 and 113 mt in 2012 result in a <u>reduction</u> of 44% and 43% respectively from 2010 levels.

- The Alternative 3 (preferred) ACLs of 180 mt in 2011 and 183 mt in 2012 result in slight <u>reductions</u> from 2010 levels but retain similar opportunities for current fisheries.

See the cumulative effects of lower ACL values for individual sector affects described in the previous section.

It is important to note that maintaining POP catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with Pacific Ocean perch. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

<u>WIDOW ROCKFISH</u>

PFMC Recommendation
Annual Catch Limit of 600 mt in 2011 and 2012.

Fisheries Affected

Widow rockfish are taken in several West Coast Fisheries including:
- Research Fisheries
- Tribal Fisheries
- Oregon Recreational Fisheries
- California Recreational Fisheries
- Limited Entry Trawl Non-whiting Fisheries
- Limited Entry Trawl Whiting Fisheries
- Limited Entry Fixed Gear Fisheries
- Open Access Directed Groundfish Fisheries
- Open Access Directed Fisheries with Incidental Groundfish Catch
    - Salmon Troll
    - Pink Shrimp

Communities Affected
- There are at least 11 port communities in Washington, Oregon and California which are affected by the amount of widow rockfish available for harvest.
- These communities are all in counties with unemployment rates ranging from a low of 8.5% (King County and Gray's Harbor County in Washington) to a high of 12.6% (Del Norte County in California).
    - Over 50% of the communities reside in counties where the unemployment rate is above the November 2010 national average of 9.8%.
- Five of these communities were ranked as "highly" dependent on groundfish fisheries.
- Two communities were ranked with a "medium" dependency on groundfish fisheries.
- Sixty-two percent (8) of the communities received a "vulnerable" ranking with respect to changes in groundfish fisheries with six of the communities receiving the "most vulnerable" rating.

- 67% of Washington communities were ranked “most vulnerable”
- 67% of Oregon communities were ranked “most vulnerable”
- 50% of California communities were ranked “most vulnerable”

State of Washington				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Ilwaco	Pacific	10.3%	Low	Most vulnerable
Seattle	King	8.5%	Not Dependent	
Westport	Gray’s Harbor	8.5%	Medium	Most vulnerable

State of Oregon				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Astoria	Clatsop	9.1%	Medium	Vulnerable
Charleston	Coos	11.8%	High	Most vulnerable
Newport	Lincoln	10.3%	High	Most vulnerable

State of California				
Community	County	County Unemployment rate a/	Groundfish Fishery Dependence b/	Vulnerability rating updated for 2006 c/
Crescent City	Del Norte	12.6%	High	Vulnerable
Eureka	Humboldt	10.3%	High	Most vulnerable
Fort Bragg	Mendocino	10.2%	High	Most vulnerable
Bodega Bay	Sonoma	9.7%	Medium	
San Francisco	San Francisco	9.3%	Medium	

a/ County unemployment rates as of October 2010 source: U.S. Bureau of Labor Statistics
b/ Groundfish fishery community dependence as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS
c/ Vulnerability rating as ranked in Appendix E of the 2011-2012 Groundfish Harvest Specifications DEIS

Justification for Recommendation

- The stock is rebuilding and the last assessment measured the stock at 38.5% of unfished biomass – just short of being rebuilt
- The stock is expected to be fully rebuilt in 2010 which is 5 years earlier then T-target
- Widow are difficult to avoid because they are rebuilt and they co-occur with many other important stocks – this ACL level provides additional opportunities for some sectors of the fishery
- Regained opportunities:
  - Trawl- higher ACLs for widow would eventually allow a targeted mid-water yellowtail fishery which has been eliminated due to canary and widow interactions

Impacts of lower ACL values

- The Alternative 1 ACLs of 200 mt in 2011 and 2012 is a 60% reduction from 2010 levels.

- The Alternative 2 ACLs of 400 mt in 2011 and 2012 is a 28% reduction from 2010 levels.

- The Alternative 3 (preferred) ACLs of 600 mt in 2011 and 2012 is an increase of 15% from 2010 levels which appropriately reflects the projection that widow rockfish is projected to be rebuilt in 2010.

See the cumulative effects of lower ACL values for individual sector affects described in the previous section.

It is important to note that maintaining widow catches at levels similar to 2010 in order to prosecute fisheries on healthier stocks DOES NOT represent a profitable position for any of the fisheries which interact with widow rockfish. Using individual annual catch levels or an average catch level from recent years as a benchmark for measuring impacts is misleading and inappropriate as these levels are not reflective of healthy coastal communities. Some would argue incorrectly that those businesses which have been able to adapt to lower OY levels and "stay alive" during recent years have "figured out how to make it work" and thus can continue to adapt to these low levels. This is a gross misrepresentation of the truth and provides a false security that the needs of fishing communities are being met.

Conclusion

These comments clearly provide information to bolster the PFMC recommended 2011 - 2012 harvest levels for certain overfished species and effectively demonstrate that some minimal harvest of those species is necessary to provide opportunity to catch healthy fish stocks. We firmly believe the PFMC recommendations balance the needs of fishing communities with the mandate to rebuild stocks in the shortest time frame possible.

References:

2011-2012 Groundfish Harvest Specifications Draft Environmental Impact Statement & Appendices

Groundfish Advisory Panel and Groundfish Management Team Reports found on www.pcouncil.org

Public comments found on www.pcouncil.org

2005-2006 Groundfish Harvest Specifications FEIS www.pcouncil.org

2007-2008 Groundfish Harvest Specifications FEIS www.pcouncil.org

PacFIN database www.psmfc.org

www.foreclosurehelpandhope.org

www.fdic.org

www.realtytrac.com

Recreational Fishing Expenses for Humboldt County (from California Survey Data) [1]

Trip Expenditures

	Residents	Non Residents	Totals
Transportation	$225,000.00	$810,000.00	$1,035,000.00
Rental / Mooring	$116,000.00	$0.00	$116,000.00
Launch Fees	$51,000.00	$110,000.000	$161,000.00
Charter Fees	$247,000	$576,000.00	$823,000.00
Food	$450,000.00	$1,350,000.00	$1,800,000.00
Lodging	$0.00	$1,150,000.00	$1,150,000.00
Boat Fuel	$685,000.00	$457,000.00	$1,142,000.00
Bait and Ice	$180,000.00	$108,000.00	$288,000.00
Subtotal	$1,954,000.00	$4,561,000.00	$6,515,000.00

Annual Expenditures

	Residents	Non Residents	Totals
Tackle	$300,000.00		$300,000.00
Club Dues	$6,000.00		$6,000.00
Vehicle License Fees	$20,000.00		$20,000.00
Boat Maintenance	$400,000.00		$400,000.00
Fishing Vehicle	$800,000.00		$800,000.00
Fishing License	$52,000.00		$52,000.00
Subtotal	$1,578,000.00		$1,578,000.00

Totals

	Residents	Non Residents	Totals
Total	$3,532,000	$6,139,000	$9,671,000

- Estimate 1,000 anglers x 62 days = 62,000 angler days
- Trip expenditure: $6,515,000 / 62,000 anger days = $105/anger/day
- Annual expenditure: $1,578,000 / 62,000 anglers - $25/angler/day
- Total angler day cost is $105 + $25 = $130 per anger/ per day
- 57,000 anglers per month from the California Rec. Survey = 28,500 anglers/month in Humboldt county
- 28,500 per month x $130 per day - $3,705,000 per month spent in Humboldt County
- $3,705,000 x 4 months = $14,820,000 in lost revenue to Humboldt County

[1] June, 2010 GAP statement http://www.pcouncil.org/wp-content/uploads/B3b_SUP_GAP_JUNE2010BB.pdf

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2/15/2011
Pacific Fisheries Management Council
AGENDA ITEM H2

Dear Council Members,

Please include my public comment under agenda item H.2. I own the trawler "Last Straw" and have been cutting, freezing and glazing ground fish during 2010.

In 2011 any processing at sea is prohibited . In November I,2010 requested a permit or exemptions to continue what was legal in 2010, stating that I had invested around 1,000,000.dollars towards preserving and developing our fishery.

Here it is the middle of February and we need to know what to do with our crew, our markets, and our investment which was permitted and legal in 2010.

In our West Coast Groundfish Catch Share Program: Program Components Guidance -2010 Page 7 of 67 states word for word: The goal and objectives of Amendment 20- " What are the economic performance goals?" states "Economic performance measures will be tracked to assess the effectiveness of the program. These include:

- Profitable and efficient fleets
- Operational Flexibility
- Minimizing the adverse impacts on fishing communities
- Promotion of economic and employment benefits
- Providing consumers with quality product

My business fulfills all these criteria ! Shutting down my business would defeat all of the above.

In the QS Permit Application cover letter issued October 2010 the first paragraph states that trawl rationalization program is "intended to increase net economic benefits, create individual economic stability . Provide full utilization of the trawl sector allocation. Consider environmental impacts and achieve individual accountability of catch and by catch. We fit these categories and criteria .

With legal and earnest history, how could we be outlawed from continuing what was legal and consistent with Amendments 20 and 21

It is important to note that this law was proposed on August 31,2010 (Federal Register/vol.75 No.168/ Tuesday Aug ,31 ,2010/ Proposed Rules, see page 53414) and became final on Oct 1,2010. This vessel has been developing the operation since 2007/2008.

Also note that there is an exeption for a whiting processor 75 feet or less. It is also important to note that there is an exception for a Limited Entry Fixed Gear Vessel who was identified as active in glazing sablefish before Amendment 14 went into effect.

Life has gone on for Fixed gear Sablefish and the whiting industry , with these exceptions therefore I request an exemption Permit now in 2010 not 2013 or whatever is convenient for the rule makers to continue what is consistent with amendments 20 and 21

Sincerely,

Brett Hearne

Agenda Item H.2.d
Supplemental Public Comment 2
March 2011

Here it is Dan Good Luck

Letter of Economic Hardship for Crescent City for Near Shore Fishermen

Last year's low catches of near shore fish in Crescent city have left our ports fishermen in dire economic situations. Three of us have lost our homes or filed for bankruptcy. Two of the three buyers of live fish are not going to buy this year. The one buyer that is left is only going to run his small truck and will pick up Port Orford's fish first because they have more of the preferred mixed exotic species available in they catches. Since our long liners have difficulty fishing under the restrictions of twenty fathoms under the boat at all times, they can not compete with the Oregon fishermen.

The fishermen still trying to land live fish will have to rent trucks and try to deliver fish driving themselves. This cuts down time on the water and limits how much you can catch and move during any one weather window.

If you lower the by-monthly limits, when fishermen have good weather during peak months, they will have to stop fishing in half the time. Then when weather is bad, fishermen have no surplus from the good weather periods to hold them till the next weather break.

After last year's low catches, we are desperate for time to catch up. Most of us have deferred maintenance that will have to be addressed. I myself have $3500 in work that will have to be done this year. Many of us are fishing with boats that need work to remain on the water. If you limit us to half of our prier catches, our harbors near shore fishermen may not recover to be active members of our fishing community. Please do not destroy our local fishing communities just to rebuild a stock of fish a few years quicker. These are people's lives you are destroying just have paper progress on a fifty year rebuilding plan. How is it going to hurt this species of fish if takes a few years longer to rebuild. That action right there guarantees maximum rebuilding. Any more cuts are unconscionable.

Kenyon Hensel

On Sun, Mar 6, 2011 at 9:36 PM, morefish@mcn.org wrote:

> Here you go Kenyon.Hope you are all doing well.Dan

PACIFIC WHITING HARVEST SPECIFICATIONS FOR 2011

The Pacific whiting fishery management process is unlike that for other Federally-managed west coast groundfish for 2011 fisheries. While harvest specifications and management measures for most groundfish are decided in the biennial specifications process, whiting are assessed annually and harvest specifications for fisheries targeting Pacific whiting are decided at each March Council meeting using results from stock assessments that are prepared and reviewed immediately prior to the Council decision.

This year the assessment review panel met during the week of the briefing book deadline. Consequently, the executive summary of the stock assessment, prepared in a collaborative effort by U.S. and Canadian scientists, and review panel report will be provided as Supplemental Attachments 1 and 2, respectively (*a CD of the full assessment document will also be provided*). The Stock Assessment and Review Panel report, along with other materials, will be reviewed by the Scientific and Statistical Committee (SSC) at this meeting.

Beginning in 2004, the transboundary stock of Pacific whiting has been managed jointly with the Department of Fisheries and Oceans, Canada, in the spirit of a new process described in a treaty that has been signed and ratified. The primary tenets of the treaty include a joint U.S.-Canada annual assessment and management process, a research commitment, and a harvest sharing agreement providing 73.88 percent of the coastwide optimum yield (OY) for U.S. fisheries and 26.12 percent for Canadian fisheries. The U.S. regulations implementing the treaty have finally been adopted; therefore, Pacific whiting harvest specifications should be decided by the new international whiting commission starting next year.

The Council is tasked with setting an acceptable biological catch (ABC) and OY for Pacific whiting that will be used to manage 2011 fisheries. Management measures to properly prosecute the U.S. fishery will be decided at this meeting under the Inseason Adjustments Agenda Items H.4 (and H.6, if needed) when bycatch balance with other fisheries is considered. Unless there is a change in the research, non-whiting fishery bycatch, and tribal set-asides, once the OY is set, the apportionment within the non-tribal fisheries is set automatically via the existing intersector allocation (i.e., 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).

Considerations for deciding 2011 Pacific whiting harvest specifications include the stock's current and projected status, the relative uncertainty of the current biomass estimate, and the international agreement with Canada. Further, impact analysis of a range of 2011 OYs has been provided in the 2011-2012 biennial specifications Draft Environmental Impact Statement to frontload the NEPA analyses needed to implement 2011 whiting fishery regulations soon after the March Council meeting. The upper range of 2011 OYs analyzed was 150 percent of the coastwide (U.S. plus Canada) 2010 OY of 262,500 mt. Therefore, the highest 2011 coastwide whiting OY that can be considered is 393,750 mt. The Council should make these considerations and consider the advice of the assessment review panel, the SSC, and other advisors before adopting an assessment for use in management decision-making. The assessment, once approved, will be used to set 2011 Pacific whiting harvest specifications. Any management measures for 2011 Pacific whiting fisheries will be decided under the inseason management agenda items H.4 and H.6.

Council Action:

1. **Adopt a 2011 Pacific whiting stock assessment.**
2. **Adopt a 2011 ABC and OY for Pacific whiting.**
3. **Adopt a Pacific whiting set-aside to accommodate 2011 tribal whiting fisheries.**

Reference Materials:

1. Agenda Item H.3.a, Supplemental Attachment 1: Executive Summary of Assessment and Management Advice for Pacific hake in U.S. and Canadian waters in 2011.
2. Agenda Item H.3.a, Supplemental Attachment 2: Pacific Whiting – The Joint U.S.-Canada STAR Panel Report.

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 Final 2011 Stock Assessment, Allowable Biological Catch, and Optimum Yield (Management Measures will be adopted under Inseason Adjustments, Agenda Item H.4 and Agenda Item H.6 (if Necessary).

PFMC
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Agenda Item H.3.a
Supplemental Attachment 1
March 2011

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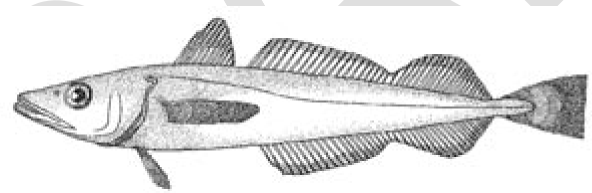
Status of the Pacific Hake (Whiting) stock in U.S. and Canadian Waters in 2011



Joint U.S. and Canadian Hake Technical Working Group

Council meeting draft
2/15/2011

Pending formal implementation of the Joint US-Canada treaty on Pacific Hake governing both scientific and management actions for Pacific hake, this document reports the collaborative efforts of a joint stock assessment team comprised of both U.S. and Canadian scientists operating in the spirit of the treaty agreement.

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Table of Contents

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; 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 221 thousand mt from 1966 to 2010, 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. Recent coast-wide landings from 2006-2010 have been above the long term average, at 274 thousand mt. Landings between 2001 and 2008 were predominately 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. The United States has averaged 164 thousand mt, or 74.5% of the average total landings over the time series, with Canadian catch averaging 56 thousand mt. 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. Total discard is estimated to be less than 1% of landings and therefore is likely to be negligible with regard to the population dynamics.

Table a. Recent commercial fishery landings (1000s mt). Tribal catches are included.

Year	US at-sea	US shore-based	US total	Canadian joint-venture	Canadian domestic	Canadian total	Total
2001	101	73	174	22	32	54	228
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	66	73	291
2008	181	68	248	4	70	74	322
2009	72	49	122	0	56	56	177
2010	106	55	161	8	48	56	217

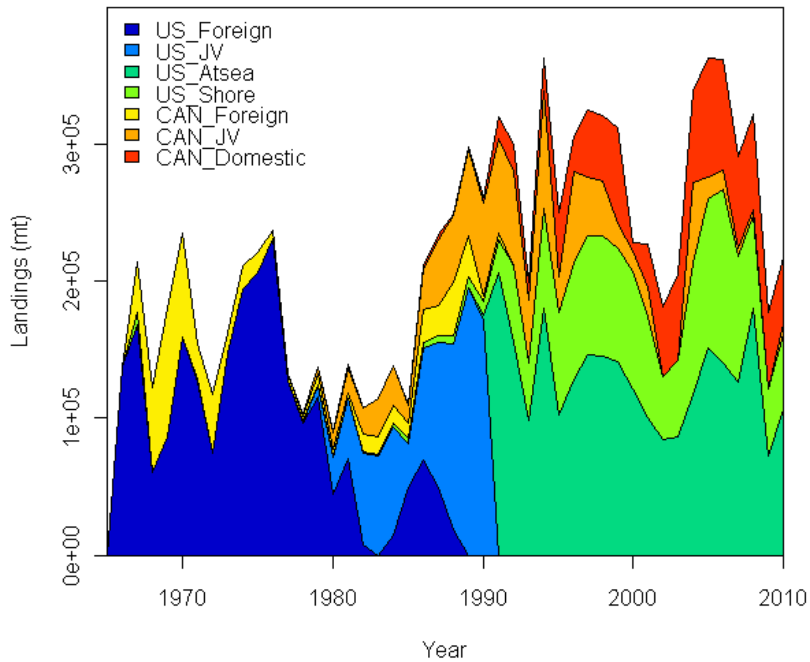

Figure a. Total Pacific hake landings used in the assessment by sector, 1966-2010. Tribal catches are included.

Data and assessment

Following the 2010 assessment, nearly all of the data sources available for Pacific hake have been reconstructed and thoroughly re-evaluated for 2011 from the original observations using consistent, and in some cases improved methods. In all cases small changes have occurred relative to data used for previous stock assessments; however the current results represent the best available information. Catches from all sectors and both nations were reconstructed from 1966 through 2010. Age-composition information is available from 1975-2010. The acoustic survey time-series was re-analyzed from the raw data, and kriging has been applied in order to provide a more robust estimate of total biomass as well as a measure of the annual sampling variability due to patchiness of hake schools and irregular transects. This has led to the conclusion that survey efforts prior to 1995 failed to sample a sufficient portion of the stock to be comparable with more recent surveys and that a reasonable estimate of the variance for those early years would render them uninformative for the stock assessment. The uncertainty in the 2009 acoustic survey biomass estimate attributable to the presence of large numbers of Humboldt squid has been quantified and explicitly included in the time-series. Age- and length-composition information from the acoustic survey has been re-processed to be consistent with the revised time-series, and the survey team's investigation into haul representativeness and survey stratification has supported their continued use in the stock assessment.

This assessment reports two models representing the collective work of the Joint Technical Working Group (JTWG). Extensive efforts to compare and revise both the Stock Synthesis and TINSS models from the 2010 assessment have been conducted. Both assessments depend upon the acoustic survey index of abundance, the aggregate fishery age-composition data and the age-composition data from the acoustic survey. Both models are fully Bayesian, incorporating prior information on key parameters and integrating over estimation and parameter uncertainty to provide results that can be probabilistically interpreted. The results from both models are presented in parallel throughout this document, and the likely causes of observed differences are discussed.

Stock biomass

Both stock assessment models indicate that the Pacific hake female spawning biomass was well below equilibrium at the start of the fishery and during the 1970s. 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. This long period of decline was followed by a brief increase to a peak in 2003 (1.44 million mt in the SS model and 1.74 million mt in the TINSS model) as the exceptionally large 1999 year class matured. In 2011 (beginning of year), spawning biomass is estimated to be rebounding rapidly based on the strength of recent year classes (2005, 2006 and particularly 2008, in both the SS and TINSS models), however this estimate is quite uncertain, with 95% posterior credibility intervals ranging from historical lows to well above equilibrium levels. Current median posterior spawning biomass equates to approximately 91% (SS model) or 177% (TINSS model) of the unfished level (SB_0). Estimates of uncertainty in current relative depletion are extremely broad, from 35%-203% of unfished biomass in the SS model and 77%-413% in the TINSS model. The estimate of spawning biomass for 2011 is 1.87 million mt in the SS model and 2.18 million mt in the TINSS model, both much larger than the 0.48 million mt estimated by the SS model in 2010 without information about the above-average 2008 recruitment. The 2010 TINSS median posterior estimate was 0.34 million mt.

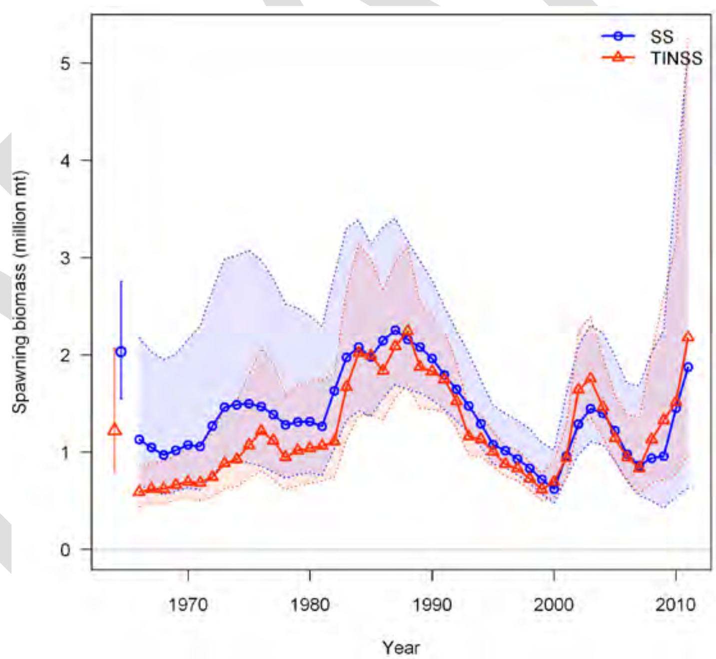

Figure b. Estimated female spawning biomass time-series from the two models with 95% posterior credibility intervals.

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

	SS			TINSS		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2002	0.972	1.289	2.099	1.260	1.630	2.250
2003	1.107	1.444	2.306	1.374	1.743	2.405
2004	1.075	1.397	2.223	1.173	1.461	1.993
2005	0.913	1.220	1.987	0.910	1.138	1.562
2006	0.695	0.976	1.704	0.724	0.938	1.391
2007	0.549	0.862	1.687	0.586	0.827	1.368
2008	0.501	0.937	2.026	0.714	1.136	1.987
2009	0.423	0.960	2.253	0.754	1.332	2.654
2010	0.544	1.451	3.767	0.801	1.531	3.152
2011	0.631	1.874	5.140	0.946	2.181	5.254

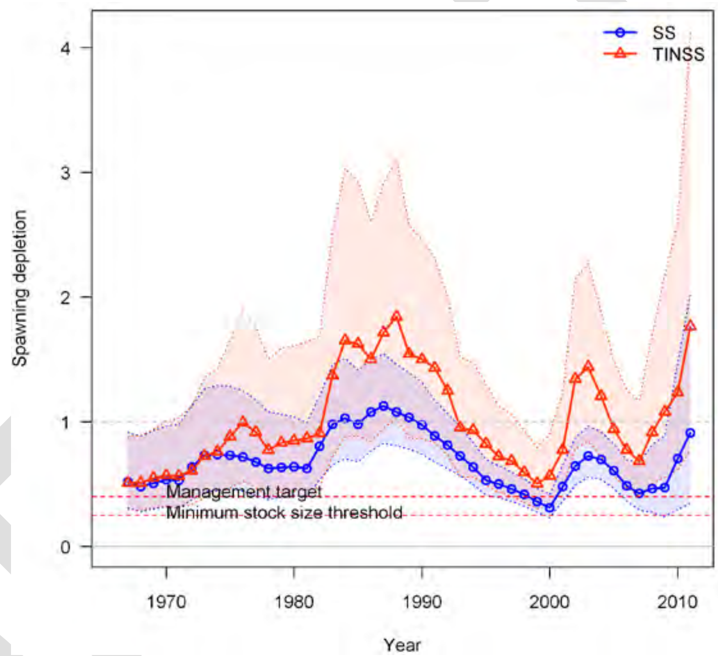

Figure c. Time-series of estimated relative spawning depletion through 2011 for both models with 95% posterior credibility intervals.

Table c. Recent trend in estimated relative spawning depletion from the two models.

	SS			TINSS		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2002	0.491	0.647	0.872	0.785	1.344	2.144
2003	0.557	0.726	0.965	0.845	1.439	2.272
2004	0.538	0.699	0.919	0.721	1.206	1.886
2005	0.467	0.608	0.824	0.568	0.943	1.495
2006	0.367	0.488	0.695	0.472	0.776	1.261
2007	0.293	0.428	0.676	0.408	0.685	1.169
2008	0.275	0.465	0.816	0.505	0.916	1.699
2009	0.239	0.474	0.890	0.554	1.080	2.181
2010	0.298	0.706	1.477	0.613	1.238	2.589
2011	0.347	0.911	2.031	0.771	1.765	4.131

Recruitment

Estimates of historical Pacific hake recruitment indicate very large year classes in 1980, 1984 and 1999 in both assessment models. The strength of the 2008 cohort is estimated to be very large, and this is informed mainly by the 2010 fishery age compositions. Uncertainty in estimated recruitments is substantial, especially so for 2008, as indicated by the broad posterior intervals.

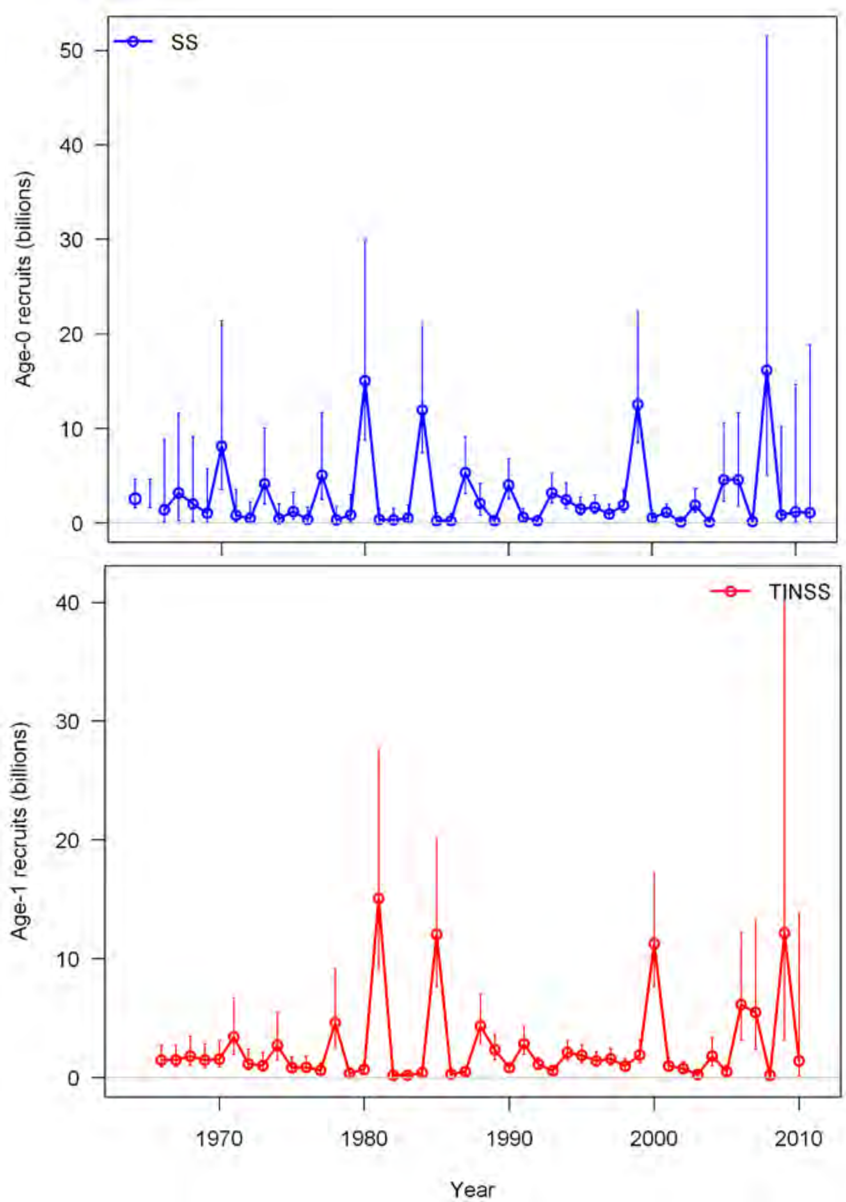

Figure d. Estimated Pacific hake recruitment time-series for both models with 95% posterior credibility intervals (billions age-0 for SS, upper panel; billions of age-1 for TINSS, lower panel).

Table d. Recent trend in Pacific hake recruitment (billions age-0 for SS; billions of age-1 for TINSS).

	SS			TINSS		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2002	0.022	0.105	0.371	0.460	0.768	1.339
2003	1.107	1.874	3.656	0.144	0.248	0.466
2004	0.018	0.115	0.406	1.009	1.783	3.346
2005	2.309	4.579	10.515	0.273	0.521	1.056
2006	1.848	4.556	11.636	3.162	6.096	12.280
2007	0.021	0.129	0.619	2.421	5.499	13.111
2008	5.117	16.166	51.527	0.075	0.194	0.477
2009	0.059	0.874	10.239	3.246	12.147	40.720
2010	0.087	1.167	14.698	0.140	1.413	13.307
2011	0.081	1.090	18.852	0.012	0.842	58.049

Reference points

Unexploited equilibrium spawning biomass increased in the SS model to 2.03 million mt (from 1.33 million metric tons in the 2010 assessment), but the uncertainty is broad, with the 95% posterior credibility interval ranging from 1.55 to 2.76 million mt. In the TINSS model, the median of the posterior was 1.22 million metric tons (credibility interval: 0.80-2.06 million mt). The *MSY*-proxy target biomass ($SB_{40\%}$) is estimated to be 0.81 million mt in the SS model and 0.49 in the TINSS model. The minimum biomass thresholds ($SB_{25\%}$) are 0.51 and 0.30 million mt, respectively. *MSY* is estimated to be 355 thousand mt in the SS model and 161 thousand mt in the TINSS model. The equilibrium yield at the biomass target ($SB_{40\%}$) is estimated to be 323 thousand mt in the SS model and 159 thousand mt in the TINSS model. The full set of reference points are reported in table i below.

Exploitation status

The spawning potential ratio for Pacific hake is estimated to have been below the proxy target of 40% for both assessment models. Uncertainty in the value is large. Exploitation fraction (catch/age-3+ biomass) estimates are remarkably similar for the two models, as this calculation is not influenced by fishery selectivity. The full exploitation history in terms of both the biomass and *F* targets is portrayed graphically via a phase-plot.

Table e. Recent trend in relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) for both models.

	SS			TINSS		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2001	0.500	0.760	0.957	0.483	0.661	0.842
2002	0.269	0.459	0.630	0.336	0.481	0.645
2003	0.279	0.465	0.623	0.344	0.494	0.666
2004	0.440	0.679	0.856	0.480	0.654	0.842
2005	0.543	0.813	0.995	0.524	0.710	0.905
2006	0.614	0.908	1.096	0.525	0.722	0.924
2007	0.593	0.918	1.133	0.505	0.724	0.939
2008	0.559	0.918	1.184	0.485	0.727	0.961
2009	0.312	0.628	1.001	0.313	0.536	0.794
2010	0.303	0.637	1.047	0.296	0.525	0.824

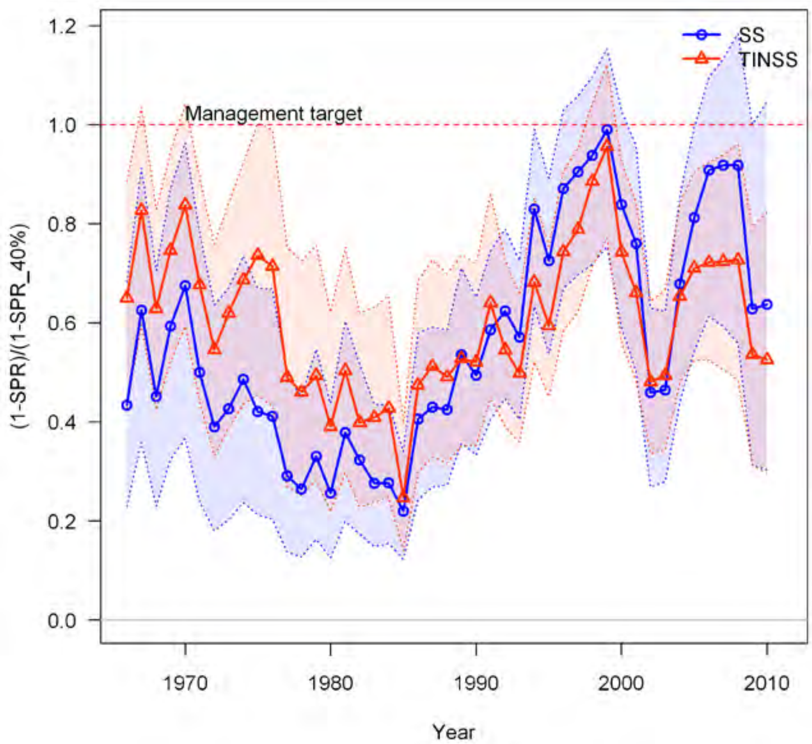

Figure e. Trend in relative spawning potential ratio through 2010 (1-SPR/1-SPR$_{Target=0.4}$) for both models.

Table f. Recent trend in exploitation fraction (catch/3+biomass) for both models (MLE values).

	SS			TINSS		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2001	0.087	0.144	0.199	0.093	0.161	0.269
2002	0.027	0.044	0.058	0.034	0.059	0.100
2003	0.036	0.058	0.076	0.040	0.069	0.115
2004	0.072	0.115	0.149	0.049	0.085	0.141
2005	0.100	0.164	0.216	0.065	0.114	0.189
2006	0.106	0.186	0.257	0.069	0.127	0.219
2007	0.109	0.210	0.319	0.087	0.169	0.307
2008	0.078	0.169	0.306	0.047	0.099	0.203
2009	0.034	0.080	0.182	0.035	0.084	0.182
2010	0.045	0.112	0.286	0.040	0.096	0.215

Management performance

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 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 acceptable biological catch (ABC) between the two countries led to quota overruns; 1991-1992 quotas summed to 128% of the ABC and quota overruns averaged 114% from 1991-1999. Since 2001, total catches have been below coast-wide ABCs. 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.

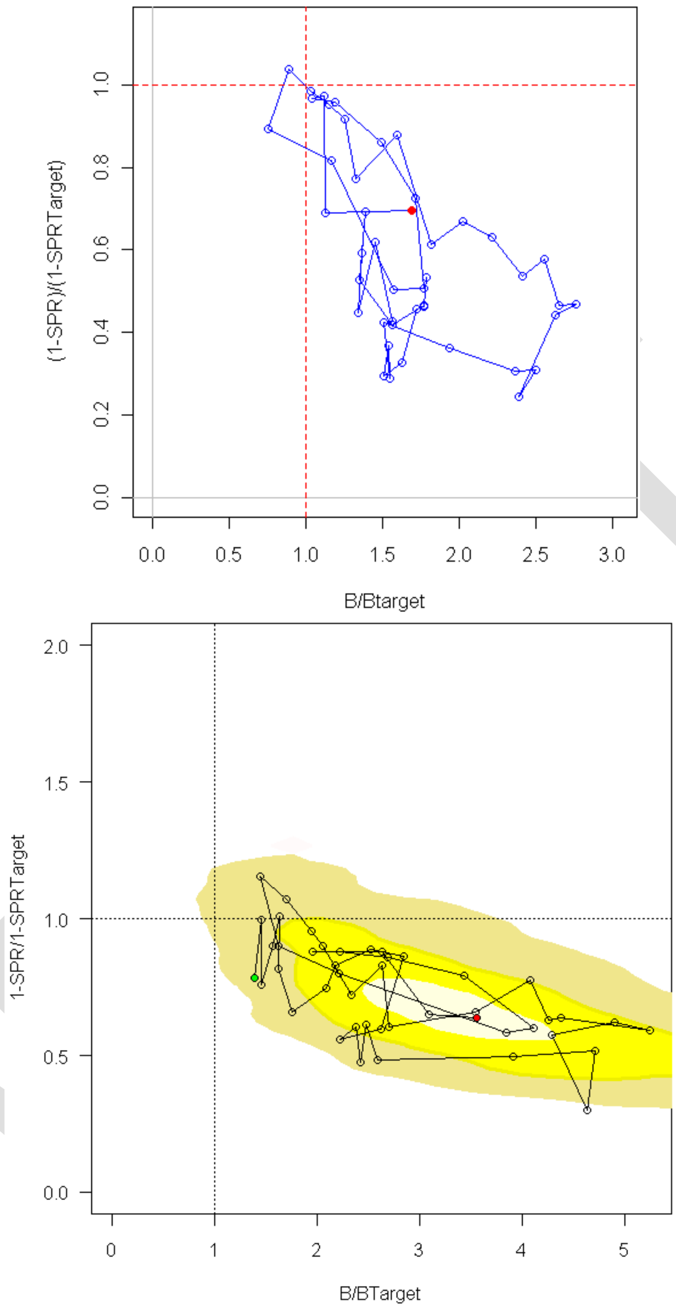

Figure f. Temporal pattern (phase plot) of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) vs. estimated spawning biomass relative to the proxy 40% level through 2010 for the SS model (upper panel, note this calculation is based on the MLE). Lower panel shows relative spawning potential ratio (1-SPR/1-SPR_{MSY}) vs. estimated spawning biomass relative to the B_{MSY} level through 2010 for the TINSS model. The filled circle denotes 2010 and the line connects years through the time-series.

In many recent years, failure to extract the entire OY available to the fishery in U.S. waters has been a result of extremely restrictive bycatch limits on overfished rockfish species, particularly widow, darkblotched and canary rockfishes; in 2008, there was a voluntary 'stand-down' during the period of highest bycatch rates as the fleet approached the bycatch limit.

Beginning in the 2009 fishery the U.S. mother-ship, catcher-processor and shore-based sectors were assigned sector specific, and much larger, bycatch limits. During 2009 and 2010 much of the U.S. tribal allocation remained uncaught and so the total catch remained below the OY.

Table g. Recent trend in Pacific hake management performance.

Year	Total landings (mt)	Coast-wide (U.S. + Canada) OY (mt)	Coast-wide (U.S. + Canada) ABC (mt)
2001	227,531	238,000	238,000
2002	180,698	162,000	208,000
2003	205,177	228,000	235,000
2004	338,654	501,073	514,441
2005	363,157	364,197	531,124
2006	361,761	364,842	661,680
2007	290,545	328,358	612,068
2008	322,145	364,842	400,000
2009	177,459	184,000	253,582
2010	216,912	262,500	455,550

Unresolved problems and major uncertainties

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 (SS via the steepness, h, of the stock-recruitment relationship; TINSS via F_{MSY}, 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 all structural modeling choices, data-weighting uncertainty and scientific uncertainty in selection of prior probability distributions. In an effort to capture these additional sources of uncertainty, we report the results from the two models throughout 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 stock trajectory in future stock assessments. The primary source of uncertainty that is relevant to management decision-making for the 2011 fishing season is the strength of the 2008 year-class. The estimate for this cohort is very uncertain, and the stock trajectory is entirely dependent on its value. For this reason, the decision table explicitly includes columns representing alternate states of nature for low, middle and high estimated 2008 cohort strengths. The vast uncertainty in this year class will likely persist until the next acoustic survey has been conducted, providing a fishery independent estimate of its magnitude.

Forecast decision table

In order to better reflect the considerable uncertainty in recent (especially 2008) and future year-class strengths, as well as current absolute biomass levels, all forecasts are reported in the decision table format. This allows for the evaluation of alternative management actions based on the full posterior distribution for both models. The decision table is organized such that the projected implications for each potential management action (the rows, containing a range of potential catch levels) can be evaluated for each of six states of nature (the columns). The six states of nature represent the lower 25%, middle 50% and upper 25% of the posterior distribution for the strength of the 2008 cohort for both the SS and TINSS models. Thus the middle value can be considered twice as likely as the first and last within each model. The choice of the 2008 cohort strength as the secondary axis of uncertainty (after including the two models) was based on the very large uncertainty associated with this recruitment as well as the fact that it is informed by only the 2010 fishery age composition data. For clarity, the decision table is divided into three sections: the first table projects the spawning biomass estimates, the second the relative depletion (for both of these the 2011 values will be identical for all management actions because they represent beginning of the year values) and the third the relative SPR rate. Relative SPR exceeding 1.0 indicates fishing in excess of the $SPR_{40\%}$ MSY-proxy (overfishing).

The stock is projected to increase in spawning biomass for all three states of nature in both models for catches up to an including 400,000 mt. At a catch level of 500,000 mt, the SS model predicts that the stock will not fall below 2011 levels at the mode of the posterior, but if the 2008 cohort is in the lower 25% of the posterior density, overfishing will occur and the stock will decline, while staying above the precautionary zone during the next three years. The TINSS model predicts that the stock will continue to increase at that harvest level under all three states of nature. The SS model 40:10 OY harvests are in excess of 900,000 mt at the mode of the posterior, while the TINSS model indicates that catches in excess of 700,000 and 1,000,000 mt would be consistent with the harvest control rule depending on whether the estimate of *MSY* or the $F_{40\%}$-proxy is applied. The differences between the two predictions are again likely due to the differences in estimated fishery selectivity and to the priors for the productivity parameters.

Table h.1. Decision table with three year projections of posterior distributions for Pacific hake female **spawning biomass** (millions mt, at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
Within model probability			25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	50,000	1.238	2.180	3.801	1.688	2.682	4.549
	2013	50,000	1.309	2.308	3.912	1.679	2.695	4.560
b	2011	100,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	100,000	1.215	2.157	3.777	1.664	2.658	4.524
	2013	100,000	1.262	2.261	3.866	1.636	2.648	4.513
c	2011	150,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	150,000	1.191	2.133	3.754	1.640	2.633	4.500
	2013	150,000	1.215	2.215	3.821	1.592	2.604	4.465
d	2011	262,500	1.053	1.873	3.232	1.409	2.159	3.562
	2012	262,500	1.138	2.081	3.701	1.586	2.578	4.445
	2013	262,500	1.110	2.110	3.718	1.490	2.504	4.359
e	2011	300,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	300,000	1.120	2.063	3.683	1.568	2.560	4.427
	2013	300,000	1.075	2.075	3.684	1.456	2.469	4.324
f	2011	400,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	400,000	1.073	2.016	3.636	1.520	2.512	4.378
	2013	400,000	0.982	1.982	3.593	1.364	2.378	4.229
g	2011	500,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	500,000	1.025	1.969	3.589	1.472	2.465	4.329
	2013	500,000	0.889	1.890	3.500	1.273	2.290	4.135
h	2011	720,700	1.053	1.873	3.232	1.409	2.159	3.562
	2012	791,000	0.921	1.866	3.485	1.368	2.361	4.221
	2013	781,500	0.650	1.657	3.264	1.037	2.059	3.898
i	2011	840,000	1.053	1.873	3.232	1.410	2.159	3.562
	2012	886,000	0.864	1.809	3.429	1.312	2.305	4.163
	2013	782,000	0.558	1.559	3.166	0.939	1.963	3.801
j	2011	1,137,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	1,121,000	0.724	1.669	3.289	1.166	2.165	4.017
	2013	1,011,000	0.355	1.314	2.920	0.584	1.719	3.567

Table h.2. Decision table with three year projections of posterior distributions for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
Within model probability			25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
	2011	50,000	0.549	0.909	1.493	1.182	1.740	2.751
a	2012	50,000	0.649	1.066	1.740	1.456	2.178	3.565
	2013	50,000	0.693	1.116	1.782	1.477	2.230	3.577
	2011	100,000	0.549	0.909	1.493	1.182	1.740	2.751
b	2012	100,000	0.633	1.055	1.729	1.434	2.160	3.548
	2013	100,000	0.669	1.095	1.760	1.435	2.192	3.543
	2011	150,000	0.549	0.909	1.493	1.182	1.740	2.751
c	2012	150,000	0.618	1.042	1.719	1.411	2.140	3.524
	2013	150,000	0.645	1.074	1.740	1.392	2.152	3.506
	2011	262,500	0.549	0.909	1.493	1.182	1.740	2.751
d	2012	262,500	0.589	1.014	1.698	1.359	2.094	3.481
	2013	262,500	0.591	1.023	1.693	1.297	2.061	3.421
	2011	300,000	0.549	0.909	1.493	1.182	1.740	2.751
e	2012	300,000	0.580	1.006	1.691	1.344	2.079	3.465
	2013	300,000	0.572	1.007	1.680	1.263	2.029	3.393
	2011	400,000	0.549	0.909	1.493	1.182	1.740	2.751
f	2012	400,000	0.556	0.984	1.670	1.298	2.036	3.423
	2013	400,000	0.519	0.963	1.642	1.174	1.946	3.318
	2011	500,000	0.549	0.909	1.493	1.182	1.740	2.751
g	2012	500,000	0.533	0.961	1.648	1.259	1.996	3.377
	2013	500,000	0.474	0.918	1.602	1.095	1.861	3.243
	2011	720,700	0.549	0.909	1.493	1.182	1.740	2.751
h	2012	791,000	0.479	0.908	1.596	1.166	1.906	3.288
	2013	781,500	0.348	0.800	1.489	0.880	1.659	3.047
	2011	840,000	0.549	0.909	1.493	1.182	1.740	2.751
i	2012	886,000	0.451	0.878	1.569	1.112	1.858	3.236
	2013	782,000	0.298	0.753	1.437	0.788	1.581	2.971
	2011	1,137,000	0.549	0.909	1.493	1.182	1.740	2.751
j	2012	1,121,000	0.382	0.809	1.499	0.963	1.744	3.114
	2013	1,011,000	0.194	0.636	1.319	0.437	1.384	2.746

Table h.3. Decision table with three year projections of posterior distributions for Pacific hake relative **spawning potential ratio** (1-SPR/1-SPRTarget=0.4; values greater than 1.0 denote overfishing). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a, b, e, and g-i), 2) the status quo OY from 2010 (row f), and 3) the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row j) and TINSS models (row d), and the OY implied by the estimated FMSY from the TINSS model (row c). TINSS results for row j are italicized because they correspond to a constant catch of 700,000 mt.

			States of nature					
		Model	SS			TINSS		
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	0.225	0.129	0.075	0.172	0.119	0.078
	2012	50,000	0.181	0.103	0.058	0.142	0.096	0.060
	2013	50,000	0.167	0.095	0.055	0.128	0.083	0.050
b	2011	100,000	0.399	0.241	0.145	0.308	0.221	0.148
	2012	100,000	0.334	0.197	0.113	0.262	0.182	0.116
	2013	100,000	0.316	0.184	0.107	0.243	0.159	0.098
c	2011	150,000	0.538	0.340	0.209	0.417	0.308	0.211
	2012	150,000	0.465	0.283	0.166	0.365	0.258	0.168
	2013	150,000	0.448	0.267	0.158	0.346	0.231	0.144
d	2011	262,500	0.766	0.519	0.337	0.603	0.465	0.332
	2012	262,500	0.699	0.451	0.274	0.555	0.406	0.273
	2013	262,500	0.699	0.437	0.266	0.541	0.373	0.240
e	2011	300,000	0.823	0.569	0.374	0.650	0.508	0.367
	2012	300,000	0.762	0.501	0.308	0.608	0.448	0.305
	2013	300,000	0.769	0.488	0.300	0.597	0.416	0.270
f	2011	400,000	0.946	0.685	0.466	0.759	0.607	0.450
	2012	400,000	0.905	0.620	0.392	0.730	0.550	0.384
	2013	400,000	0.933	0.615	0.387	0.734	0.523	0.346
g	2011	500,000	1.038	0.780	0.546	0.846	0.689	0.522
	2012	500,000	1.016	0.723	0.470	0.833	0.638	0.454
	2013	500,000	1.067	0.727	0.468	0.856	0.617	0.416
h	2011	720,700	1.174	0.936	0.691	0.992	0.829	0.648
	2012	791,000	1.226	0.941	0.656	1.046	0.836	0.620
	2013	781,500	1.311	0.975	0.665	1.128	0.838	0.583
i	2011	840,000	1.226	1.000	0.755	1.053	0.888	0.704
	2012	886,000	1.280	1.002	0.710	1.114	0.892	0.668
	2013	782,000	1.340	1.003	0.679	1.175	0.861	0.594
j	2011	1,137,000	1.312	1.117	0.884	1.174	1.006	0.819
	2012	1,121,000	1.360	1.126	0.829	1.287	1.015	0.772
	2013	1,011,000	1.380	1.168	0.822	1.664	1.022	0.718

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 alternative indices for juvenile or young (0 and/or 1 year old) Pacific hake, perhaps based on existing acoustic survey observations or new sampling efforts.

3) 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.

4) 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.

5) Evaluate the quantity and quality of biological data prior to 1988 from the Canadian fishery for use in developing composition data.

6) Evaluate the quantity and quality of biological data prior to 1975 from the U.S. fishery for use in developing 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).

10) Develop management strategy evaluation tools to evaluate major sources of uncertainty relating to data, model structure and the harvest control rule for this fishery.

Table i.1. Summary of Pacific hake reference points from the SS model.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female spawning biomass (SB_0, million mt)	1.549	2.034	2.756
Unfished total biomass (million mt)	3.735	4.921	6.871
Unfished 3+ biomass (million mt)	3.239	4.252	5.760
Unfished recruitment (R_0, billions)	1.624	2.576	4.649
Reference points based on $SB_{40\%}$			
MSY Proxy female spawning biomass ($SB_{40\%}$ million mt)	0.620	0.814	1.102
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.406	0.435	0.512
Exploitation fraction resulting in $SB_{40\%}$	0.136	0.187	0.236
Yield at $SB_{40\%}$ (million mt)	0.217	0.323	0.521
Reference points based on SPR proxy for MSY			
Female spawning biomass at $SPR_{MSY\text{-}proxy}$ (SB_{SPR} million mt)	0.506	0.721	0.991
$SPR_{MSY\text{-}proxy}$	0.400	0.400	0.400
Exploitation fraction corresponding to SPR	0.182	0.217	0.258
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (million mt)	0.222	0.334	0.536
Reference points based on estimated MSY values			
Female spawning biomass at MSY (SB_{MSY} million mt)	0.315	0.491	0.790
SPR_{MSY}	0.189	0.286	0.451
Exploitation fraction corresponding to SPR_{MSY}	0.172	0.342	0.564
MSY (million mt)	0.228	0.355	0.581

Table i.2. Summary of Pacific hake reference points from the TINSS model.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female spawning biomass (SB_0, million mt)	0.802	1.218	2.064
Unfished total biomass (million mt)	1.945	2.989	5.091
Unfished 3+ biomass (million mt)	1.665	2.531	4.307
Unfished recruitment (R_0, billions)	0.860	1.490	2.809
Reference points based on $SB_{40\%}$			
MSY Proxy female spawning biomass ($SB_{40\%}$ million mt)	0.321	0.487	0.826
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.445	0.523	0.646
Exploitation fraction resulting in $SB_{40\%}$	0.101	0.154	0.199
Yield at $SB_{40\%}$ (million mt)	0.094	0.159	0.265
Reference points based on SPR proxy for MSY			
Female spawning biomass at $SPR_{MSY\text{-}proxy}$ (SB_{SPR} million mt)	0.000	0.288	0.505
$SPR_{MSY\text{-}proxy}$	0.400	0.400	0.400
Exploitation fraction corresponding to SPR	0.197	0.236	0.279
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (million mt)	0.000	0.145	0.257
Reference points based on estimated MSY values			
Female spawning biomass at MSY (SB_{MSY} million mt)	0.274	0.457	0.837
SPR_{MSY}	0.348	0.505	0.672
Exploitation fraction corresponding to SPR_{MSY}	0.092	0.165	0.270
MSY (million mt)	0.093	0.161	0.268

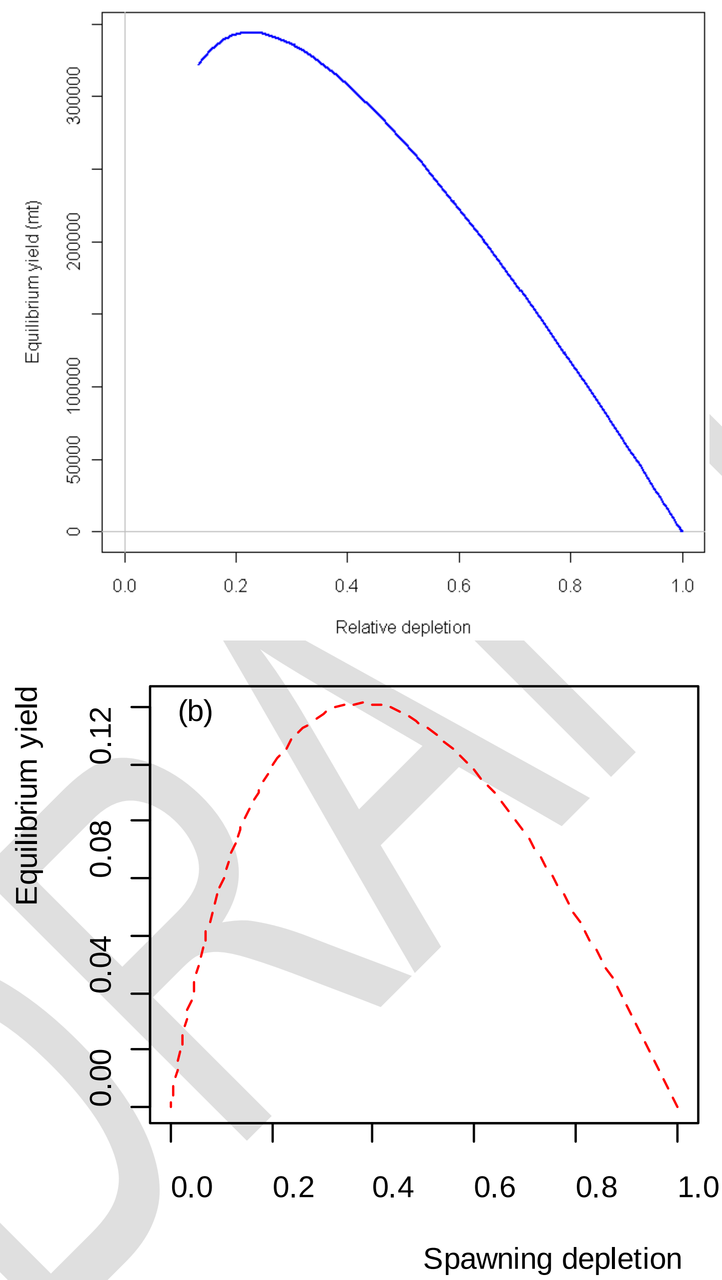

Figure h. Equilibrium yield curves for the SS (upper panel, mt) and TINSS (lower panel, million mt) assessment models. These results are based on MLE estimates.

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; however, as of this writing the treaty has not been fully implemented. Under the treaty, Pacific hake stock assessments are to be prepared by the Hake Technical Working Group comprised of U.S. and Canadian scientists and reviewed by a Scientific Review Group (SRG), with memberships as 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 stock assessment team. In addition, the stock assessment results reported here reflect nearly complete re-analysis of all available data for the Pacific hake stock during 2010. Many of these sources had not been investigated for decades and as a result the basic fishery and acoustic survey catch and age-frequency information differs somewhat from previous analyses after standardized methods were applied to raw data from both nations. The 2010 assessment and review process was marked by several rather difficult situations which included competing stock assessments from U.S. and Canadian analysts, as well as disagreement among analysts and reviewers on the use of certain data sources. Extensive modeling efforts conducted during 2010 as well as highly productive discussions among analysts have resulted in a unified document for 2011. It is our attempt to highlight progress made during 2010, 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 13 species of hake from the genus *Merluccius* (being the majority of the family *Merluccidae)*, which are distributed worldwide in both hemispheres of the Atlantic and Pacific oceans and collectively have constituted nearly two million mt of catch annually (Alheit and Pitcher 1995). 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 North 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). 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 Queen Charlotte Sound. 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.

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 predatory behavior. The role of hake predation in the regulation of other groundfish species is likely to be important (Harvey et al. 2008), although difficult to measure. 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 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 observations of Humboldt squid by hake fishermen as well as recreational fishermen and scientists 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 this range extension 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 of 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 to this assessment in the future, 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 so 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 prevent 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 1980's, and domestic fisheries in 1990's (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-1970's, 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, former Soviet Union, 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. Previously, these vessels had engaged primarily 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 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 surimi, fillets, 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 are 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 acceptable biological catch (ABC) between U.S. and Canadian fisheries led to quota overruns; 1991-1992 quotas summed to

128% of the ABC, while the 1993-1999 combined quotas were 107% of the ABC 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 optimal yields (OYs, harvest targets) for Pacific hake have generally been set well below the Allowable Biological Catches (ABCs, harvest limits) and 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 OY; however it was still below the ABC 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 OY 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. OY 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 whiting 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 and greatly reducing 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. Bycatch limits were not exceeded by any sector of the U.S. fishery and the fishery was able to harvest fish during the fall and early winter when bycatch rates were lower.

Faced with two stock assessments which yielded very different results, for 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 73.88% of the OY apportioned to U.S. fisheries and 26.12% to Canadian fisheries. 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 2009 U.S. fishery caught 160,818 mt, or 84.2% of the U.S. OY. Catcher-processor vessels fished from the May 15 start of the season through to December. 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 process the smaller fish.

The U.S. tribal fishery reported a reduced amount of hake in their fishing areas and generally smaller sized fish.

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 owner 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 7 years (Table 2).

Canadian Pacific hake catches were fully utilized in the 2005 fishing season with 85,284 mt and 15,178 mt taken by the shore-side and joint venture fisheries, respectively. In 2006, the joint-venture and shore-side 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-side 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-side fishery harvested 55,620 mt in 2009, or 115.7% of the Canadian OY.

Canada established the 2010 Canadian TAC at 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 in to 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 will carry over the maximum 15% into the 2011 season, as an overage allowance for 2011.

The fishery commenced in late April off the west coast of Vancouver Island. From mid-July to mid-August the fishing in the traditional area around La Perouse Bank limited due to presence of large quantities of small Hake in the area. The fishing fleet effort moved more westerly off the edge of the shelf where larger fish were found, however higher bycatch rates particularly of Yellowtail Rockfish were encountered. Vessels in the fleet are held individually accountable and responsible for the all catch and to many the increased bycatch proved to a major point of concern and affected fishing plans. The small fish presence resulted in many vessels to venture to more northerly waters into Queen Charlotte Sound. This resulted in deliveries into Port Hardy and the catch then shipped via trucks to Vancouver. This spatial shift of the fishery has been ongoing since 2008. The fleet moved back near the traditional grounds from August through October. Fishers continued to report the need to avoid large schools of small Hake (thought to be Age 2) in the area.

2. Available data sources

Nearly all of the data sources available for Pacific hake have been re-evaluated during 2010. This process has 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. Primary fishery dependent and independent data sources used here (Figure 4) include:

- Total catch from all U.S. and Canadian fisheries (1966-2010).
- Age compositions from the U.S. fishery (1975-2010) and Canadian fishery (1990-2010).
- Biomass indices and age compositions from the Joint U.S. and Canadian integrated acoustic and trawl survey (1995, 1998, 2001, 2003, 2005, 2007, and 2009).

Some sources were not included in the final base models, but have been explored and discarded in recent stock assessments or are included for 2011 via alternate models or sensitivity runs (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.

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, 1975-2010.
- Mean observed length-at-age from fishery and survey catches, 1975-2010.
- 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 1966-2009 by nation and fishery sector is shown in Table 1. Catches in U.S. waters for 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 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 (Figure 5). 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 1991-2009 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 to April 2007 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 to April 2007 from the Pacific Harvest Trawl (PacHarvTrawl) database. From April 1, 2007 to the present the catch data for both fleets is found in the Fisheries Operations System (FOS). 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, Figure 5). This fishery gradually spread out over the summer and fall, and the most recent five years has seen some of the largest catches in the late summer and fall. 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 1991-2009. 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, 1991-2010, 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 10% observer coverage. 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 records 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 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 multinomial sample size input to the SS stock assessment model or as a relative weighting factor among years.

Aggregate fishery age compositions differed somewhat from those used in previous assessments, with smaller fish slightly more represented. This change is likely due to the calculation of age-composition data without including lengths extrapolated to ages via static age-length keys, as well as application of more accurate catch-weighting of the sector-specific compositions. These data confirm the well-known pattern of very large cohorts born in 1980, 1984 and 1999 (Figure 6). The most recent age-composition data from the 2009-2010 fishery indicate the presence of relatively strong 2005 and 2006 year classes. There was only a small number of fish from the 1999 year-class still present in the population, in 2010, at age 11. Most importantly for this assessment, is the presence of an extremely large relative proportion of one-year old hake in 2009 and 2-year old hake in 2010, indicating an unusually strong 2008 year-class.

Both the weight- and length-at-age information suggest that the growth of hake 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 (Figure 7). 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 observed in both of the U.S. fishery sectors (Figure 8).

2.1.3 Bycatch in the pink shrimp fishery

Juvenile hake are frequently encountered by the trawl fishery for pink shrimp, which operates primarily in the waters off Oregon (NWFSC, 2009; Hannah and Jones, 2009). As part of the 2010 assessment, the estimated bycatch of juvenile hake in the pink shrimp fishery were examined in order to determine whether they might provide an alternate index of recent year-class strength prior to clear signal in the fishery. Many confounding factors resulted in an inability to create a proportional index of juvenile hake from the shrimp fishery. In the future, when and if the gear and behavior in the shrimp fishery becomes stable this potential index could be revisited, although spatial limitations may remain.

2.1.4 Catch per unit effort

Catch-per-unit-effort (CPUE) is a commonly utilized source of information about relative population trend in stock assessments world-wide. However, calculation of a reliable CPUE metric is particularly problematic for Pacific hake, and has therefore never been used as a tuning index for the stock assessment at any time during the 30-year assessment history. This is due to several important aspects of the fishery. 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 due to bycatch avoidance. 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.

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, *Merluccius productus*, 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 in 2003, 2005, 2007 and 2009. 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 (Table 4) and therefore are not used in the current assessment because of concerns over both bias and variability. Specific concerns are that Pacific hake abundance in the northern portion of the stock's range is highly variable and is not a simple fraction of the total population and that the survey did not extend offshore past a depth of 457 meters at most. A reasonable estimate of the variance for those early years would likely render them uninformative for the stock assessment, and raw data were not available from these surveys to re-analyze using current methods. Therefore, only acoustic surveys performed in 1995, 1998, 2001, 2003, 2005, 2007, and 2009 were used in this assessment (Table 5). 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 larger hake and concerns over drastically 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 (Figure 1). The 1998 acoustic survey stands out and shows an extremely northward occurrence that is thought to be tied to the strong 1997-1998 El Nino (Figure 2). In contrast, the distribution of hake during the 2001 survey was very 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, the majority of the hake distribution was found in U.S. waters. Pacific hake also tend to migrate further 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 and the older ages are located more to the north within the same year. The mean locations of Pacific hake aged 6 and older tend to be more similar than the younger ages.

Historically, hake biomass (age 2+) was estimated from the survey data using a stratified transect design following Jolly & Hampton (1990). These design-based estimates did not account for spatial correlation of the data or patchiness of hake distributions and assumed that there was no hake biomass beyond the ends of each transect. In addition, estimates of variability were not routinely produced. For lack of a better methods, previous stock assessments assumed a constant variance for the acoustic survey index across all years, despite changes in the transect design and the distribution of the stock.

For the 2011 assessment of Pacific hake, acoustic survey data from 1995 onward were completely re-analyzed from the raw data using the conventional methods as well as geostatistical techniques (Petitgas 1993). Geostatistical methods account for spatial correlation and provide a more robust estimate of total biomass as well as an estimate of the year-specific sampling variability due to patchiness of hake schools and irregular transects. They have been endorsed by an ICES working group (Anon. 1993) as an appropriate method to analyze acoustic data, and have been used in many fisheries applications (Petitgas, 1993; Rivoirard et al. 2000; Mello & Rose 2005; Simmonds and MacLenann, 2005). More specifically, kriging was used to estimate both the biomass of Pacific hake and the uncertainty in that estimate from each year of the acoustic survey. There are several advantages to the kriging approach: 1) it provides the hake biomass and associated sample variance estimates simultaneously and properly accounts for spatial correlation along and between transects, 2) it provides biomass estimates in the area beyond transect lines but within correlation distance, 3) it provides maps of hake biomass and variance that take into account the heterogeneous and patchy hake distribution, and 4) it provides more flexibility in survey transect design such that transects do not need to be more or less perpendicular to the coast line, thus allowing for more efficient sampling designs.

During the acoustic surveys, mid-water trawls were made opportunistically to determine the species composition of observed acoustic marks and to obtain necessary length data to scale the acoustic backscatter into biomass (see Table 4 for the number of trawls). These biological samples have been post-stratified based on similarity in size composition and geographic proximity. There has been concern in past assessment reviews that the trawling conducted during the acoustic survey may not be representative of the acoustic backscatter due to stratification within schools as well as net avoidance behavior.

Field research done during the summer of 2010, and re-analysis of historical data was conducted in order to specifically address concerns in both the representativeness of trawling relative to observed backscatter and the sensitivity of the acoustic results to post-stratification. Both of these issues were made tractable due to the acquisition of all available historical data during 2010 and the development of new software to efficiently process these data. Multiple trawl sets were made on individual aggregations of hake during both U.S. and Canadian research cruises in 2010. In addition, a number of trawls were deployed with a camera mounted in the net to monitor fish behavior. These efforts revealed that hake were observed to be passively entering the net, without clear avoidance behavior. Further, the length composition of the trawl catch did vary substantially among hauls made in a relatively small area and short time period. In some cases, different modal structure was observed in the length-frequency distributions, indicating the presence of two or more cohorts. However, the only indication of systematic patterns occurred in a single bottom trawl deployed which captured somewhat larger fish than proximate mid-water trawls. Investigation of historical trawling effort revealed that trawl deployment was relatively proportional to observed backscatter as a function of distance off bottom, so such a pattern would be unlikely to produce a strong bias in the acoustic results. Because of the observed variability in the size structure of hake among hauls, it is quite reasonable to predict that there is a relatively large amount of observation error in survey estimates resulting from the fact that relatively few trawls are deployed each year (Table 4) and almost none repeated for a single aggregation. Utilizing software developed during 2010, sensitivity to post-survey stratification was evaluated for observations made in the most recent two acoustic surveys: 2007 and 2009. Alternate stratifications ranging from no stratification to schemes similar to historical methods were applied to each year’s biological samples. The results of this analysis indicated that biomass estimates varied by less than 9% over all stratification methods. This result suggests another source of variability in the acoustic results that could lead to variation in annual index observations relative to the true population, but also suggests that it is a relatively minor component among the sources of variability inherent to acoustic methods. These new analyses will be presented in more detail during the 2011 STAR panel, and were the primary basis for continued use of biological samples from the acoustic survey in the Pacific hake stock assessment models presented in this document.

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. However, this difference would be accounted for directly in estimates of acoustic catchability within the assessment model. Estimates of biomass of hake at length (and age) within individual cells were summed for each transect to derive the conventional coast-wide estimate. Additionally, the cell-specific biomass estimates were used in the kriging analysis to provide kriged estimates. More details of the acoustic methods can be found in the background documents provided for the 2011 STAR panel.

The most recent acoustic survey (2009) spanned the continental slope and shelf areas along the west coast from south of Monterey California to the Dixon Entrance area. Biological sampling revealed the presence of four clear cohorts in the hake population (ages 3, 4, 6, and 10 corresponding to the 2006, 2005, 2003 and 1999 year classes), and also showed that Humboldt squid were present in very large numbers, representing the second most common species in the acoustic survey trawl catch by weight (47% after hake at 50%). Although the acoustic teams attempted to carefully and consistently delineate regions of backscatter to Pacific hake, the high abundance of Humboldt squid and the mixing of these two species resulted in an additional, and appreciable, source of uncertainty in the 2009 acoustic biomass estimate. This source of variability was relatively unexplored during the 2010 stock assessment and concerns over the potential magnitude of uncertainty in the hake biomass index that was attributable to mixing with squid led to the exclusion of that observation from one of the assessment models used by management. To address these concerns, a detailed re-analysis of the available data from 2009 was undertaken by the acoustics team and bootstrapping methods were employed to examine the variability in estimated hake abundance on a transect-by-transect basis. It was found that 61% of the estimated hake biomass occurred on transects that had no squid present. Two methods of bootstrapping the variability about the 39% of the hake biomass estimate that was potentially more variable due to the co-occurrence of Humboldt squid were: 1) resample from all the proportions of squid and hake observed during trawl sampling and assign them randomly to transects, and 2) create pdfs, based on the expert judgment of several acousticians, of the likely proportion of hake and squid below and above the depth threshold used for analysis and resample from these pdfs. Both methods yielded a similar level of variance in the resulting hake biomass estimates. Utilizing the larger of the two, the variance component attributable to Humboldt squid was roughly half as large as that attributable to sampling variability and school patchiness. To reflect these results in the stock assessment, the CV of the acoustic index based on the kriging analysis for 2009 (0.112) was inflated to a value of 0.138 (Table 5).

Comparisons of the acoustic survey biomass estimates (age 2+) are shown in Table 5 and Figure 9. The historical and reprocessed conventional estimates are not exactly the same, but are very similar. The kriged estimates are slightly greater than the conventional estimates, but follow the same pattern. This increase is expected because additional biomass beyond the end of each transect is predicted when kriging. In addition, year specific estimates of uncertainty are provided for the kriged estimates and the 2009 estimate of variability is inflated due to the presence of Humboldt squid (Table 5 and Figure 9). 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 other species, and interannual differences in catchability likely lead to increased uncertainty in the acoustic estimates. In the future, it is possible that a thorough bootstrapping of many of these additional sources of variability can be conducted and the estimation of variance inflation constants in the assessment may be less important, but at present there is strong reason to believe that all survey variance estimates are underestimated relative to the true variability.

These uncertainties, as well as other factors, suggest that the survey estimates of biomass may not be an absolute estimate of biomass, but are more reasonably an index of abundance that describes the trend in Pacific hake biomass. The acoustic survey catchability coefficient, q, globally scales the population biomass predicted in the assessment model lower ($q<1$) or higher ($q>1$) to match the index of abundance, and uncertainty in q reflects the uncertainty in the absolute scale of the hake population. All stock assessments prior to 2004 that used the acoustic survey in age-structured assessments (e.g., Dorn et al. 1999) asserted $q=1.0$ and treated the parameter as a fixed quantity (In fact ABCs and OYs until 2003 were predicated upon that assumption). The 2004-2007 assessments presented two models with differing q's in order to bracket the range of uncertainty in the acoustic survey catchability coefficient. In 2008, an attempt was made to integrate out the uncertainty in q while incorporating uncertainty in the shape of the acoustic survey selectivity curve. In the 2009, 2010 and in current assessments q is estimated and the uncertainty is included in the estimates of population biomass from the assessment models.

As with the fishery data, acoustic survey age compositions were used to reconstruct the age structure of the hake observed by this survey. Proportions-at-age for the seven acoustic surveys are summarized in Figure 10 and clearly show the strong 1999 year class as well as the large 2005 and 2006 year classes. The acoustic survey does not include age-1 fish in their analysis. Therefore, with the most recent survey being conducted in 2009, the acoustic age data can only provide insight into the 2007 and earlier cohorts, but not the strength of the 2008 year-class.

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 West Coast, and, in 2003, the Northwest Fisheries Science Center survey was extended shoreward to a depth of 30 fathoms 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 uses 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 recent assessments. Because the survey was not conducted in 2010 it has not been revisited for this assessment.

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 bottom trawl surveys, but these samples have not yet been analyzed.

2.3.2 Aging error

With the transfer of Pacific hake ageing to the NWFSC in 2001, an effort was made to evaluate age reader agreement and calibrate readers at the Cooperative Aging Project (CAP, Newport, Oregon) with those at the Department of Fisheries and Oceans (DFO). As expected, agreement was greater for younger fish than for older fish. This exchange was used to estimate the ageing imprecision matrix applied in the 2008 assessment, using the maximum likelihood method of Punt et al. (2008). Subsequent to the 2008 assessment, 1,773 age estimates were compared between the CAP and AFSC for otoliths collected throughout the time-series but prior to 2001. These estimates allowed estimation of the degree of ageing imprecision for the AFSC ages. There were insufficient samples to estimate bias; however, precision was estimated and quantified as the standard deviation of observed age from true age. Values of imprecision at age estimated directly were found to be of similar magnitude to those from the CAP.

With this much larger available data set, the 2009 and 2010 assessments included 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 perhaps increased mis-ageing of neighbor year-classes. To account for this process in the model, we created year-specific ageing-error matrices (or vectors of standard deviations of observed age at true age), where the standard deviations of strong year classes were reduced by a constant proportion. In 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. The result suggested that strong year classes only had 55% of the read-to-read disagreement in ageing as other year classes. In each year, that proportion (0.55) was applied for the strong year classes (for ages 2-15) as a multiplicative factor to the base ageing error vectors of standard deviations. For relatively strong but not dominant year classes, a proportion of 0.80 was applied. An alternative method of calculating the proportion by the age of the strong year class was explored in the 2010 assessment, with little change in overall results.

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 done 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 (a portion of which is shown in Figure 11) 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, and the calculated strong cohort proportional ageing error was 0.41 (95% CI = 0.28 – 0.55), supporting the use of the 0.55 proportion.

In the current (2011) SS assessment, the ageing error matrix for all years is based on the analysis of CAP ageing error, since the AFSC and DFO ageing error data show similar results. In addition, we have applied the 0.55 proportion to the four strongest year classes (1980, 1984, 1999 and 2008). The use of the 0.8 proportion for moderately strong year classes was found to make negligible difference in results in previous assessments, and thus was not applied here. Sensitivity analyses to removing all ageing error and removing just the cohort effect are provided below.

2.3.3 Weight-at-length and age

In order to provide input values for the two models, a matrix of empirically derived population weight at age was required. Mean weight at age was calculated from samples pooled from all fisheries and the acoustic survey for the years 1975 to 2010 (Figure 12). 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 the missing values. However, the samples are generally representative of the catch, so the combinations of year and age with no samples have very 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 (Figure 13) 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. Synthesis models in recent years have not explicitly accounted for sex-specific patterns (although they have been documented repeatedly) but have allowed for the dramatic decline in maximum size and corresponding increase in growth rate observed in the data (Figure 7). Parametric growth models fit externally to data collected prior to 1990 and afterward show the same dramatically different rates of growth for both sexes that has been estimated inside the SS model in recent years (Figure 14). Hake show very rapid growth at younger ages, clearly evident in data partitioned into seasons within each year (Figures 15 and 16). The trajectories of individual cohorts also vary greatly, as has been documented in previous assessments.

In aggregate, these patterns result in a great amount of process error for length at age relative to commonly employed 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 recent SS models. We investigated models that allow for a high degree of complexity in the growth process and fit to length and age-at-length data in preparation for this assessment, but poor residual patterns persisted in all cases (Figure 17).

2.4 Prior probability distributions

The informative prior probability distributions used in this stock assessment are reported in Table 6. The two models used priors for different parameters, a summary for each model is provided in Table 7. Priors intended to be non-informative are listed in tables 8 and 9. 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 reasonable estimates. The 0.23 estimate was originally obtained via tracking the decline in abundance of year classes from one acoustic survey to the next (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 undoubtedly somewhere in 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, a combination of the informative prior used in recent Canadian assessments and the results from Hoenig's method described above were used to generate 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.

2.4.2 Steepness

This assessment considered two priors for the steepness parameter (h) of the stock-recruit relationship: one directly informing the probability distribution via a Beta-distributed constraint, the second via informing the plausible distribution for F_{MSY}, which, given fixed life-history characteristics and selectivity, maps directly into an implied prior for steepness. The direct prior 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 Beta-distributed with a mean of 0.777 and standard deviation of 0.113. The implied prior from F_{MSY} is explained below.

2.4.3 F_{MSY}

The underlying production function in TINSS is defined by three key population parameters (*MSY*, F_{MSY}, and *M*) and the parameters that define age-specific selectivity ($\hat{a}$ and $\hat{\lambda}$). Informative lognormal prior distributions were used for *MSY*, F_{MSY}, and *M* where the log means and log standard deviations are given in Table 6. These prior distributions for MSY and F_{MSY} were developed on an ad hoc basis and not necessarily derived from meta-analytic work that is the typical source of prior information.

In comparison to the SS model, a prior probability for F_{MSY} is nearly equivalent to a prior probability for steepness (h) A lognormal prior was assumed for F_{MSY}, with a mean corresponding to 0.35 and a standard deviation of 0.4 (corresponding to a 95% confidence interval for h of 0.16 to 0.77). This is broader than the prior used in 2010, which had a standard deviation of 0.263 (corresponding to a 95% confidence interval of 0.21 to 0.59). The prior was broadened to address concerns that the posterior predicted distribution for F_{MSY} (in this and previous assessments) tended to match the prior, indicating that the data contain little information about the productivity of the population. Broadening the prior for F_{MSY} therefore admits more uncertainty into the analysis.

Martell (2010) described the methodology to derive the 2010 prior for F_{MSY}, on which this prior is based. In his method, a steady-state, age-structured model was developed to calculate a Spawning Potential Ratio based on growth parameters from Francis et al. (1982), a natural mortality rate of 0.23, and a logistic selectivity curve. Arbitrarily, it was assumed that production is maximized somewhere between SPR=0.3 and SPR=0.45, and the corresponding values for $F_{30\%}$ and $F_{45\%}$ were then calculated. Based on the growth-maturity, natural mortality, and assumed selectivity, the values correspond to $F_{30\%} = 0.48$ and $F_{45\%} = 0.25$, which were then assumed to be the 10th and 90th percentiles for a lognormal distribution. Note that the SPR curve is insensitive to the assumed value of steepness and that $F_{40\%}$ is the assumed proxy for F_{MSY} that is used by the Pacific Fisheries Management Council. The analytical transformation from (*MSY*; F_{MSY}) to (SB_0; h) implies a prior density for the steepness parameter which is shown in Figure 18.

Note that in the Beverton-Holt stock recruitment model, values of h range between 0.2 and 1.0, where 0.2 implies that recruitment is nearly proportional to spawner/egg production, and 1.0 implies that recruitment is unrelated to spawner/egg production. The implied prior for h is sensitive to two key model components: the assumed prior distribution for F_{MSY}, and the ratio of the age at which fish recruit to the fishery and the age at which fish mature. Larger values of F_{MSY} imply a more productive stock and higher values of h for given selectivity and maturity schedules. Similarly, if fish recruit to the fishery prior to maturing then the levels of recruitment compensation (or *h*) must increase for a given value of F_{MSY}. This relationship is highly non-linear (Forrest et al. 2008). Therefore, critical pieces of information are the maturity-at-age and weight-at-age schedules used to develop the age-specific fecundity relationship, as well as the age at which fish recruit to the fishery.

2.4.4 MSY

The global scaling parameter in this model is *MSY*, the maximum long-term sustainable yield. The prior for this parameter was the same as that used in the 2010 assessment (Martell 2010). Since 1966, the average annual catch has been 221 thousand mt, and in the last decade 268 thousand mt. The TINSS model assumes a rather diffuse lognormal prior for *MSY*, with median value corresponding to 200,000 mt and a standard deviation of 500 thousand mt. This represents a 95% confidence interval of roughly 75 thousand mt to 532 thousand mt. Assigning a prior density for *MSY* is nearly equivalent to assigning a prior density for the global scaling parameter *q*.

2.4.5 Acoustic survey catchability (q)

A lognormal prior was placed on the survey catchability parameter *q*, in the TINSS model, 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. It might be considered overly precise, although it is worth noting that the maximum likelihood estimate was 0.73, outside the confidence limits of the prior. Sensitivity tests were done to evaluate the influence of the standard deviation of this prior.

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) 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 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 modeling framework written by Dr. Richard Methot (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 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 in TINSS and one in SS) 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.

For 2011 we have focused on collaborative modeling, considerably refining both the historical U.S. and Canadian models to better understand the reasons for previous differences among models and to better present the uncertainty in current stock status in the spirit of the Pacific hake treaty.

3.2 Response to recent 2009 and 2010 review recommendations

3.2.1 2010 STAR Panel recommendations

1. *A detailed analysis of catch, effort, length, and age data by sex, going as far back as possible, and split by fleet, and vessel type, is needed to help understand the commercial data which go into the stock assessment models. In particular, this would enable, (i) defensible length and age frequencies to be constructed by fleet (not just shore-based and at-sea within country), which in turn may enable the modeling of the fisheries data with constant selectivities over time within fleet (or, at least, lead to a reduction in the need for time-varying selectivities); and (ii) abundance indices (i.e. one or more fleet-based CPUE indices) to be explored to provide an alternative (or an addition) to the acoustic survey biomass (should the squid remain in the region and continue to make survey-based hake biomass unreliable; also, having alternative or additional indices would strengthen the ability of the modelers to adequately assess the hake stock). This should also include additional spatial data describing the tribal and shore-based fisheries.*

Response: Catch, length, weight and age data were broken out by sex, fleet and season for the 2011 assessment. Models were constructed that utilized each of these data sources (the efforts described below); however, these models did not prove sufficiently different from the simpler Empirical Age model to justify their use. By conducting this exercise, we have been able to show that the model we are using mimics the model which includes the added complexity, and future assessments can continue to consider and revise the range of possible models which have been explored using the data processing tools that have been developed.

2. *Analysis from all data sources (commercial and acoustic survey) aimed at understanding the spatial, vertical, and temporal patterns of hake distribution (by length, age, and sex).*

Response: Much progress was made on this topic during 2010. The re-analysis of acoustic biological samples to investigate haul representativeness and sensitivity to stratification is described in section 2.2.1 above.

3. *Fund research into the appropriateness of attempting to produce biomass estimates at length, age, and sex, from acoustic surveys of semi-demersal species such as hake and pollock, including in the presence of possible confounding species such as Humboldt squid and lingcod. Once the work has been done (by statistician(s) with practical fisheries experience, in conjunction with acousticians) convene a workshop to discuss and review the findings. Ideally this should also address the issue of adequately sampling to groundtruth the acoustic estimates, including, for example, duration of trawl sampling, using a commercial trawler to sample, using another (additional) gear type to sample.*

Response: A workshop to evaluate acoustic survey design and methods is planned for 2012.

4. Place a very high priority on obtaining a defensible length to target strength relationship for hake.

Response: It is a high priority. Although alternate values for target strength will scale pure biomass estimates proportionally (and thus be absorbed by a freely estimated catchability coefficient), delineation of mixed-species backscatter may be sensitive to the relative target strengths for each component species. Aggregations of hake with sufficient individual targets were not present during the cruises conducted in 2010, but this research will be continued as is possible. Ongoing research by the U.S. and Canadian acoustics teams includes the use of a 'drop-transducer' for resolving single targets at depth as well as tethered animal observations.

5. Construct informed priors for the acoustic qs associated with the existing time series (this will ensure that future model runs stay in sensible space, or alternatively, that the estimates will be a revealing diagnostic).

Response: This is an area for future research, but not one that is likely to be easily resolved. Such a prior was unnecessary for the current SS model. A description of the prior for q used in the TINSS model is provided in section 2.4.5 above.

5. Provide an option in SS3 to disable or severely limit the penalty on recruitment deviations while maintaining internal consistency in the definition of B0.

Response: This is a general topic of research for age-structured models and likely requires simulation testing under varying data quality and quantity scenarios to determine its performance. A way to limit the penalty on recruitment in SS is to fix a very large σ_r parameter. However, this would cause the highly variable estimates in recruitment under the current modeling approach to only become more variable. Without including the assumption that recruitment has a distribution, nothing would prevent wild fluctuations in recruitments during early years with no data or the most recent recruitment years that have not yet been observed in the age composition data. Fundamentally, the connection between an internally consistent B0 and assumptions about a central tendency in recruitment are difficult if not impossible to separate.

3.2.2 2009 STAR Panel recommendations

1. *The Panel recommends the investigation of how the biological sampling in the acoustic survey occurs to determine whether these data are representative of the backscatter in the survey.*

Response: Mid-water and bottom trawls are made during survey operations in order to classify the observed acoustic quantity and to gather the length and age data needed to scale the acoustic data into units of biomass. The locations of these trawl deployments are not systematic, but rather opportunistic, depending on the local acoustic observations, recent trawl effort, and other logistical constraints (time available for trawling, time required to process the catch, weather and sea conditions, etc.). Due primarily to logistic and time constraints, not all scattering aggregations can be sampled. Typically, one to three trawl sets are made per day during the survey. While the biological sampling is not random, a comparative analysis of the occurrence of backscatter versus the deployment of trawl over both depth and latitude did not indicate a source of bias from the trawl sampling. Variability in the size and age structure of the trawl samples due to sparse sampling is therefore likely to contribute an additional source of process error in the acoustic index of abundance. The estimation of an additional variance component in the SS model accounts for this and other sources of process error.

2. *The panel recommends and investigation of how the biological samples are processed and applied to the acoustic estimates, including the post-stratification of length samples.*

Response: Documentation of the analysis methods has been completed and provided as part of the background materials for this assessment. Analysis of post-stratification methods and results during 2010 indicated that the time-series of abundance was remarkably robust to the stratification method (all stratification analyses produced < 10% change in the resulting biomass estimate). Pending re-analysis of all years from 1995-2009, a simpler *a priori* stratification approach may be employed in future surveys and historical estimates reanalyzed to be consistent with that choice of strata.

3. *The panel recommends that the raw data in the acoustic survey, including the length samples, be appropriately assembled to allow statistical analysis of these data as well as appropriate stratification*.

Response: All extant raw acoustic data has been assembled during 2010 and reanalyzed for this assessment. Data prior to 1995 was found to be inadequate to reconstruct abundance estimates and spatial coverage was such that reasonable variance estimates would be prohibitively large. Automated software tools for processing and kriging the acoustic data and for processing biological samples will allow bootstrapping of additional variance components for future stock assessments.

4. *The Panel recommends that a Management Strategy Evaluation approach be used to evaluate whether the current 40-10 harvest control rule is sufficient to produce the management advice necessary to ensure the sustainable use of the Pacific hake stock with its dramatically episodic recruitment. The 40-10 rule assumes that simply reducing catches in a linear fashion as stock biomass declines will be sufficient to guide the fishery back towards the target spawning biomass level. However, with the fishery being dependent upon a single declining cohort just reducing the catch may achieve the status quo but it rebuilding will not occur without new recruitment.*

Response: The STAT agrees strongly with this recommendation; however the extensive work on data processing and modeling methods during 2010 was a necessary first step before an MSE could be undertaken by the joint technical working group. Canadian scientists have begun research into this area, and it is likely that this issue will be addressed by the committees formed to fulfill the now ratified but currently not implemented hake treaty.

4.1 *Related to Recommendation 4, the operating model developed for the Management Strategy Evaluation should evaluate how well the different assessment models recapture true population dynamics. At issue is whether a simpler model such as ADAPT / VPA performs better or worse than a more complex model such as SS2.*

Response: One of the top research priorities provided in this assessment is to develop management strategy evaluation tools to evaluate major sources of uncertainty relating to data, model structure and the harvest control rule for this fishery.

5. *Future assessment models should explore gender- and length-based selection processes, in recognition that the gender differ in growth and that many of the more influential dynamic processes that operate in the fishery and length-based but are currently considered from and age-based perspective (for example selectivity).*

Response: A range of models was explored in preparation for the 2011 assessment with some including length-based selectivity, explicitly fitting to sex-specific data sources and estimating the degree of dimorphic growth. The conclusion for this effort, was that the processes driving growth of hake (both weight at length and length at age) are extremely dynamic, far more so than for most west coast groundfish. Hake get markedly heavier for their length during the growing season and this growth varies significantly from year to year. Prior to 1990 the patterns of length at age differed dramatically from growth observed in more recent years, and this variability is far more pronounced than the modest but significant difference between males and females. In aggregate, we were unable to create parsimonious models which could mimic the temporal variability in growth sufficiently to provide statistically acceptable fits to the length and age-at-length observations. While this may be possible in the future, it must be recognized that hake are atypical in the degree of growth variability relative to other groundfish. Even if such models could be constructed, it would not be a foregone conclusion that they could provide more reliable management advice than the somewhat simpler empirical approaches here, given that several models reported in this document, which included parametric growth, provided very consistent results.

6. When the raw acoustic survey data become available there should be a re-evaluation of the treatment of pre-1995 acoustic survey data and index values. For example, the biomass index implied by the area covered by the pre-1995 surveys should be compared with the total biomass from the full area covered by the post-1995 surveys. The difference between these two indices has implications for the magnitude of the survey catchability coefficient prior to 1995.

Response: All available historical acoustic survey data have been reanalyzed for this stock assessment. Data prior to 1995 were found to be inadequate to reconstruct abundance estimates for the entire stock and spatial coverage was such that reasonable variance estimates would be prohibitively large.

7. *There should be further exploration of geographical variations in fish densities and relationships with average age and the different fisheries, possibly by including spatial-structure into future assessment models.*

Response: The addition of spatial structure into the assessment model was beyond the scope of available resources for the 2011 assessment, but could be considered for future analyses.

8. *There should be exploration of possible environmental effects on recruitment and the acoustic survey.*

Response: A Fisheries And The Environment (FATE) proposal was funded and the research to investigate environmental effects on hake distribution, using acoustic survey data and an array of environmental variables is ongoing (see figure 2).

3.2.3 2009 Industry contracted review

A review of the 2009 Pacific hake stock assessment was conducted in 2009 by Quantitative Resource Assessment LLC (Dr. Mark Maunder, 2009). The review was thorough and suggested a number of improvements to the model; in particular, Dr. Maunder suggested two main changes to the assessment: 1) Explicit modeling of sex structure (i.e. treating males and females separately in the model and the data), and 2) Splitting the data into more fisheries, in part to improve the modeling of selectivity and changes in selectivity over time. Of additional concern was the treatment of the acoustic survey data for years when geographic coverage was incomplete as well as the assumption that trawl sampling (the biological data) and acoustic backscatter (the acoustic index) necessarily arise from the same selectivity process. Dr. Maunder emphasized that, due to actual differences in growth between the sexes, most of the other suggested improvements would be far less helpful without a split-sex model.

Response: Several assessment models including split-sex and fleet-disaggregated dynamics were constructed for this assessment and are reported as sensitivity analyses. These assumptions did not produce markedly different results for age-based selectivity and data constructs. As described above, models fully utilizing all available length observations, and length-based selectivity contained residual patterns that precluded their use for management advice. The data processing tools and re-analysis of historical observations will make it far easier for future stock assessments to revisit this topic and perhaps make additional progress. The potential benefit to full utilization of all length data could be a reduction in the considerable uncertainty in the assessment models, however the reliability of such models may need to be simulation-tested given the extremely dynamic growth processes observed in the historical time-series.

The acoustic survey data prior to 1995 have been removed from the stock assessment due to the raw observations being unusable. This is due to the incomplete spatial and depth coverage of the sampling and the prohibitively large variance that would result from analysis consistent with the recent time-series (kriging).

3.3 2011 Model descriptions

3.3.1 Stock Synthesis

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 current base assessment 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 TINSS 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.

In the SS model, 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 1966-2010 (last year of available data), with forecasts extending to 2013. 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 8. The assessment model includes a single fishery representing the aggregate catch from all sectors in both nations (in comparison to recent SS assessments that have separated U.S. and Canadian fisheries into separate fleets). 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, unlike recent SS models. 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 5, but this restriction is evaluated via sensitivity analysis, as are alternate parameterizations. There was no evidence of dome-shaped selectivity in this assessment; this is a change from previous models which may be related to the removal of inconsistent acoustic survey observations prior to 1995.

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 are compared via sensitivity analyses 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 was a Beverton-Holt parameterization, with the log of the mean unexploited recruitment freely estimated. This assessment used a beta prior for stock-recruit steepness (h) applied to previous assessments and described above. Year-specific recruitment deviations were estimated from 1946-2010. The constraint and bias-correction standard deviation, σ_R, for recruitment variability is fixed at a value of 1.3 in this assessment based on consistency with the observed variability in the time-series. 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, with an additional constant and additive log(SD) component, 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 TINSS

TINSS is an age-structured model that is conditioned on historical catch and parameterized from a management-oriented perspective, where leading estimated parameters are *MSY* and F_{MSY}. These were referred to as *C** and *F** in previous assessments (Martell 2008; 2009; 2010) after Schnute and Kronlund (1996), the original proponents of management-oriented models. For internal consistency within the present document, these parameters will now be referred to as *MSY* and F_{MSY} throughout. In management-oriented models, *MSY* and F_{MSY} are directly estimated as parameters and analytically transformed to their biological equivalents SB_0 and steepness, through the survivorship, growth, maturity and selectivity schedules (see Martell et al., 2008 for a detailed description of the transformation). In other respects, the model is structurally very similar to SS. The main differences are: the treatment of selectivity; the negative log-likelihood function for catch-at-age residuals; partitioning of observation and process error; and priors on the leading estimated parameters *MSY* and F_{MSY}. Where possible, sensitivity to these factors is reported below.

The TINSS model presented here differs from the 2010 assessment (Martell, 2010). The model is no longer 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. 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 *MSY* and F_{MSY}. 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 jointly by the two stock assessment teams.

A total of 67 model parameters are conditionally estimated (Table 9). A summary of the input data is provided in Appendix D. The technical description of the model is provided in Appendix F; see also Martell et al. (2008) for further description of the model. The approach of TINSS 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 acoustic survey using a Bayesian estimation framework. First, TINSS is conditioned on the total landings where the fishing mortality rate each year is determined by solving the instantaneous Baranov catch equation using the observed total landings and the estimated vulnerable biomass. The Baranov catch equation is solved using a derivative based root finding method. The model is fit to the acoustic survey biomass (Table 5), 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. The model estimates the inverse of the total variance φ^{-2} as well as the variance ratio ρ, which partitions the total variance into the variances used for observation and process error (i.e., ρ represents the proportion of the total variance due to observation error).

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 0 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 1,000 iterations from a chain of length 2 million (the first 2,000 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.

Catch advice is based on the samples from the joint posterior distribution. Empirical weight-at-age data, aggregated and weighted from both US and Canadian data, were used to convert numbers-at-age to weight-at-age (Figure 12, and described in section 2.3.3 above).

The biomass index was treated as a relative abundance index that is directly proportional to the survey vulnerable biomass as the beginning of 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, ~N(0.0, 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). See section 3.4.2 for details on a modification to this likelihood used in the present assessment.

No aging errors were assumed in this assessment. Historical observations on mean weight-at-age show systematic changes where the average weights-at-age have declined from the mid-1970s and increased again slightly late 1990s (Figure 12). A number of the historical cohorts have growth trajectories that initially increase from age2 to age-8 then decline or stay relatively flat (e.g., 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; 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, TINSS uses the observed mean weight-at-age data from the commercial fishery to scale population numbers to biomass.

It was assumed that recruitment follows a Beverton-Holt type stock-recruitment relationship and the process error terms are represented by a vector of deviation parameters (ωj) that are assumed to be log-normally distributed. Both fishing mortality and natural mortality were assumed to occur simultaneously. Instantaneous fishing mortality was based on the Baranov catch equation where the analytical solution for F_t is found using an iterative Newton-Raphson method with a fixed number of iterations to ensure the proper derivative information is carried forward in the autodiff libraries. 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 curve, and time-invariant. Age-specific fecundity is assumed to be proportional to the product of body-weight and the proportion-at-age that are sexually mature.

As in the SS3 base model, the commercial catch and age-composition information from Canada and the U.S. was combined to represent a single fishery. The aggregation of the commercial catch data has the potential to create a bias in the predicted-age composition because it assumes that the age-specific fishing mortality rates between the two countries has been relatively consistent over time. Furthermore, the combining of the age-composition data is done using a weighted average, where the weights are based on the proportion of U.S. or Canadian landings by weight rather than by numbers.

3.4 Modeling results

3.4.1 Changes from 2010

Virtually all data sources and modeling approaches have been re-evaluated for 2011 and both the TINSS and SS models represent quite different model formulations than previously applied. The details and results are described fully below.

3.4.2 Model selection and evaluation

The SS modeling framework allows the fitting of a wide range of model complexities with only relatively small changes to input files and data organization. With the data-processing tools developed during 2010, the efficiency with which the technical team could explore alternate model formulations increased dramatically, no longer being hampered by an excessive period of time for data processing and formatting for each model. For this assessment, a multitude of models were constructed, ranging from simple production models to seasonal, sex-specific, fleet-disaggregated models with fully specified growth sub-models. An overview of these efforts is provided in Table 7, and the range of models is included in the sensitivity analyses.

The base SS generally provides similar results to those with more complex dynamics and a complex treatment of the data. However, as noted above and in the sensitivity section below, we were unable to find a parameterization that provided acceptable fits to the observed length and age-at-length data. This is likely due to temporal changes in growth among years and cohorts, as well as possibly mortality and fishery selectivity. A simple four-parameter production model, fitting to only the survey index, provided results that were so uncertain as to be of little value for management purposes (Figure 19).

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 10%, and the acoustic data to 89%, of the observed number of trips/hauls. This 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 0.26 at the median of the posterior distribution, indicating that additional process error, beyond simple sampling variability was present (as expected), but that it was not overwhelmingly large (although it did substantially exceed the sampling variance) and therefore the fit to the survey still informed the assessment.

The TINSS model is provided as an alternative to the SS models and to maintain consistency with recent assessment years. The SS base model is much more similar to TINSS compared to previous 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 functions 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 was originally introduced into TINSS 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 more 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 and survey index for both models can be found in the model results section 3.4.3.

3.4.3 Assessment model results

Bayesian results are presented here for both assessment models. For the SS model, the MCMC chain was run for 5,000,000 iterations with the first 9,999 discarded to eliminate 'burn-in' effects. The 10,000th value and every 5,000th subsequent value were 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 (Figures 21 and 22) and correlation-corrected effective sample sizes were sufficient to summarize the posterior distributions. Neither the Geweke nor the Hiedelberger and Welch statistics for these parameters exceeded critical values more frequently than expected via random chance (Figure 23). Correlations among key parameters and derived quantities were generally low (Figure 24).

The fit of the modeled time series to the acoustic survey biomass index is shown in Figure 25. 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 higher than any predicted value observed in 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 26). 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 27-29). 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 30 and 31).

Posterior distributions for SS model parameters showed that for both steepness and natural mortality the prior distributions were likely strongly influencing the posterior (Figure 32).

In the TINSS model, the MCMC chain was run for 2,000,000 iterations. Every 10,000th subsequent value was retained, resulting in 2,000 samples from the posterior distributions for model parameters and derived quantities. Stationarity of the posterior distribution for model parameters was assessed by visualization of trace plots (Figure 33) and analysis of lagged autocorrelation. Autocorrelation plots (Figures 34 and 35) indicate minor autocorrelation for all parameters. There was some unresolved confounding among the parameters describing the scale of recruitment, the variability in recruitment and natural mortality in this population. Further evidence for confounding among these parameters is the negative correlation between the posterior estimates of $\ln \bar{R}$ and φ^{-2}, and between $\ln \bar{R}$ and M in the cross-correlation plot of posterior estimates (Figure 36 and 37). The plots of posterior density compared with prior density (Figure 38) provide further evidence that there is little information in the data about the productivity of the population (the posterior distribution for F_{MSY} is almost identical to the prior).

The fit of the modeled time series to the acoustic survey biomass index is shown in Figure 25. The assessment model fit to the acoustic survey biomass time series is similar to that for SS, although the TINSS model fit to the 2009 data point, despite down-weighting of this point.

The estimate of selectivity at age for the fishery is higher than in recent years (Figure 39; MLE of age at 50% first harvest estimated to be 4.83, compared to 3.51 from the 2010 TINSS assessment (Martell 2010).

Fits to the age-composition data in TINSS are reasonably good, with close correspondence of the dominant cohorts (Figures 40 and 41). Residual patterns to the fishery and survey age data do not show strong trends that would indicate systematic bias in model predictions (Figures 42 and 43), although the model did tend to overestimate proportion of age six fish, suggesting that age at 50% first harvest was overestimated, or natural mortality underestimated.

Both stock assessment models indicate that the Pacific hake female spawning biomass was well below equilibrium at the start of the fishery and during the 1970s (Figure 44 and Tables 10-13). The stock increased rapidly after two or more large recruitment events in the early 1980s (Figure 45 and Tables 14-15) 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 (1.44 million mt in the SS model and 1.75 million mt in the TINSS model) as the exceptionally large 1999 year class matured. In 2011 (beginning of year), spawning biomass is estimated to be rebounding rapidly based on the strength of recent year classes (2005, 2006 and particularly 2008, in both the SS and TINSS models), however this estimate is quite uncertain, with 95% posterior credibility intervals ranging from historical lows to well above equilibrium levels. Current median posterior spawning biomass equates to approximately 91% (SS model) or 177% (TINSS model) of the unfished level (SB_0; Figure 46). Estimates of uncertainty in current relative depletion are extremely broad, from 35%-203% of unfished biomass in the SS model and 77%-413% in the TINSS model (Figure 47). The estimate of spawning biomass for 2011 is 1.87 million mt in the SS model and 2.18 million mt in the TINSS model, both much larger than the 0.48 million mt estimated by the SS model in 2010 without information about the above-average 2008 recruitment. The 2010 TINSS median posterior estimate was 0.34 million mt.

Estimates of historical Pacific hake recruitment indicate very large year classes in 1980, 1984 and 1999 in both assessment models. The strength of the 2008 cohort is estimated to be very large, and this is informed mainly by the 2010 fishery age compositions. Uncertainty in estimated recruitments is substantial, especially so for 2008, as indicated by the broad posterior intervals (Figure 45). A comparison of the stock-recruit relationships and recruitment deviations from the two models is provided in figures 48-50.

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 (SS via the steepness, h, of the stock-recruitment relationship; TINSS via F_{MSY}, 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 all structural modeling choices, data-weighting uncertainty and scientific uncertainty in selection of prior probability distributions. In an effort to capture these additional sources of uncertainty, we report the results from the two models throughout this document.

The Pacific hake stock displays the highest degree of recruitment variability of any west coast groundfish 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 stock trajectory in future stock assessments. The primary source of uncertainty that is relevant to management decision-making for the 2011 fishing season is the strength of the 2008 year-class. The estimate for this cohort is very uncertain, and the stock trajectory is entirely dependent on its value. For this reason, the decision table explicitly included columns representing alternate states of nature for low, mid and high estimated 2008 cohort strength. The vast uncertainty in this year class will likely persist until an acoustic survey has been conducted that provides an independent estimate of the magnitude.

3.4.5 Reference points

Unexploited equilibrium spawning biomass increased in the SS model to 2.03 million mt (from 1.33 million metric tons in the 2010 assessment), but the uncertainty is broad, with the 95% posterior credibility interval ranging from 1.55 to 2.76 million mt (Table 16). In the TINSS model, the median of the posterior was 1.22 million metric tons (Table 16; credibility interval: 0.80-2.06 million mt). The *MSY*-proxy target biomass ($SB_{40\%}$) is estimated to be 0.81 million mt in the SS model and 0.49 in the TINSS model. The minimum biomass thresholds ($SB_{25\%}$) are 0.51 and 0.30 million mt, respectively. *MSY* is estimated to be 355 thousand mt in the SS model and 161 thousand mt in the TINSS model (Figure 51). The equilibrium yield at the biomass target ($SB_{40\%}$) is estimated to be 323 thousand mt in the SS model and 159 thousand mt in the TINSS model. The full set of reference points are reported in table 16.

The spawning potential ratio for Pacific hake is estimated to have been below the proxy target of 40% for both assessment models (Figure 52). Uncertainty in the value is large, and the TINSS model estimates that the SPR target has been exceeded in 1997 and 1998, while the SS model estimates that the value has remained below target. This difference is likely due to the very different selectivity curves estimated for the fishery in the two models and to the priors for the productivity parameters (see sensitivity analyses in section 3.4.7 below). Exploitation fraction (catch/age-3+ biomass estimates are remarkably similar for the two models, as this calculation is not influenced by fishery selectivity. The full exploitation history in terms of both the biomass and *F* targets is portrayed graphically via a phase-plot (Figure 53).

3.4.6 Model projections

In order to better reflect the considerable uncertainty in recent (especially 2008) and future year-class strengths, as well as current absolute biomass levels, all forecasts are reported in the decision table format (Table 17). This allows for the evaluation of alternative management actions based on the full posterior distribution for both models. The decision table is organized such that the projected implications for each potential management action (the rows, containing a range of potential catch levels) can be evaluated for each of six states of nature (the columns). The six states of nature represent the lower 25%, middle 50% and upper 25% of the posterior distribution for the strength of the 2008 cohort for both the SS and TINSS models. Thus the middle value can be considered twice as likely as the first and last within each model. The choice of the 2008 cohort strength as the secondary axis of uncertainty (after including the two models) was based on the very large uncertainty associated with this recruitment as well as the fact that it is informed by only the 2010 fishery age composition data. For clarity, the decision table is divided into three sections: the first table projects the spawning biomass estimates, the second the relative depletion (for both of these the 2011 values will be identical for all management actions because they represent beginning of the year values) and the third the relative SPR rate. Relative SPR exceeding 1.0 indicates fishing in excess of the $SPR_{40\%}$ MSY-proxy (overfishing).

The stock is projected to increase in spawning biomass for all three states of nature in both models for catches up to an including 400,000 mt. At a catch level of 500,000 mt, the SS model predicts that the stock will not fall below 2011 levels at the mode of the posterior, but if the 2008 cohort is in the lower 25% of the posterior density, overfishing will occur and the stock will decline, while staying above the precautionary zone during the next three years. The TINSS model predicts that the stock will continue to increase at that harvest level under all three states of nature. The SS model 40:10 OY harvests are in excess of 900,000 mt at the mode of the posterior, while the TINSS model indicates that catches in excess of 700,000 and 1,000,000 mt would be consistent with the harvest control rule depending on whether the estimate of *MSY* or the $F_{40\%}$-proxy is applied. The differences between the two predictions are again likely due to the differences in estimated fishery selectivity and to the priors for the productivity parameters.

3.4.7 Sensitivity and retrospective analyses

A number of sensitivity analyses were conducted to test the effect of structural choices on the SS model results. These results, as well as retrospective analyses, (both within and among assessments) are presented below. Since both models are fully Bayesian, posterior parameter distributions for the base cases are provided instead of the frequently reported likelihood profiles, which are an imperfect proxy for the actual posteriors.

To expedite the comparison of sensitivities, MLE estimates are used instead of attempting to create full, converged posteriors for all sensitivity runs. In other words, the base model (Empirical Age or EA) MLE estimates are compared to the MLE estimates from each alternate sensitivity model via both. Because MLE estimates are used, the similarity between MCMC and MLE estimates were evaluated. Figures 54-57 show the MLE estimates and the medians of the posterior distributions of spawning biomass and depletion in 2011 for the SS and TINSS base-case models. The median of the posterior distribution for spawning biomass and 2011 depletion is slightly greater than the MLE estimate, which is expected due to the skewness of the posterior distribution. Additional comparisons are shown in Tables 18-19, and show a similar pattern. Overall, the MLE estimates and the medians of the posterior distributions are very similar for both the SS and TINSS models, and the MLE is likely to show similar patterns in sensitivity and retrospective analyses.

The first set of sensitivities for SS evaluated model structures that were more complex than the base-case model. Three models were tested.

1. **Age with Growth:** Similar to the Empirical Age model but used a growth curve that was externally estimated from length and age data. Composition data was fit for each of seven fishery sectors (instead of being aggregated into a single fishery as in the base model).
2. **Age by Sex with Growth:** Similar to the Age with Growth model, but modeled females and males separately. Age compositions and growth curves were sex-specific. Composition data were fit for each of seven fishery sectors (instead of being aggregated into a single fishery as in the base model).
3. **Age with Catch by Season:** Similar to Age with Growth, but fishery catches were further disaggregated into nine seasons within each year to account for both fishery timing and growth within the year. Changes in weight-at-length were explicitly modeled for each year and each season within the year based on externally estimated parameters. Composition data was fit for each of seven fishery sectors (instead of being aggregated into a single fishery as in the base model).

Results of these three models compared to the Empirical Age model are shown in Table 20 and Figure 58. The four models were remarkably similar in terms of spawning biomass trajectories, although the Empirical Age model tended to have the lowest spawning biomass. Historic large year classes tended to be larger for the Empirical Age model, but the 2008 cohort was smaller. The estimated parameters were generally similar, and it is interesting to note that the estimated male and female natural mortalities were almost identical. The biggest difference was in estimates of long-term average unexploited biomass, which resulted in differences in depletion. The Age with Sex and Growth model estimated the largest long-term average unexploited biomass, thus showed the most depleted stock in 2011. The long-term average unexploited biomass for the Age with Growth model was slightly higher than the Empirical Age and Age with Catch by Season models, which both used empirical weight-at-age instead of growth. Overall, more complex models did not result in appreciable differences in the basic results and the more parsimonious Empirical Age model appears to predict the abundance of Pacific hake consistently.

The next sensitivity analysis addresses the uncertainty of the 2008 year-class and the sensitivity of the forecasts to removing the 2010 age data. Spawning biomass in 2010 and 2011 is projected to increase dramatically due to the large estimated 2008 year class, although its estimate includes a great deal of uncertainty. Removing the 2010 age data makes very little difference to the historic spawning biomass and recruitment time-series, but greatly reduces the 2010 and 2011 spawning biomass estimates due to the prediction of much lower recruitment in 2008, which was close to equilibrium recruitment (Figure 59). The recent large year-classes from 2005 and 2006 were also slightly affected, but parameters not associated with recent recruitments remained nearly unchanged (Table 21). This sensitivity shows that the majority of information for the 2008 year class is in the 2010 age data. The 2009 fishery catch-at-age data showed a slight hint of a strong 2008 year class (Figure 6), but due to low selectivity at age-1 and no other data to support this observation, it was not very informative. The acoustic survey specifically excludes age-1 fish, thus there was no indication of this cohort in the 2009 acoustic survey data. A 2010 acoustic survey would have been extremely informative to the prediction of recent and future spawning biomass because it would have been an additional observation either corroborating or invalidating the observation from the fishery.

The influence of prior distributions developed for steepness (*h*) and natural mortality (*M*) were investigated through additional sensitivity testing. To provide a rough comparison of the aggregate effects of the priors for *M*, *MSY,* and F_{MSY} used in the 2010 TINSS model, the implied prior for steepness from that model was implemented in SS. This steepness prior had a mean of 0.48 and a SD of 0.10 (this differs from the somewhat updated value resulting from the 2011 assessment, but is still illustrative with regard to the effects of a prior on steepness with a mode at a much lower value). This alternate prior resulted in very little change to recent estimates of spawning biomass, but increased the estimate of equilibrium biomass, resulting in predictions of a more depleted stock (Table 22 and Figure 60). Next, the standard deviation on the prior for M was increased to 0.5 from 0.10, resulting in an increased estimate of natural mortality as well as larger estimates of spawning biomass and a less depleted stock. Estimates of equilibrium biomass were similar, but showed increased uncertainty. Finally, fixing *M* at 0.23 (the value used in recent assessments), produced intuitive results falling between the base run and the widened M prior run (Table 22 and Figure 61). Overall, lower values of steepness and natural mortality independently resulted in a slightly more depleted stock and smaller virgin equilibrium recruitment.

The effect of using ageing error was addressed for the SS model. The base model assumes that cohort ageing error occurs, and a sensitivity test to using ageing error without the additional cohort ageing error showed minor differences. As expected, the large estimated recruitments were slightly stronger than with cohort ageing error and equilibrium spawning biomass was slightly less, but there was virtually no change to 2011 depletion (Table 23 and Figure 62). Spawning biomass at the beginning of the time-series was slightly less than the base case. Removing ageing error altogether resulted in a slightly larger change to predictions. The equilibrium spawning biomass was further reduced, and large recruitments were smaller than those estimated in the base model, resulting in a smaller increase in the spawning biomass in recent years. Therefore, 2011 depletion was lower and the SPR ratio was slightly higher.

Estimated selectivity was different for the SS and TINSS models, and was investigated through additional sensitivity tests. The SS model compared three runs to its base-case: 1) non-parametric, age-specific parameters estimated up to age 8, 2) estimating parameters for a parametric double-normal selectivity, and 3) introducing time-varying selectivity. The results indicated that the SS model was quite insensitive to the shape and complexity of the selectivity curves (Table 24 and Figure 63) and that the support for dome-shaped selectivity observed in recent stock assessments has disappeared, likely due to the removal of inconsistent and incomplete acoustic surveys prior to 1995. There was some discussion of time-varying selectivity during the 2011 STAR panel and the general result that the first sensitivity run listed above produced a somewhat lower estimate of the 2008 year-class was of interest to the panel. At the informal request of the GMT, the 2011 ABC catch implied by the 40:10 harvest control rule was calculated for the sensitivity run with time-varying selectivity in all years. The value was 757,738 mt, somewhat lower than the base case model, but still relatively larger compared to recent actual catches.

The key sensitivities in the TINSS analysis were assumed priors for the leading parameters F_{MSY} and *MSY* and to the prior for *M*. Sensitivity to these assumptions was tested using MLE results. Note that there has been insufficient time between the end of the STAR panel and the due date for this document to show sensitivity results relative to the current base case model. Results are relative to a slightly previous base-case, developed during the February STAR panel.

A full list of sensitivity analyses is provided in Table 25. Maximum likelihood estimates of predicted model quantities were relatively insensitive to priors for F_{MSY} and *MSY* (Figures 64 and 65; Tables 26 and 27); and quite sensitive to priors for *M* and *q* (Figures 66 and 67, Tables 28 and 29). F_{MSY} and *MSY* tended to be positively correlated (Figure 37). Therefore, higher estimated F_{MSY} occurred with higher estimated *MSY*. These values translated (through the selectivity function) to estimates of higher steepness and lower R_0, respectively (Tables 26 and 27). This represents unresolved confounding between a larger, less productive population versus a smaller, more productive population, with both able to explain the observations equally well. This type of confounding is typical of many stock assessments.

The effect of varying the mean of M in the prior had an expected effect. Increasing the mean resulted in estimates of a larger population with smaller unfished biomass and correspondingly slightly larger predicted depletion in 2011 (Figure 66 and Table 28). The opposite was true when mean M was decreased. Increasing the SD for survey catchability (*q*) resulted in higher estimates of *q* compared to the base (Table 29). Corresponding estimates of spawning biomass predictably decreased slightly as the catchability increased, as did estimates of depletion.

Retrospective analyses were conducted by systematically removing the terminal years' data sequentially for five years. For the SS model, no retrospective pattern was observed for spawning biomass and recruitment estimates prior to the year 2000 (Figure 68). Parameter estimates also showed no patterns except that the additional variability on the acoustic survey index increased each time an observation was removed (Table 30). 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. The effect of additional data can also be seen in the 1999 year class, which increases as data are added since observations of this cohort are persistent through time. This further shows that recent data are critical to accurately estimate current and future biomass.

An analogous retrospective analysis was performed for the maximum likelihood estimates from the TINSS model. There was a slight downward retrospective bias in spawning stock biomass in runs when data was excluded (Figure 69, Table 31). For example, as data are removed, estimates of spawning stock biomass in 2006 generally become smaller. This is due to a modest decrease in the estimate of the strength of the 1999 cohort - as indicated by the estimates of age-1 recruits in the year 2000 (Figure 34). Retrospective estimates of unfished spawning stock biomass SB_0 and the parameters that defined the underlying production (F_{MSY} and M) also showed very little trend as data were sequentially removed. Estimates of SB_0 were relatively stable as data from 2005, and onward, were included in the assessment. Estimates of M and F_{MSY} were also relatively stable. Overall, the retrospective analysis suggest that the underlying production function is relatively stable, and change in estimates of spawning stock biomass is due to retrospective changes in age-1 recruits.

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 70). 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. Perhaps the most important feature of this historical perspective is the inclusion of alternate values for survey catchability during 2004-2007, and then freely estimated values from 2008-the present; prior to that period catchability was ubiquitously assumed to be equal to 1.0.

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6. Tables

Table 1. Annual catches of Pacific hake (1000s mt) in U.S. and Canadian waters by sector, 1966-2010. 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	66.08	72.86	290.55
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	54.50	160.82	0.00	8.08	48.01	56.09	216.91
Average:					164.28				56.31	220.60

Table 2. Recent trend in Pacific hake management performance.

Year	Total landings (mt)	Coast-wide (U.S. + Canada) OY (mt)	Coast-wide (U.S. + Canada) ABC (mt)
2001	227,531	238,000	238,000
2002	180,698	162,000	208,000
2003	205,177	228,000	235,000
2004	338,654	501,073	514,441
2005	363,157	364,197	531,124
2006	361,761	364,842	661,680
2007	290,545	328,358	612,068
2008	322,145	364,842	400,000
2009	177,459	184,000	253,582
2010	216,912	262,500	455,550

Table 3. U.S. and Canadian fishery sampling summary by year for data 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	0	0	0	0	0	0
1976	142	0	0	0	0	0	0
1977	320	0	0	0	0	0	0
1978	336	5	0	0	0	0	0
1979	99	17	0	0	0	0	0
1980	191	30	0	0	0	0	0
1981	113	41	0	0	0	0	0
1982	52	118	0	0	0	0	0
1983	0	117	0	0	0	0	0
1984	49	74	0	0	0	0	0
1985	37	19	0	0	0	0	0
1986	88	32	0	0	0	0	0
1987	22	34	0	0	0	0	0
1988	39	42	0	0	0	0	0
1989	0	77	0	0	0	0	0
1990	0	143	0	15	0	5	0
1991	0	0	116	26	0	18	0
1992	0	0	164	46	0	33	0
1993	0	0	108	36	0	25	6
1994	0	0	143	50	0	41	0
1995	0	0	61	51	0	35	0
1996	0	0	123	35	0	28	0
1997	0	0	127	65	0	27	3
1998	0	0	149	64	0	21	9
1999	0	0	389	80	0	14	31
2000	0	0	413	91	0	25	0
2001	0	0	429	82	0	28	2
2002	0	0	342	71	0	0	37
2003	0	0	358	78	0	0	21
2004	0	0	381	72	0	20	28
2005	0	0	499	58	0	11	45
2006	0	0	549	83	0	21	67
2007	0	0	524	68	0	1	36
2008	0	0	680	52	0	0	51
2009	0	0	594	57	0	0	26
2010	0	0	729	47	0	0	24

Table 4. Acoustic survey summary, 1977-2009.

Year	Start date	End date	Vessels[1]	Inshore limit (m)	Offshore limit (depth, m)	Northern limit (°N)	Number of hauls with bio. samples
1977	12 July	29 Sept.	Miller Freeman	91	457	50.0	85
1980	1 July	11 Sept.	Miller Freeman	55	457	50.0	49
1983	27 July	29 Sept.	Miller Freeman	55	366	49.5	35
1986[2]	30 June	31 July	Miller Freeman	55	366	49.5	43
1989	22 July	25 Aug.	Miller Freeman	55	366	50.0	22
1992	7 July	19 Aug.	Miller Freeman	55	366	51.7	43
1995	1 July	1 Sept.	Miller Freeman, Ricker	50	1,500	55.0	69
1998	6 July	27 Aug.	Miller Freeman, Ricker	50	1,500	55.0	84
2001	15 June	29 July	Miller Freeman, Ricker	50	1,500	55.0	49
2003	29 June	1 Sept.	Ricker	50	1,500	55.0	71
2005	20 June	19 Aug.	Miller Freeman	50	1,500	55.0	49
2007	20 June	21 Aug.	Miller Freeman	50	1,500	55.0	130
2009	30 June	7 Sept.	Miller Freeman, Ricker	50	1,500	55.0	61

[1]Multi-vessel coverage always included some transects sampled by only one vessel.
[2]Unexplained differences in pre- and post-survey calibration lead to a 1.5x difference in estimated stock biomass.

Table 5. Historical and updated acoustic survey biomass estimates (millions of metric tons) and SEs of the log-index representing only sampling variability (1995-2007) and sampling variability as well as squid/hake apportionment uncertainty (2009).

Year	Historical	Reprocessed	Kriged	SE ln(value)
1995	1.385	1.360	1.518	0.067
1998	1.185	1.103	1.343	0.049
2001	0.737	0.694	0.919	0.082
2003	1.840	1.608	2.521	0.071
2005	1.265	1.228	1.755	0.085
2007	0.879	0.824	1.123	0.075
2009	1.462	1.419	1.612	0.137

Table 6. Informative prior probability distributions used in this stock assessment.

Parameter	prior	Justification
Steepness (*h*)	~Beta(mean=0.777, SD=0.113)	Myers et al. 1999 meta-analysis results for Gadids.
Steepness (*h*)	~Beta(mean=0.478, SD=0.096)	Implied from F_{MSY}, *MSY* and selectivity in the 2010 TINSS model.
Natural mortality (*M*)	~log(N)(mean=0.2, SD=0.1)	Hoenig's method and maximum age = 22.
Maximum sustainable harvest rate (F_{MSY})	~log(N)(mean=0.35, SD=0.4)	See section 2.4 in text.
Maximum sustainable harvest (*MSY*)	~log(N)(mean=200,000, SD=500,000)	See section 2.4 in text.
Acoustic survey catchability (*q*)	~log(N)(mean=1.0, SD=0.1)	See section 2.4 in text.

Table 7. Structural overview of alternate models evaluated for 2011.

Model	TINSS	Production	SS base (Empirical age)	Age with growth	Age sex and growth	Age catch season	Age sex length	Age sex length season
Data use								
Aggregate fishery catch	X	X	X					
Catch by sector				X	X	X	X	X
Catch by sector and season						X		X
Aggregate fishery age data	X		X					
Fishery age data by sector				X	X	X	X	X
Fishery age data by sector and sex					X		X	X
Fishery length data by sex							X	X
Fishery age-at-length data								X
Survey index	X	X	X	X		X	X	X
Survey index and timing						X		X
Survey age data	X		X	X	X	X	X	X
Survey age by sex					X		X	X
Survey length data							X	X
Survey age at length data								X
Aggregate weight at age	X		X					
Aggregate length at age				X	X	X		
Informative priors								
Natural mortality (*M*)	X	X	X	X	X	X	X	X
Steepness (*h*)		X	X	X	X	X	X	X
F_{MSY}	X							
MSY	X							
Acoustic catchability (*q*)	X							
Dynamics								
Stochastic recruitment	X		X	X	X	X	X	X
Empirical weight at age	X		X					
Fixed parametric growth		X		X	X	X		
Estimated growth							X	X
Includes dimorphic growth					X		X	X
Weight length variation among years	X		X			X		X
Variably timing of fishery removals						X		X
Ageing error			X	X	X	X	X	X
Age-based selectivity	X	X	X	X	X	X		
Size-based selectivity							X	X

Table 8. Summary of estimated model parameters in the base case SS model.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD) (single value = fixed)
Stock dynamics			
Ln(R_0)	1	(13,18)	uniform
Steepness (*h*)	1	(0.2,1.0)	~Beta(0.777,0.113)
Recruitment variability (σ_R)	-	NA	1.30
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, 1.0)	uniform
Non parametric age-based selectivity: ages 3-5	3	(-5,9)	Uniform in scaled logistic space
Fishery:			
Non parametric age-based selectivity: ages 2-5	4	(-5,9)	Uniform in scaled logistic space
Total: 12 + 66 recruitment deviations = 88 estimated parameters. See Appendix A for all parameter estimates.			

Table 9. Summary of estimated model parameters in the base case TINSS model.

Parameter	Number estimated	Bounds (low,high)	Prior (Mean, SD) (single value=fixed)
Maximum Sustainable Yield (*MSY*)	1	(0.01,3)	~lognormal(0.2,0.5)
Fishing mortality at *MSY* (F_{MSY})	1	(0.01,3)	~lognormal(0.35,0.4)
Natural mortality (*M*)	1	(0.05,0.9)	~lognormal(0.2,0.1)
Commercial fishery: age at 50% vulnerability ($\hat{a}$)	1	(0,14)	Uniform
Commercial fishery: SD of logistic selectivity ($\hat{\gamma}$)	1	(0.05,5)	Uniform
Survey: age at 50% vulnerability ($\bar{a}$)	1	(0,14)	Uniform
Survey: SD of logistic selectivity ($\bar{\gamma}$)	1	(0.05,5)	~gamma(4.0,2.25)
Variance ratio (ρ)	1	(0.01,0.999)	~beta(3,12)
Inverse total variance (φ^{-2})	1	(0.01,150)	~gamma(7.5,5.8)
Log of the mean recruitment ($\ln \bar{R}$)	1	None	Uniform
log of survey catchability (*q*)	1	None	~Normal(0,0.1)
Log recruitment deviations	59	(-5,5)	~Normal(0,τ[1])

1. τ = standard deviation of recruitment residuals

Table 10. Time-series of median posterior population estimates from the SS model. The first two quantities are not available from the MCMC in SS, so MLE values are reported; spawning biomass is reported for both MLE and MCMC for comparison.

Year	Total biomass (millions mt) from MLE	Age 3+ biomass (millions mt) from MLE	Female spawning biomass (millions mt) from MLE	Female spawning biomass (millions mt)	Depletion	Age-0 recruits (billions)	1-SPR / 1-SPR40%	Exploitation fraction (catch/3+ biomass)
1966	2.85	2.47	1.19	1.13	55%	1.39	0.43	0.06
1967	2.76	2.30	1.10	1.05	52%	3.18	0.63	0.10
1968	2.68	2.12	1.02	0.97	48%	2.01	0.45	0.06
1969	2.77	2.11	1.03	1.02	51%	1.04	0.59	0.09
1970	2.92	2.27	1.05	1.07	54%	8.12	0.68	0.10
1971	2.99	2.26	1.03	1.06	53%	0.80	0.50	0.07
1972	3.35	2.12	1.19	1.27	64%	0.52	0.39	0.05
1973	3.48	3.18	1.34	1.46	73%	4.16	0.43	0.05
1974	3.37	3.00	1.35	1.49	74%	0.47	0.49	0.06
1975	4.21	3.37	1.34	1.50	73%	1.23	0.42	0.06
1976	4.34	4.15	1.31	1.47	72%	0.38	0.41	0.05
1977	3.95	3.37	1.23	1.39	68%	5.07	0.29	0.04
1978	3.36	2.93	1.15	1.28	63%	0.34	0.26	0.03
1979	3.58	2.81	1.17	1.31	64%	0.84	0.33	0.04
1980	3.80	3.01	1.17	1.31	64%	15.02	0.26	0.03
1981	3.89	2.59	1.14	1.27	62%	0.39	0.38	0.05
1982	4.32	2.11	1.47	1.63	80%	0.30	0.32	0.05
1983	4.22	4.13	1.79	1.97	98%	0.50	0.28	0.03
1984	4.63	4.03	1.89	2.08	103%	11.94	0.28	0.03
1985	5.32	3.71	1.81	1.98	98%	0.25	0.22	0.03
1986	5.24	3.25	1.99	2.15	108%	0.25	0.41	0.06
1987	4.84	4.58	2.09	2.25	113%	5.32	0.43	0.05
1988	4.84	4.19	2.01	2.16	108%	2.06	0.42	0.06
1989	4.32	3.24	1.93	2.08	103%	0.23	0.54	0.09
1990	4.13	3.64	1.83	1.96	97%	4.04	0.49	0.07
1991	3.93	3.46	1.68	1.79	89%	0.60	0.59	0.09
1992	3.31	2.68	1.53	1.64	81%	0.23	0.62	0.10
1993	2.56	2.32	1.38	1.48	73%	3.17	0.57	0.08
1994	2.56	2.14	1.21	1.29	64%	2.45	0.83	0.16
1995	2.48	1.72	1.01	1.08	53%	1.50	0.73	0.14
1996	2.37	1.78	0.95	1.01	50%	1.65	0.87	0.16
1997	2.26	1.80	0.87	0.93	46%	0.96	0.91	0.17
1998	1.85	1.53	0.79	0.84	42%	1.89	0.94	0.20
1999	1.98	1.30	0.67	0.72	36%	12.53	0.99	0.22
2000	3.41	1.31	0.58	0.62	31%	0.55	0.84	0.16
2001	3.61	1.45	0.88	0.96	48%	1.11	0.76	0.14
2002	4.03	3.84	1.19	1.29	65%	0.11	0.46	0.04
2003	3.50	3.28	1.34	1.44	73%	1.87	0.46	0.06
2004	2.92	2.75	1.30	1.40	70%	0.11	0.68	0.12
2005	2.46	2.06	1.13	1.22	61%	4.58	0.81	0.16
2006	2.38	1.82	0.90	0.98	49%	4.56	0.91	0.19
2007	2.05	1.28	0.79	0.86	43%	0.13	0.92	0.21
2008	2.72	1.76	0.85	0.94	46%	16.17	0.92	0.17
2009	2.81	1.98	0.85	0.96	47%	0.87	0.63	0.08
2010	3.94	1.73	1.28	1.45	71%	1.17	0.64	0.11
2011	4.85	4.33	1.69	1.87	91%	1.09	NA	NA

Table 11. Time-series of median posterior population estimates from the TINSS model.

Year	Total biomass (millions mt)	Age 3+ biomass (millions mt)	Female spawning biomass (millions mt)	Depletion	Age-1 recruits (billions)	1-SPR / 1-SPR40%	Exploitation fraction
1966	0.76	1.25	0.59	0.48	1.49	0.65	0.17
1967	0.73	1.33	0.62	0.51	1.49	0.83	0.16
1968	0.70	1.33	0.62	0.51	1.80	0.63	0.16
1969	0.75	1.41	0.66	0.55	1.46	0.75	0.15
1970	0.77	1.50	0.69	0.57	1.57	0.84	0.14
1971	0.77	1.45	0.69	0.57	3.41	0.68	0.15
1972	0.85	1.51	0.74	0.61	1.17	0.55	0.14
1973	0.96	2.04	0.89	0.73	1.02	0.62	0.10
1974	1.04	1.96	0.93	0.76	2.71	0.69	0.11
1975	1.33	2.13	1.07	0.88	0.82	0.74	0.10
1976	1.54	2.71	1.22	0.99	0.88	0.71	0.08
1977	1.41	2.32	1.12	0.92	0.62	0.49	0.09
1978	1.30	1.97	0.95	0.77	4.58	0.46	0.11
1979	1.47	1.92	1.02	0.83	0.35	0.49	0.11
1980	1.27	2.53	1.04	0.85	0.67	0.39	0.08
1981	1.33	2.17	1.06	0.87	15.07	0.50	0.10
1982	1.42	1.74	1.11	0.91	0.21	0.40	0.12
1983	1.65	4.47	1.67	1.37	0.20	0.41	0.05
1984	2.02	4.26	2.02	1.65	0.40	0.43	0.05
1985	2.47	3.98	1.99	1.62	12.03	0.25	0.05
1986	2.67	3.23	1.84	1.50	0.31	0.47	0.07
1987	2.57	5.18	2.09	1.72	0.51	0.51	0.04
1988	2.71	4.66	2.24	1.84	4.34	0.49	0.05
1989	2.51	3.63	1.88	1.54	2.34	0.53	0.06
1990	2.58	3.92	1.83	1.50	0.82	0.52	0.05
1991	2.40	3.70	1.75	1.43	2.83	0.64	0.06
1992	2.12	3.05	1.52	1.25	1.11	0.55	0.07
1993	1.59	2.50	1.16	0.95	0.59	0.50	0.09
1994	1.56	2.36	1.13	0.93	2.09	0.68	0.09
1995	1.43	1.98	1.00	0.82	1.86	0.59	0.11
1996	1.19	1.86	0.88	0.72	1.41	0.74	0.12
1997	1.02	1.79	0.83	0.69	1.59	0.79	0.12
1998	0.86	1.53	0.73	0.59	0.96	0.89	0.14
1999	0.72	1.33	0.62	0.51	1.91	0.96	0.16
2000	0.82	1.39	0.69	0.57	11.25	0.74	0.15
2001	1.04	1.63	0.94	0.77	0.98	0.66	0.13
2002	1.40	4.36	1.64	1.34	0.77	0.48	0.05
2003	1.57	3.75	1.75	1.44	0.25	0.49	0.06
2004	1.65	3.02	1.46	1.21	1.78	0.65	0.07
2005	1.56	2.25	1.14	0.94	0.52	0.71	0.10
2006	1.35	2.03	0.94	0.78	6.10	0.72	0.11
2007	1.15	1.52	0.83	0.68	5.50	0.72	0.14
2008	1.22	2.58	1.13	0.92	0.19	0.73	0.08
2009	1.31	3.08	1.33	1.08	12.15	0.54	0.07
2010	1.67	2.71	1.51	1.24	1.41	0.53	0.08
2011	2.27	5.21	2.18	1.76	0.84	NA	NA

Table 12. 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 (catch/3+biomass) from the SS model.

Year	Female spawning Biomass (millions mt)	Depletion	Age-0 recruits (billions)	(1-SPR) / (1-SPR_{target})	Exploitation fraction
1966	0.66-2.17	33%-100%	0.09-8.84	0.23-0.68	0.03-0.10
1967	0.61-2.03	31%-92%	0.23-11.59	0.36-0.91	0.05-0.18
1968	0.56-1.95	28%-88%	0.15-9.14	0.23-0.71	0.03-0.11
1969	0.60-2.01	30%-93%	0.09-5.78	0.32-0.87	0.04-0.16
1970	0.63-2.16	32%-96%	3.54-21.43	0.37-0.96	0.05-0.18
1971	0.61-2.30	31%-98%	0.08-3.59	0.24-0.78	0.03-0.12
1972	0.77-2.66	38%-113%	0.06-2.18	0.18-0.64	0.02-0.09
1973	0.89-2.99	44%-126%	2.00-10.06	0.20-0.67	0.02-0.08
1974	0.90-3.02	45%-129%	0.06-2.00	0.24-0.73	0.03-0.11
1975	0.89-3.07	46%-128%	0.41-3.28	0.21-0.67	0.03-0.10
1976	0.86-2.97	44%-125%	0.06-1.67	0.20-0.67	0.03-0.09
1977	0.79-2.78	41%-117%	2.50-11.65	0.14-0.49	0.02-0.06
1978	0.73-2.52	38%-108%	0.04-1.72	0.13-0.45	0.02-0.06
1979	0.77-2.48	40%-106%	0.12-3.00	0.16-0.55	0.02-0.08
1980	0.79-2.40	41%-104%	8.82-29.89	0.13-0.44	0.01-0.04
1981	0.76-2.29	40%-99%	0.05-1.54	0.20-0.60	0.03-0.08
1982	1.03-2.81	53%-121%	0.04-1.53	0.17-0.52	0.03-0.08
1983	1.33-3.30	66%-146%	0.07-1.93	0.15-0.44	0.02-0.04
1984	1.42-3.38	70%-151%	7.40-21.16	0.15-0.43	0.02-0.05
1985	1.37-3.14	68%-142%	0.03-1.10	0.12-0.34	0.02-0.04
1986	1.56-3.32	77%-150%	0.04-1.01	0.24-0.58	0.04-0.09
1987	1.69-3.40	83%-155%	3.13-9.16	0.27-0.59	0.03-0.06
1988	1.65-3.17	81%-146%	0.81-4.16	0.27-0.59	0.04-0.07
1989	1.61-2.96	78%-139%	0.03-0.83	0.36-0.71	0.06-0.11
1990	1.54-2.77	74%-131%	2.57-6.84	0.33-0.65	0.05-0.08
1991	1.43-2.49	68%-117%	0.10-1.51	0.41-0.74	0.06-0.11
1992	1.32-2.25	63%-107%	0.04-0.80	0.45-0.79	0.08-0.13
1993	1.20-2.02	57%-96%	2.10-5.25	0.40-0.73	0.06-0.10
1994	1.05-1.74	50%-84%	1.55-4.23	0.63-0.99	0.12-0.19
1995	0.88-1.48	41%-70%	0.87-2.77	0.54-0.89	0.10-0.17
1996	0.84-1.40	39%-65%	1.01-2.98	0.67-1.03	0.12-0.20
1997	0.77-1.32	36%-60%	0.41-1.97	0.70-1.06	0.12-0.21
1998	0.68-1.24	32%-54%	1.11-3.55	0.72-1.10	0.13-0.24
1999	0.57-1.10	28%-47%	8.50-22.37	0.75-1.15	0.15-0.28
2000	0.47-1.02	23%-42%	0.17-1.34	0.59-1.03	0.10-0.21
2001	0.73-1.60	36%-65%	0.63-2.04	0.50-0.96	0.09-0.20
2002	0.97-2.10	49%-87%	0.02-0.37	0.27-0.63	0.03-0.06
2003	1.11-2.31	56%-97%	1.11-3.66	0.28-0.62	0.04-0.08
2004	1.07-2.22	54%-92%	0.02-0.41	0.44-0.86	0.07-0.15
2005	0.91-1.99	47%-82%	2.31-10.51	0.54-0.99	0.10-0.22
2006	0.69-1.70	37%-69%	1.85-11.64	0.61-1.10	0.11-0.26
2007	0.55-1.69	29%-68%	0.02-0.62	0.59-1.13	0.11-0.32
2008	0.50-2.03	28%-82%	5.12-51.53	0.56-1.18	0.08-0.31
2009	0.42-2.25	24%-89%	0.06-10.24	0.31-1.00	0.03-0.18
2010	0.54-3.77	30%-148%	0.09-14.70	0.30-1.05	0.05-0.29
2011	0.63-5.14	35%-203%	0.08-18.85	NA	NA

Table 13. Time-series of ~95% posterior credibility intervals for female spawning biomass, relative depletion estimates, age-1 recruits, relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) and exploitation fraction (catch/3+biomass) from the TINSS model.

Year	Female spawning Biomass (millions mt)	Depletion	Age-1 recruits (billions)	(1-SPR) / (1-SPR_{target})	Exploitation fraction
1966	0.44-0.86	27%- 84%	0.92-2.70	0.43-0.88	0.07-0.33
1967	0.48-0.89	29%- 88%	0.92-2.70	0.60-1.04	0.07-0.30
1968	0.48-0.91	29%- 89%	1.04-3.49	0.42-0.83	0.06-0.31
1969	0.51-0.97	31%- 94%	0.83-2.85	0.52-0.95	0.06-0.29
1970	0.52-1.04	32%-101%	0.90-3.10	0.59-1.04	0.06-0.27
1971	0.50-1.09	31%-103%	1.94-6.65	0.44-0.89	0.06-0.29
1972	0.53-1.20	34%-112%	0.66-2.39	0.33-0.76	0.06-0.28
1973	0.63-1.45	39%-135%	0.56-2.09	0.39-0.84	0.04-0.21
1974	0.65-1.53	41%-143%	1.48-5.44	0.44-0.92	0.04-0.22
1975	0.73-1.80	47%-166%	0.44-1.70	0.45-1.00	0.04-0.20
1976	0.81-2.06	52%-191%	0.48-1.80	0.43-0.99	0.03-0.16
1977	0.72-1.91	47%-177%	0.33-1.23	0.27-0.75	0.03-0.20
1978	0.61-1.59	40%-150%	2.59-9.06	0.25-0.72	0.04-0.23
1979	0.66-1.68	43%-159%	0.18-0.69	0.28-0.76	0.04-0.24
1980	0.68-1.72	44%-161%	0.37-1.29	0.22-0.62	0.03-0.18
1981	0.70-1.75	45%-164%	9.04-27.07	0.30-0.75	0.04-0.21
1982	0.74-1.80	48%-169%	0.11-0.40	0.23-0.62	0.05-0.25
1983	1.12-2.67	72%-252%	0.11-0.36	0.24-0.63	0.02-0.10
1984	1.38-3.14	88%-303%	0.24-0.70	0.25-0.65	0.02-0.10
1985	1.38-2.99	89%-293%	7.65-20.20	0.14-0.40	0.02-0.11
1986	1.33-2.66	84%-260%	0.19-0.52	0.30-0.69	0.03-0.13
1987	1.55-2.96	95%-292%	0.32-0.88	0.33-0.73	0.02-0.08
1988	1.69-3.11	103%-311%	2.79-6.95	0.32-0.70	0.02-0.09
1989	1.45-2.54	87%-258%	1.53-3.66	0.35-0.74	0.02-0.11
1990	1.44-2.41	86%-246%	0.55-1.28	0.35-0.72	0.02-0.10
1991	1.41-2.24	83%-232%	1.94-4.34	0.45-0.86	0.02-0.11
1992	1.25-1.92	73%-201%	0.75-1.66	0.39-0.73	0.03-0.13
1993	0.96-1.44	56%-152%	0.39-0.88	0.36-0.66	0.04-0.16
1994	0.96-1.38	56%-147%	1.47-3.09	0.52-0.85	0.04-0.16
1995	0.86-1.21	49%-130%	1.27-2.79	0.45-0.75	0.05-0.19
1996	0.75-1.06	43%-113%	0.95-2.14	0.58-0.91	0.05-0.20
1997	0.71-1.02	41%-106%	1.05-2.45	0.62-0.95	0.05-0.21
1998	0.61-0.90	35%- 93%	0.63-1.58	0.71-1.04	0.06-0.25
1999	0.50-0.78	30%- 79%	1.23-3.14	0.77-1.12	0.07-0.30
2000	0.54-0.92	33%- 90%	7.67-17.34	0.56-0.93	0.07-0.28
2001	0.72-1.27	46%-124%	0.59-1.64	0.48-0.84	0.06-0.25
2002	1.26-2.24	79%-214%	0.46-1.34	0.34-0.64	0.02-0.09
2003	1.36-2.39	85%-227%	0.14-0.47	0.34-0.67	0.02-0.11
2004	1.16-1.99	72%-189%	1.01-3.35	0.48-0.84	0.03-0.13
2005	0.90-1.58	57%-149%	0.27-1.06	0.52-0.91	0.04-0.17
2006	0.71-1.39	47%-126%	3.16-12.28	0.53-0.92	0.04-0.20
2007	0.57-1.35	41%-117%	2.42-13.11	0.50-0.94	0.06-0.28
2008	0.69-2.02	50%-170%	0.08-0.48	0.48-0.96	0.03-0.19
2009	0.72-2.60	55%-218%	3.25-40.72	0.31-0.79	0.02-0.16
2010	0.77-3.14	61%-259%	0.14-13.31	0.30-0.82	0.03-0.20
2011	0.97-5.28	77%-413%	0.012-58.04	NA	NA

Table 14. Estimated numbers at age at the beginning of the year from the SS model (MLE; millions).

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1966	1.71	1.24	0.84	0.62	0.49	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.40
1967	2.79	1.38	1.00	0.67	0.49	0.38	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.10	0.08	0.37
1968	2.18	2.25	1.11	0.80	0.51	0.36	0.27	0.22	0.18	0.16	0.13	0.11	0.10	0.08	0.07	0.33
1969	1.18	1.76	1.82	0.89	0.62	0.39	0.27	0.20	0.16	0.14	0.12	0.10	0.09	0.07	0.06	0.30
1970	6.81	0.95	1.42	1.45	0.68	0.46	0.28	0.19	0.15	0.12	0.10	0.08	0.07	0.06	0.05	0.26
1971	0.92	5.50	0.77	1.13	1.09	0.49	0.32	0.20	0.14	0.10	0.08	0.07	0.06	0.05	0.04	0.22
1972	0.53	0.74	4.44	0.62	0.87	0.82	0.36	0.24	0.15	0.10	0.08	0.06	0.05	0.04	0.04	0.19
1973	3.62	0.43	0.60	3.56	0.48	0.67	0.62	0.27	0.18	0.11	0.08	0.06	0.05	0.04	0.03	0.18
1974	0.50	2.92	0.35	0.48	2.77	0.37	0.50	0.46	0.21	0.13	0.08	0.06	0.04	0.03	0.03	0.16
1975	1.17	0.41	2.36	0.28	0.37	2.08	0.27	0.37	0.34	0.15	0.10	0.06	0.04	0.03	0.03	0.14
1976	0.41	0.94	0.33	1.89	0.22	0.28	1.55	0.20	0.28	0.26	0.11	0.07	0.05	0.03	0.02	0.12
1977	4.45	0.33	0.76	0.26	1.47	0.16	0.21	1.16	0.15	0.21	0.19	0.08	0.06	0.03	0.02	0.11
1978	0.34	3.59	0.26	0.61	0.21	1.14	0.13	0.16	0.90	0.12	0.16	0.15	0.07	0.04	0.03	0.10
1979	0.83	0.27	2.90	0.21	0.48	0.16	0.88	0.10	0.13	0.69	0.09	0.12	0.11	0.05	0.03	0.10
1980	13.41	0.67	0.22	2.33	0.17	0.37	0.12	0.68	0.08	0.10	0.53	0.07	0.09	0.09	0.04	0.10
1981	0.38	10.82	0.54	0.18	1.84	0.13	0.29	0.10	0.52	0.06	0.07	0.41	0.05	0.07	0.07	0.11
1982	0.31	0.31	8.74	0.44	0.14	1.41	0.10	0.22	0.07	0.40	0.04	0.06	0.31	0.04	0.06	0.13
1983	0.53	0.25	0.25	7.02	0.34	0.11	1.08	0.08	0.17	0.06	0.30	0.03	0.04	0.24	0.03	0.14
1984	10.81	0.43	0.20	0.20	5.54	0.27	0.08	0.83	0.06	0.13	0.04	0.23	0.03	0.03	0.18	0.14
1985	0.26	8.73	0.34	0.16	0.16	4.32	0.21	0.06	0.64	0.05	0.10	0.03	0.18	0.02	0.03	0.25
1986	0.26	0.21	7.05	0.28	0.13	0.13	3.37	0.16	0.05	0.50	0.04	0.08	0.03	0.14	0.02	0.21
1987	4.75	0.21	0.17	5.65	0.22	0.10	0.09	2.53	0.12	0.04	0.38	0.03	0.06	0.02	0.11	0.17
1988	1.96	3.84	0.17	0.14	4.39	0.16	0.07	0.07	1.89	0.09	0.03	0.28	0.02	0.04	0.01	0.21
1989	0.23	1.58	3.10	0.13	0.11	3.34	0.12	0.06	0.05	1.42	0.07	0.02	0.21	0.02	0.03	0.17
1990	3.65	0.19	1.28	2.48	0.10	0.08	2.42	0.09	0.04	0.04	1.03	0.05	0.02	0.15	0.01	0.15
1991	0.63	2.95	0.15	1.02	1.91	0.08	0.06	1.78	0.07	0.03	0.03	0.76	0.04	0.01	0.11	0.12
1992	0.24	0.51	2.38	0.12	0.78	1.40	0.06	0.04	1.27	0.05	0.02	0.02	0.54	0.03	0.01	0.16
1993	2.96	0.20	0.41	1.90	0.09	0.57	0.99	0.04	0.03	0.90	0.03	0.02	0.01	0.38	0.02	0.12
1994	2.25	2.39	0.16	0.33	1.45	0.07	0.41	0.71	0.03	0.02	0.65	0.02	0.01	0.01	0.27	0.10
1995	1.39	1.82	1.93	0.12	0.24	0.98	0.04	0.26	0.46	0.02	0.01	0.41	0.02	0.01	0.01	0.24
1996	1.49	1.12	1.46	1.53	0.09	0.17	0.66	0.03	0.18	0.31	0.01	0.01	0.28	0.01	0.01	0.17
1997	0.88	1.21	0.91	1.16	1.10	0.06	0.10	0.41	0.02	0.11	0.19	0.01	0.01	0.18	0.01	0.11
1998	1.70	0.71	0.97	0.71	0.82	0.71	0.04	0.06	0.25	0.01	0.07	0.12	0.01	0.00	0.11	0.07
1999	11.27	1.37	0.57	0.76	0.50	0.52	0.42	0.02	0.04	0.15	0.01	0.04	0.07	0.00	0.00	0.11
2000	0.55	9.10	1.11	0.45	0.52	0.31	0.29	0.24	0.01	0.02	0.08	0.00	0.02	0.04	0.00	0.06
2001	1.01	0.44	7.34	0.87	0.32	0.35	0.19	0.19	0.15	0.01	0.01	0.05	0.00	0.01	0.03	0.04
2002	0.10	0.81	0.36	5.82	0.64	0.22	0.23	0.13	0.12	0.10	0.01	0.01	0.04	0.00	0.01	0.04
2003	1.71	0.08	0.66	0.29	4.50	0.48	0.17	0.17	0.10	0.09	0.07	0.00	0.01	0.03	0.00	0.04
2004	0.11	1.38	0.07	0.53	0.22	3.40	0.36	0.12	0.13	0.07	0.07	0.06	0.00	0.01	0.02	0.03
2005	4.13	0.09	1.12	0.05	0.39	0.16	2.35	0.25	0.09	0.09	0.05	0.05	0.04	0.00	0.00	0.04
2006	4.02	3.34	0.07	0.88	0.04	0.27	0.10	1.52	0.16	0.06	0.06	0.03	0.03	0.03	0.00	0.03
2007	0.14	3.25	2.69	0.06	0.62	0.03	0.16	0.06	0.92	0.10	0.03	0.04	0.02	0.02	0.02	0.02
2008	14.28	0.11	2.62	2.12	0.04	0.40	0.02	0.10	0.04	0.55	0.06	0.02	0.02	0.01	0.01	0.02
2009	1.74	11.53	0.09	2.06	1.49	0.03	0.24	0.01	0.06	0.02	0.33	0.04	0.01	0.01	0.01	0.02
2010	2.21	1.41	9.30	0.07	1.55	1.08	0.02	0.17	0.01	0.04	0.02	0.23	0.02	0.01	0.01	0.02
2011	2.24	1.78	1.13	7.41	0.05	1.12	0.75	0.01	0.12	0.00	0.03	0.01	0.16	0.02	0.01	0.02

Table 15. Estimated numbers at age from the TINSS model (millions).

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1966	NA	1.30	1.10	0.66	0.71	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.06
1967	NA	1.30	1.02	0.86	0.50	0.51	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.06
1968	NA	1.53	1.01	0.78	0.63	0.34	0.33	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.04
1969	NA	1.22	1.20	0.79	0.59	0.46	0.24	0.22	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.03
1970	NA	1.30	0.95	0.92	0.59	0.42	0.31	0.15	0.13	0.01	0.01	0.01	0.01	0.01	0.01	0.02
1971	NA	2.80	1.01	0.73	0.68	0.40	0.27	0.18	0.09	0.07	0.01	0.01	0.01	0.00	0.00	0.02
1972	NA	0.94	2.20	0.79	0.55	0.49	0.28	0.18	0.12	0.05	0.04	0.01	0.00	0.00	0.00	0.01
1973	NA	0.83	0.74	1.72	0.60	0.41	0.36	0.20	0.12	0.08	0.04	0.03	0.00	0.00	0.00	0.01
1974	NA	2.18	0.65	0.58	1.31	0.44	0.29	0.24	0.13	0.08	0.05	0.02	0.02	0.00	0.00	0.01
1975	NA	0.66	1.71	0.50	0.43	0.95	0.30	0.19	0.15	0.08	0.05	0.03	0.01	0.01	0.00	0.01
1976	NA	0.71	0.52	1.33	0.38	0.32	0.67	0.21	0.12	0.10	0.05	0.03	0.02	0.01	0.01	0.00
1977	NA	0.50	0.56	0.40	1.02	0.28	0.23	0.46	0.14	0.08	0.06	0.03	0.02	0.01	0.01	0.01
1978	NA	3.70	0.39	0.44	0.31	0.78	0.21	0.17	0.33	0.10	0.06	0.05	0.02	0.01	0.01	0.01
1979	NA	0.29	2.93	0.31	0.34	0.24	0.58	0.16	0.12	0.24	0.07	0.04	0.03	0.02	0.01	0.01
1980	NA	0.55	0.23	2.30	0.24	0.26	0.18	0.43	0.11	0.09	0.17	0.05	0.03	0.02	0.01	0.02
1981	NA	12.52	0.44	0.18	1.80	0.19	0.20	0.13	0.31	0.08	0.06	0.12	0.04	0.02	0.02	0.02
1982	NA	0.17	9.90	0.34	0.14	1.37	0.14	0.14	0.09	0.22	0.06	0.04	0.08	0.03	0.01	0.03
1983	NA	0.17	0.14	7.81	0.27	0.11	1.03	0.10	0.11	0.07	0.16	0.04	0.03	0.06	0.02	0.03
1984	NA	0.34	0.13	0.11	6.11	0.21	0.08	0.77	0.08	0.08	0.05	0.12	0.03	0.02	0.04	0.03
1985	NA	10.21	0.27	0.10	0.08	4.72	0.16	0.06	0.57	0.06	0.06	0.04	0.08	0.02	0.02	0.06
1986	NA	0.26	8.11	0.21	0.08	0.07	3.65	0.12	0.05	0.43	0.04	0.04	0.03	0.06	0.02	0.06
1987	NA	0.44	0.21	6.39	0.17	0.06	0.05	2.71	0.09	0.03	0.31	0.03	0.03	0.02	0.05	0.05
1988	NA	3.77	0.35	0.16	4.98	0.13	0.05	0.04	1.96	0.06	0.02	0.22	0.02	0.02	0.01	0.07
1989	NA	2.05	2.98	0.28	0.13	3.81	0.09	0.04	0.03	1.40	0.05	0.02	0.16	0.02	0.02	0.06
1990	NA	0.72	1.62	2.34	0.21	0.10	2.80	0.07	0.02	0.02	0.97	0.03	0.01	0.11	0.01	0.05
1991	NA	2.51	0.57	1.27	1.82	0.16	0.07	2.04	0.05	0.02	0.01	0.68	0.02	0.01	0.08	0.04
1992	NA	0.99	1.98	0.45	0.98	1.36	0.12	0.05	1.41	0.03	0.01	0.01	0.46	0.02	0.01	0.08
1993	NA	0.52	0.78	1.55	0.34	0.73	0.99	0.08	0.04	0.95	0.02	0.01	0.01	0.30	0.01	0.06
1994	NA	1.87	0.41	0.61	1.20	0.26	0.54	0.70	0.06	0.02	0.65	0.02	0.01	0.00	0.21	0.05
1995	NA	1.64	1.47	0.32	0.46	0.86	0.18	0.35	0.44	0.04	0.01	0.39	0.01	0.00	0.00	0.15
1996	NA	1.23	1.29	1.14	0.24	0.34	0.61	0.12	0.23	0.28	0.02	0.01	0.25	0.01	0.00	0.10
1997	NA	1.37	0.96	1.00	0.85	0.17	0.22	0.38	0.07	0.13	0.16	0.01	0.01	0.14	0.00	0.06
1998	NA	0.83	1.06	0.73	0.73	0.58	0.11	0.13	0.21	0.04	0.07	0.09	0.01	0.00	0.07	0.03
1999	NA	1.64	0.65	0.80	0.53	0.49	0.35	0.06	0.07	0.11	0.02	0.03	0.04	0.00	0.00	0.05
2000	NA	9.70	1.26	0.48	0.57	0.34	0.28	0.18	0.03	0.03	0.05	0.01	0.02	0.02	0.00	0.02
2001	NA	0.84	7.58	0.97	0.36	0.40	0.22	0.17	0.11	0.02	0.02	0.03	0.00	0.01	0.01	0.01
2002	NA	0.66	0.66	5.86	0.73	0.26	0.27	0.14	0.11	0.07	0.01	0.01	0.02	0.00	0.01	0.01
2003	NA	0.21	0.52	0.52	4.52	0.55	0.19	0.19	0.10	0.07	0.04	0.01	0.01	0.01	0.00	0.01
2004	NA	1.52	0.17	0.41	0.40	3.40	0.40	0.13	0.13	0.07	0.05	0.03	0.01	0.01	0.01	0.01
2005	NA	0.45	1.19	0.13	0.31	0.29	2.35	0.26	0.09	0.08	0.04	0.03	0.02	0.00	0.00	0.01
2006	NA	5.21	0.35	0.92	0.10	0.22	0.20	1.51	0.16	0.05	0.05	0.03	0.02	0.01	0.00	0.01
2007	NA	4.74	4.07	0.27	0.68	0.07	0.14	0.12	0.88	0.09	0.03	0.03	0.01	0.01	0.01	0.01
2008	NA	0.17	3.71	3.13	0.20	0.48	0.05	0.09	0.07	0.51	0.05	0.02	0.02	0.01	0.01	0.01
2009	NA	10.44	0.13	2.84	2.32	0.14	0.32	0.03	0.05	0.04	0.29	0.03	0.01	0.01	0.00	0.01
2010	NA	1.21	8.24	0.10	2.19	1.74	0.10	0.22	0.02	0.04	0.03	0.19	0.02	0.01	0.01	0.01
2011	NA	0.93	0.96	6.45	0.08	1.64	1.26	0.07	0.15	0.01	0.02	0.02	0.13	0.01	0.00	0.01

Table 16.1. Summary of Pacific hake reference points from the SS model.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female spawning biomass (SB_0, millions mt)	1.549	2.034	2.756
Unfished total biomass (millions mt)	3.735	4.921	6.871
Unfished 3+ biomass (millions mt)	3.239	4.252	5.760
Unfished recruitment (R_0, billions)	1.624	2.576	4.649
Reference points based on $SB_{40\%}$			
MSY Proxy female spawning biomass ($SB_{40\%}$ mt)	0.620	0.814	1.102
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.406	0.435	0.512
Exploitation fraction resulting in $SB_{40\%}$	0.136	0.187	0.236
Yield at $SB_{40\%}$ (million mt)	0.217	0.323	0.521
Reference points based on SPR proxy for MSY			
Female spawning biomass at $SPR_{MSY\text{-}proxy}$ (SB_{SPR} mt)	0.506	0.721	0.991
$SPR_{MSY\text{-}proxy}$	0.400	0.400	0.400
Exploitation fraction corresponding to SPR	0.182	0.217	0.258
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (million mt)	0.222	0.334	0.536
Reference points based on estimated MSY values			
Female spawning biomass at *MSY* (SB_{MSY} mt)	0.315	0.491	0.790
SPR_{MSY}	0.189	0.286	0.451
Exploitation fraction corresponding to SPR_{MSY}	0.172	0.342	0.564
MSY (million mt)	0.228	0.355	0.581

Table 16.2. Summary of Pacific hake reference points from the TINSS model.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female spawning biomass (SB_0, millions mt)	0.802	1.218	2.064
Unfished total biomass (millions mt)	1.945	2.989	5.091
Unfished 3+ biomass (millions mt)	1.665	2.531	4.307
Unfished recruitment (R_0, billions)	0.860	1.490	2.809
Reference points based on $SB_{40\%}$			
MSY Proxy female spawning biomass ($SB_{40\%}$ mt)	0.321	0.487	0.826
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.445	0.523	0.646
Exploitation fraction resulting in $SB_{40\%}$	0.101	0.154	0.199
Yield at $SB_{40\%}$ (million mt)	0.094	0.159	0.265
Reference points based on SPR proxy for MSY			
Female spawning biomass at $SPR_{MSY\text{-}proxy}$ (SB_{SPR} mt)	0.000	0.288	0.505
$SPR_{MSY\text{-}proxy}$	0.400	0.400	0.400
Exploitation fraction corresponding to SPR	0.197	0.236	0.279
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (million mt)	0.000	0.145	0.257
Reference points based on estimated MSY values			
Female spawning biomass at *MSY* (SB_{MSY} mt)	0.274	0.457	0.837
SPR_{MSY}	0.348	0.505	0.672
Exploitation fraction corresponding to SPR_{MSY}	0.092	0.165	0.270
MSY (million mt)	0.093	0.161	0.268

Table 17.1. Decision table with three year projections of posterior distributions for Pacific hake female **spawning biomass** (millions mt, at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
Within model probability			25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	50,000	1.238	2.180	3.801	1.688	2.682	4.549
	2013	50,000	1.309	2.308	3.912	1.679	2.695	4.560
b	2011	100,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	100,000	1.215	2.157	3.777	1.664	2.658	4.524
	2013	100,000	1.262	2.261	3.866	1.636	2.648	4.513
c	2011	150,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	150,000	1.191	2.133	3.754	1.640	2.633	4.500
	2013	150,000	1.215	2.215	3.821	1.592	2.604	4.465
d	2011	262,500	1.053	1.873	3.232	1.409	2.159	3.562
	2012	262,500	1.138	2.081	3.701	1.586	2.578	4.445
	2013	262,500	1.110	2.110	3.718	1.490	2.504	4.359
e	2011	300,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	300,000	1.120	2.063	3.683	1.568	2.560	4.427
	2013	300,000	1.075	2.075	3.684	1.456	2.469	4.324
f	2011	400,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	400,000	1.073	2.016	3.636	1.520	2.512	4.378
	2013	400,000	0.982	1.982	3.593	1.364	2.378	4.229
g	2011	500,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	500,000	1.025	1.969	3.589	1.472	2.465	4.329
	2013	500,000	0.889	1.890	3.500	1.273	2.290	4.135
h	2011	720,700	1.053	1.873	3.232	1.409	2.159	3.562
	2012	791,000	0.921	1.866	3.485	1.368	2.361	4.221
	2013	781,500	0.650	1.657	3.264	1.037	2.059	3.898
i	2011	840,000	1.053	1.873	3.232	1.410	2.159	3.562
	2012	886,000	0.864	1.809	3.429	1.312	2.305	4.163
	2013	782,000	0.558	1.559	3.166	0.939	1.963	3.801
j	2011	1,137,000	1.053	1.873	3.232	1.409	2.159	3.562
	2012	1,121,000	0.724	1.669	3.289	1.166	2.165	4.017
	2013	1,011,000	0.355	1.314	2.920	0.584	1.719	3.567

Table 17.2. Decision table with three year projections of posterior distributions for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
	2011	50,000	0.549	0.909	1.493	1.182	1.740	2.751
a	2012	50,000	0.649	1.066	1.740	1.456	2.178	3.565
	2013	50,000	0.693	1.116	1.782	1.477	2.230	3.577
	2011	100,000	0.549	0.909	1.493	1.182	1.740	2.751
b	2012	100,000	0.633	1.055	1.729	1.434	2.160	3.548
	2013	100,000	0.669	1.095	1.760	1.435	2.192	3.543
	2011	150,000	0.549	0.909	1.493	1.182	1.740	2.751
c	2012	150,000	0.618	1.042	1.719	1.411	2.140	3.524
	2013	150,000	0.645	1.074	1.740	1.392	2.152	3.506
	2011	262,500	0.549	0.909	1.493	1.182	1.740	2.751
d	2012	262,500	0.589	1.014	1.698	1.359	2.094	3.481
	2013	262,500	0.591	1.023	1.693	1.297	2.061	3.421
	2011	300,000	0.549	0.909	1.493	1.182	1.740	2.751
e	2012	300,000	0.580	1.006	1.691	1.344	2.079	3.465
	2013	300,000	0.572	1.007	1.680	1.263	2.029	3.393
	2011	400,000	0.549	0.909	1.493	1.182	1.740	2.751
f	2012	400,000	0.556	0.984	1.670	1.298	2.036	3.423
	2013	400,000	0.519	0.963	1.642	1.174	1.946	3.318
	2011	500,000	0.549	0.909	1.493	1.182	1.740	2.751
g	2012	500,000	0.533	0.961	1.648	1.259	1.996	3.377
	2013	500,000	0.474	0.918	1.602	1.095	1.861	3.243
	2011	720,700	0.549	0.909	1.493	1.182	1.740	2.751
h	2012	791,000	0.479	0.908	1.596	1.166	1.906	3.288
	2013	781,500	0.348	0.800	1.489	0.880	1.659	3.047
	2011	840,000	0.549	0.909	1.493	1.182	1.740	2.751
i	2012	886,000	0.451	0.878	1.569	1.112	1.858	3.236
	2013	782,000	0.298	0.753	1.437	0.788	1.581	2.971
	2011	1,137,000	0.549	0.909	1.493	1.182	1.740	2.751
j	2012	1,121,000	0.382	0.809	1.499	0.963	1.744	3.114
	2013	1,011,000	0.194	0.636	1.319	0.437	1.384	2.746

Table 17.3. Decision table with three year projections of posterior distributions for Pacific hake relative **spawning potential ratio** (1-SPR/1-SPRTarget=0.4; values greater than 1.0 denote overfishing). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a, b, e, and g-i), 2) the status quo OY from 2010 (row f), and 3) the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row j) and TINSS models (row d), and the OY implied by the estimated FMSY from the TINSS model (row c). TINSS results for row j are italicized because they correspond to a constant catch of 700,000 mt.

			States of nature					
		Model	SS			TINSS		
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	0.225	0.129	0.075	0.172	0.119	0.078
	2012	50,000	0.181	0.103	0.058	0.142	0.096	0.060
	2013	50,000	0.167	0.095	0.055	0.128	0.083	0.050
b	2011	100,000	0.399	0.241	0.145	0.308	0.221	0.148
	2012	100,000	0.334	0.197	0.113	0.262	0.182	0.116
	2013	100,000	0.316	0.184	0.107	0.243	0.159	0.098
c	2011	150,000	0.538	0.340	0.209	0.417	0.308	0.211
	2012	150,000	0.465	0.283	0.166	0.365	0.258	0.168
	2013	150,000	0.448	0.267	0.158	0.346	0.231	0.144
d	2011	262,500	0.766	0.519	0.337	0.603	0.465	0.332
	2012	262,500	0.699	0.451	0.274	0.555	0.406	0.273
	2013	262,500	0.699	0.437	0.266	0.541	0.373	0.240
e	2011	300,000	0.823	0.569	0.374	0.650	0.508	0.367
	2012	300,000	0.762	0.501	0.308	0.608	0.448	0.305
	2013	300,000	0.769	0.488	0.300	0.597	0.416	0.270
f	2011	400,000	0.946	0.685	0.466	0.759	0.607	0.450
	2012	400,000	0.905	0.620	0.392	0.730	0.550	0.384
	2013	400,000	0.933	0.615	0.387	0.734	0.523	0.346
g	2011	500,000	1.038	0.780	0.546	0.846	0.689	0.522
	2012	500,000	1.016	0.723	0.470	0.833	0.638	0.454
	2013	500,000	1.067	0.727	0.468	0.856	0.617	0.416
h	2011	720,700	1.174	0.936	0.691	0.992	0.829	0.648
	2012	791,000	1.226	0.941	0.656	1.046	0.836	0.620
	2013	781,500	1.311	0.975	0.665	1.128	0.838	0.583
i	2011	840,000	1.226	1.000	0.755	1.053	0.888	0.704
	2012	886,000	1.280	1.002	0.710	1.114	0.892	0.668
	2013	782,000	1.340	1.003	0.679	1.175	0.861	0.594
j	2011	1,137,000	1.312	1.117	0.884	1.174	1.006	0.819
	2012	1,121,000	1.360	1.126	0.829	1.287	1.015	0.772
	2013	1,011,000	1.380	1.168	0.822	1.664	1.022	0.718

Table 18. Select likelihoods, parameters and estimated quantities for SS MLE and posterior medians. Likelihood comparisons are not meaningful between MLE and posterior results.

	MLE	Posterior median
Negative log-likelihood		
Total	155.460	NA
Survey index	-5.478	NA
Age data	129.445	NA
Parameter priors	0.174	NA
Parameters		
R_0 (billions)	2.253	2.576
Steepness (*h*)	0.851	0.810
Natural mortality (*M; m/f*)	0.214	0.223
Acoustic catchability (*Q*)	1.019	NA
Additional acoustic survey SD	0.195	0.265
Reference points		
2008 recruitment deviation	2.617	2.729
SB_0 (million mt)	1.893	2.034
2011 Depletion	0.890	0.910
2010 SPR ratio	0.695	0.637

Table 19. Select likelihoods, parameters and estimated quantities for TINSS MLE and posterior medians. Likelihood comparisons are not meaningful between MLE and posterior results.

	MLE	Posterior median
Negative log-likelihood		
Total	1.44	NA
Survey index	-288.67	NA
Age data	-53.92	NA
Parameter priors	64.92	NA
Parameters		
R_0 (billions)	1.23	1.49
Steepness (*h*)	0.55	0.55
Natural mortality (*M; m/f*)	0.23	0.25
Acoustic catchability (*Q*)	1.25	1.21
Additional acoustic survey SD		
Reference points	0.27	0.49
2009 age-1 recruitment deviation	1.14	1.22
SB_0 (million mt)	1.65	1.76
2011 Depletion	0.60	0.52
2010 SPR ratio	1.44	NA

Table 20. Select likelihoods, parameters and estimated quantities for SS sensitivity analyses to basic model structure. Likelihood values in italics are not comparable.

	Empirical age	Age with growth	Age by sex with growth	Age with catch by season
Negative log-likelihood				
Total	155.460	*390.107*	*650.547*	*407.663*
Survey index	-5.478	-6.171	-5.706	-5.137
Age data	129.445	*355.405*	*610.428*	*369.765*
Parameter priors	0.174	0.201	0.096	0.144
Parameters				
R_0 (billions)	2.253	2.347	2.371	2.139
Steepness (*h*)	0.851	0.863	0.873	0.863
Natural mortality (*M; m/f*)	0.214	0.214	0.206/0.206	0.212
Acoustic catchability (*Q*)	1.019	0.942	0.997	1.011
Additional acoustic survey SD	0.195	0.167	0.183	0.207
Reference points				
2008 recruitment deviation	2.617	3.177	3.297	3.121
SB_0 (million mt)	1.893	2.157	2.567	1.942
2011 Depletion	0.890	0.936	0.720	0.872
2010 SPR ratio	0.695	0.626	0.710	0.681

Table 21. Select likelihoods, parameters and estimated quantities for SS sensitivity analyses to the exclusion of the 2010 fishery age data. Likelihood values in italics are not comparable.

	Base SS	No 2010 fishery data
Negative log-likelihood		
Total	155.460	146.378
Survey index	-5.478	-5.555
Age data	129.445	*122.642*
Parameter priors	0.174	0.146
Parameters		
R_0 (billions)	2.253	2.271
Steepness (h)	0.851	0.850
Natural mortality ($M; m/f$)	0.214	0.213
Acoustic catchability (Q)	1.019	0.960
Additional acoustic survey SD	0.195	0.194
Reference points		
2008 recruitment deviation	2.617	0.773
SB_0 (million mt)	1.893	1.923
2011 Depletion	0.890	0.485
2010 SPR ratio	0.695	0.719

Table 22. Select likelihoods, parameters and estimated quantities for SS sensitivity analyses to the priors on steepness and natural mortality. Likelihood values in italics are not comparable.

	Base SS	Low *h* prior	M prior SD = 0.5	M fixed at 0.23
Negative log-likelihood				
Total	155.460	*156.742*	*154.618*	*154.814*
Survey index	-5.478	-5.364	-5.308	-5.414
Age data	129.445	129.351	129.270	129.369
Parameter priors	0.174	*0.653*	*0.055*	*-0.059*
Parameters				
R_0 (billions)	2.253	2.662	3.614	2.685
Steepness (*h*)	0.851	0.529	0.841	0.847
Natural mortality (*M; m/f*)	0.214	0.220	0.256	0.230
Acoustic catchability (*Q*)	1.019	0.995	0.813	0.940
Additional acoustic survey SD	0.195	0.199	0.203	0.198
Reference points				
2008 recruitment deviation	2.617	2.691	2.564	2.595
SB_0 (million mt)	1.893	2.122	2.171	1.973
2011 Depletion	0.890	0.787	1.042	0.949
2010 SPR ratio	0.695	0.682	0.509	0.622

Table 23. Select likelihoods, parameters and estimated quantities for SS sensitivity analyses to the structure of ageing error. Likelihood values in italics are not comparable.

	Base SS	No cohort ageing error	No ageing error
Negative log-likelihood			
Total	*155.460*	*222.264*	*109.160*
Survey index	-5.478	-5.413	-5.200
Age data	*129.445*	*193.481*	*91.795*
Parameter priors	*0.174*	*0.100*	*0.238*
Parameters			
R_0 (billions)	2.253	2.172	2.149
Steepness (*h*)	0.851	0.843	0.852
Natural mortality (*M; m/f*)	0.214	0.212	0.216
Acoustic catchability (*Q*)	1.019	1.026	1.032
Additional acoustic survey SD	0.195	0.198	0.205
Reference points			
2008 recruitment deviation	2.617	2.745	2.116
SB_0 (million mt)	1.893	1.858	1.776
2011 Depletion	0.890	0.890	0.797
2010 SPR ratio	0.695	0.706	0.726

Table 24. Select likelihoods, parameters and estimated quantities for SS sensitivity analyses to fishery and survey selectivity parameterization. Likelihood values in italics are not comparable.

	SS base	Non-parametric selectivity to age 8	Double-normal selectivity (dome-shaped)	Time-varying non-parametric selectivity
Negative log-likelihood				
Total	155.460	145.893	170.529	123.635
Survey index	-5.478	-5.574	-6.298	-5.775
Age data	129.445	119.918	145.474	91.257
Parameter priors	0.174	0.184	0.062	0.064
Parameters				
R_0 (billions)	2.253	2.103	2.183	1.978
Steepness (*h*)	0.851	0.854	0.848	0.856
Natural mortality (*M; m/f*)	0.214	0.214	0.210	0.209
Acoustic catchability (*Q*)	1.019	1.702	0.838	1.305
Additional acoustic survey SD	0.195	0.191	0.166	0.187
Reference points				
2008 recruitment deviation	2.617	2.581	2.316	1.935
SB_0 (million mt)	1.893	1.765	1.897	1.727
2011 Depletion	0.890	0.845	0.714	0.653
2010 SPR ratio	0.695	0.766	0.740	0.754

Table 25. Sensitivity to priors and model assumptions tested in TINSS. Note sensitivity runs shown in the table were done individually, with all other priors set to the values in the base case (Table 9).

Parameter	**Distribution**	***μ, σ***	***μ, σ***	***μ, σ***	***μ, σ***	
F_{MSY}	lognormal	0.35, 0.262[1]	0.3, 0.4	0.4, 0.4	0.35,0.5	Prior mapped from SS steepness prior
MSY	lognormal	0.15, 0.5	0.3, 0.5	0.2, 0.75		
M	lognormal	0.15, 0.1	0.25, 0.1	0.2,0.5		
q	lognormal	0, 0.2	0, 0.3			

1. 2010 assessment prior (Martell 2010)

Table 26. Select parameters and estimated quantities for TINSS sensitivity analyses to the prior for FMSY to the acoustic survey . Note, recruits are age 1 and not directly comparable with SS.

	TINSS Base	***μ, σ***	***μ, σ***	***μ, σ***	***μ, σ***	
Parameters		**0.35, 0.262**	**0.3, 0.4**	**0.4, 0.4**	**0.35,0.5**	**Mapped from SS prior on steepness**
MSY	0.13	0.13	0.13	0.14	0.13	0.19
F_{MSY}	0.34	0.35	0.3	0.38	0.34	0.96
R_0 (billions)	1.23	1.22	1.24	1.21	1.23	1.15
Steepness (*h*)	0.55	0.55	0.52	0.57	0.54	0.83
Natural mortality (*M; m/f*)	0.23	0.23	0.23	0.23	0.23	0.23
Acoustic catchability (*Q*)	1.25	1.25	1.25	1.25	1.25	1.26
Reference points						
2009 log recruitment deviation	0.27	0.27	0.28	0.26	0.27	0.2
SB_0 (million mt)	1.21	1.21	1.23	1.19	1.21	1.12
2011 Depletion	1.57	1.57	1.55	1.58	1.57	1.63
2010 SPR ratio	0.64	0.64	0.64	0.64	0.64	0.63

Table 27. Select parameters and estimated quantities for TINSS sensitivity analyses to the prior for MSY. Note, recruits are age 1 and not directly comparable with SS.

	TINSS Base	**μ, σ**	**μ, σ**	**μ, σ**
Parameters		**0.3,0.5**	**0.15,0.5**	**0.2,0.75**
MSY	0.13	0.15	0.12	0.12
F_{MSY}	0.34	0.37	0.32	0.32
R_0 (billions)	1.23	1.31	1.17	1.18
Steepness (*h*)	0.55	0.56	0.53	0.53
Natural mortality (*M; m/f*)	0.23	0.23	0.23	0.23
Acoustic catchability (*Q*)	1.25	1.25	1.26	1.26
Reference points				
2009 log recruitment deviation	0.27	0.32	0.24	0.24
SB_0 (million mt)	1.21	1.28	1.155	1.16
2011 Depletion	1.57	1.52	1.61	1.6
2010 SPR ratio	0.64	0.64	0.63	0.64

Table 28. Select parameters and estimated quantities for TINSS sensitivity analyses to the prior for M. Note, recruits are age 1 and not directly comparable with SS.

	TINSS Base	**μ, σ**	**μ, σ**	**μ, σ**
Parameters		**0.15, 0.1**	**0.25, 0.1**	**0.2, 0.5**
MSY	0.13	0.13	0.14	0.15
F_{MSY}	0.34	0.31	0.36	0.34
R_0 (billions)	1.23	0.8	1.83	3.52
Steepness (*h*)	0.55	0.67	0.46	0.36
Natural mortality (*M; m/f*)	0.23	0.17	0.28	0.36
Acoustic catchability (*Q*)	1.25	1.33	1.18	1.09
Reference points				
2009 log recruitment deviation	0.27	0.32	0.19	-0.01
SB_0 (million mt)	1.21	1.3	1.235	1.47
2011 Depletion	1.57	1.18	1.84	2.06
2010 SPR ratio	0.64	0.51	0.73	0.82

Table 29. Select parameters and estimated quantities for TINSS sensitivity analyses to the standard deviation of the prior for survey selectivity q. Note, recruits are age 1 and not directly comparable with SS.

	TINSS Base	SD fixed 0.2	SD fixed 0.3
Parameters			
MSY	0.13	0.13	0.12
F_{MSY}	0.34	0.34	0.34
R_0 (billions)	1.23	1.03	0.96
Steepness (*h*)	0.55	0.58	0.59
Natural mortality (*M; m/f*)	0.23	0.21	0.2
Acoustic catchability (*Q*)	1.25	1.72	2.05
Reference points			
2009 log recruitment deviation	0.27	0.22	0.19
SB_0 (million mt)	1.21	1.15	1.13
2011 Depletion	1.57	1.05	0.88
2010 SPR ratio	0.64	0.52	0.47

Table 30. Select likelihoods, parameters and estimated quantities for SS retrospective analyses. Likelihood values in italics are not comparable to the SS base model.

	Base SS	-1 year	-2 years	-3 years	-4 years	-5 years
Negative log-likelihood						
Total	155.460	*146.378*	*138.073*	*134.258*	*128.301*	*124.731*
Survey index	-5.478	-5.555	*-4.470*	*-4.496*	*-3.230*	*-3.136*
Age data	129.445	*122.642*	*115.022*	*111.783*	*106.085*	*102.900*
Parameter priors	0.174	0.146	0.164	0.154	0.126	0.144
Parameters						
R_0 (billions)	2.253	2.271	2.275	2.263	2.183	2.252
Steepness (*h*)	0.851	0.850	0.850	0.849	0.846	0.846
Natural mortality (*M; m/f*)	0.214	0.213	0.214	0.213	0.213	0.213
Acoustic catchability (*Q*)	1.019	0.960	1.030	1.038	1.071	1.113
Additional acoustic survey SD	0.195	0.194	0.214	0.213	0.244	0.250
Reference points						
2008 recruitment deviation	2.617	0.773	NA	NA	NA	NA
SB_0 (million mt)	1.893	1.923	1.916	1.910	1.855	1.904
2006 Depletion	0.478	0.506	0.449	0.445	0.402	0.356
2005 SPR ratio	0.860	0.835	0.877	0.884	0.937	0.987

Table 31. Retrospective tables for TINSS model runs.

	Base TINSS	-1 year	-2 years	-3 years	-4 years	-5 years
Negative log-likelihood						
Total	-276.27	-274.68	-260.69	-245.5	-212.6	-199.79
Survey index	1.44	2.63	1.13	1.54	1.28	1.54
Commercial age data	-288.7	*-278.2*	*-261.52*	*-243.41*	*-229.11*	*-217.0*
Survey age data	-53.92	*-61.6*	*-58.97*	*-60.88*	*-39.63*	*-39.07*
Parameter priors	64.91	62.49	58.67	57.25	54.86	54.74
Parameters						
MSY (million mt)	0.13394	0.12765	0.12900	0.13076	0.12554	0.12674
FMSY	0.343	0.343	0.350	0.346	0.345	0.341
Natural mortality (*M*)	0.227	0.220	0.218	0.215	0.208	0.203
Acoustic catchability (*q*)	1.25	1.20	1.21	1.15	1.12	1.08
Reference points						
2009 log recruitment deviation	2.42	0.31	NA	NA	NA	NA
SB_0 (million mt)	1.14	1.12	1.10	1.11	1.08	1.10
2006 SSB	1.05	1.01	0.81	0.93	0.85	0.90
2006 Depletion	0.92	0.91	0.74	0.84	0.78	0.816
2005 SPR ratio	0.79	0.76	0.83	0.93	0.85	0.83

7. Figures

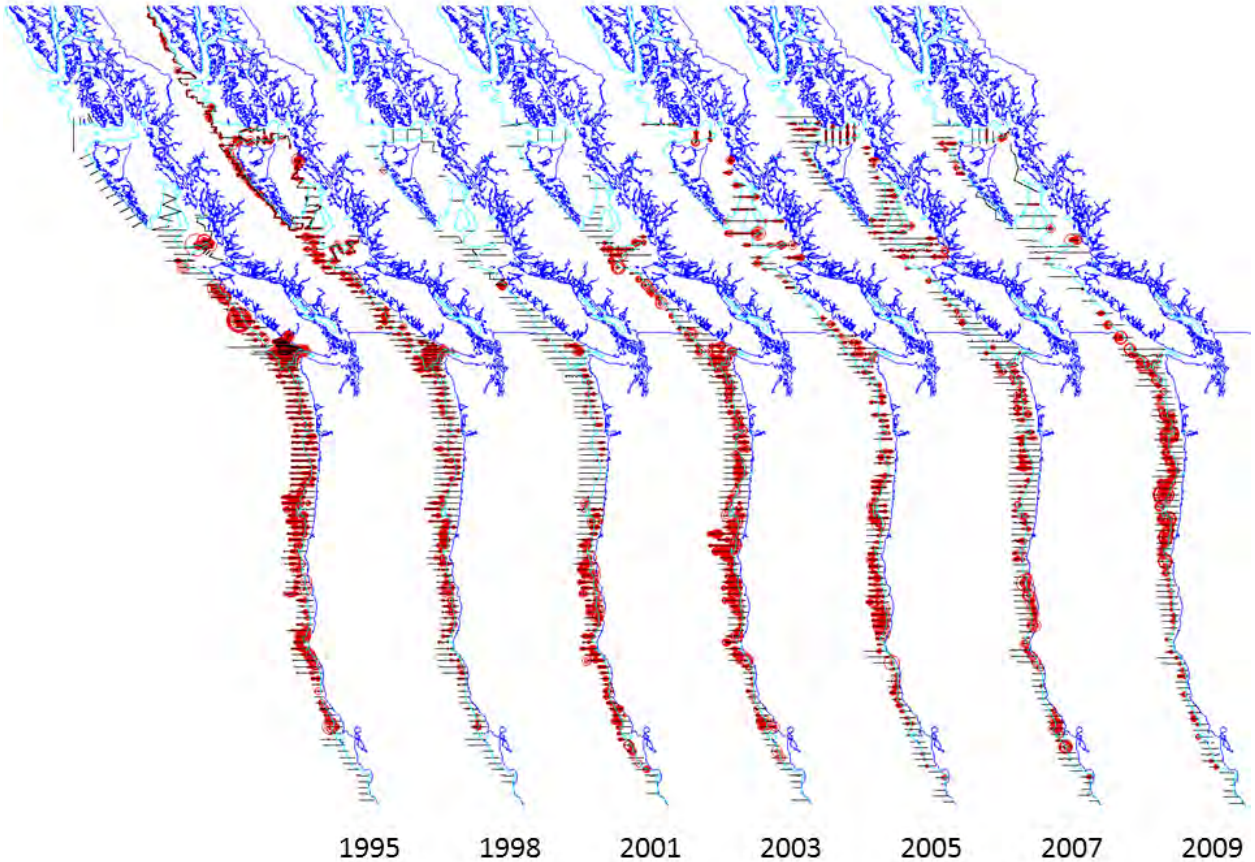


Figure 1. Spatial distribution of acoustic backscatter attributable to Pacific hake from joint US-Canada acoustic surveys 1995-2009. Area of the circles is proportional to observed backscatter.

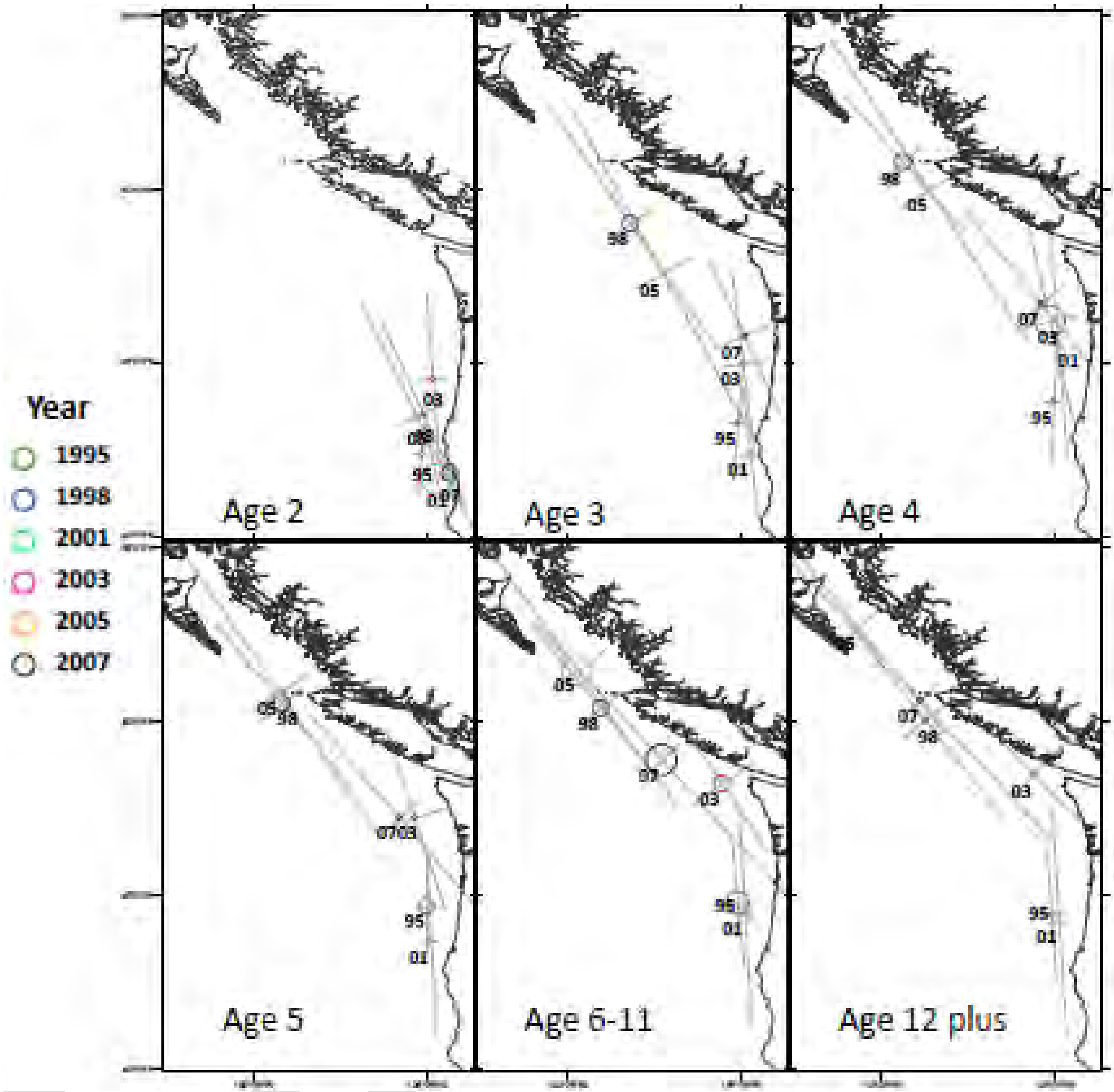


Figure 2. The mean spatial location of the hake stock (circles are proportional to biomass) and variance (grey lines) by age group and year based on acoustic survey observations 1995-2007 (Figure courtesy of O'Conner and Haltuch's ongoing Fisheries And The Environment project investigating the links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

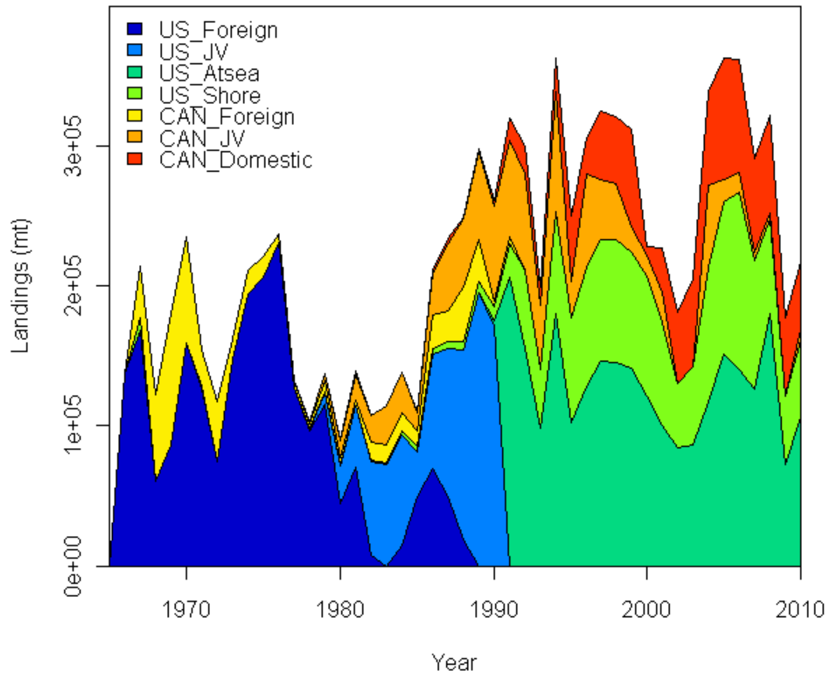


Figure 3. Total Pacific hake landings used in the assessment by sector, 1966-2010.

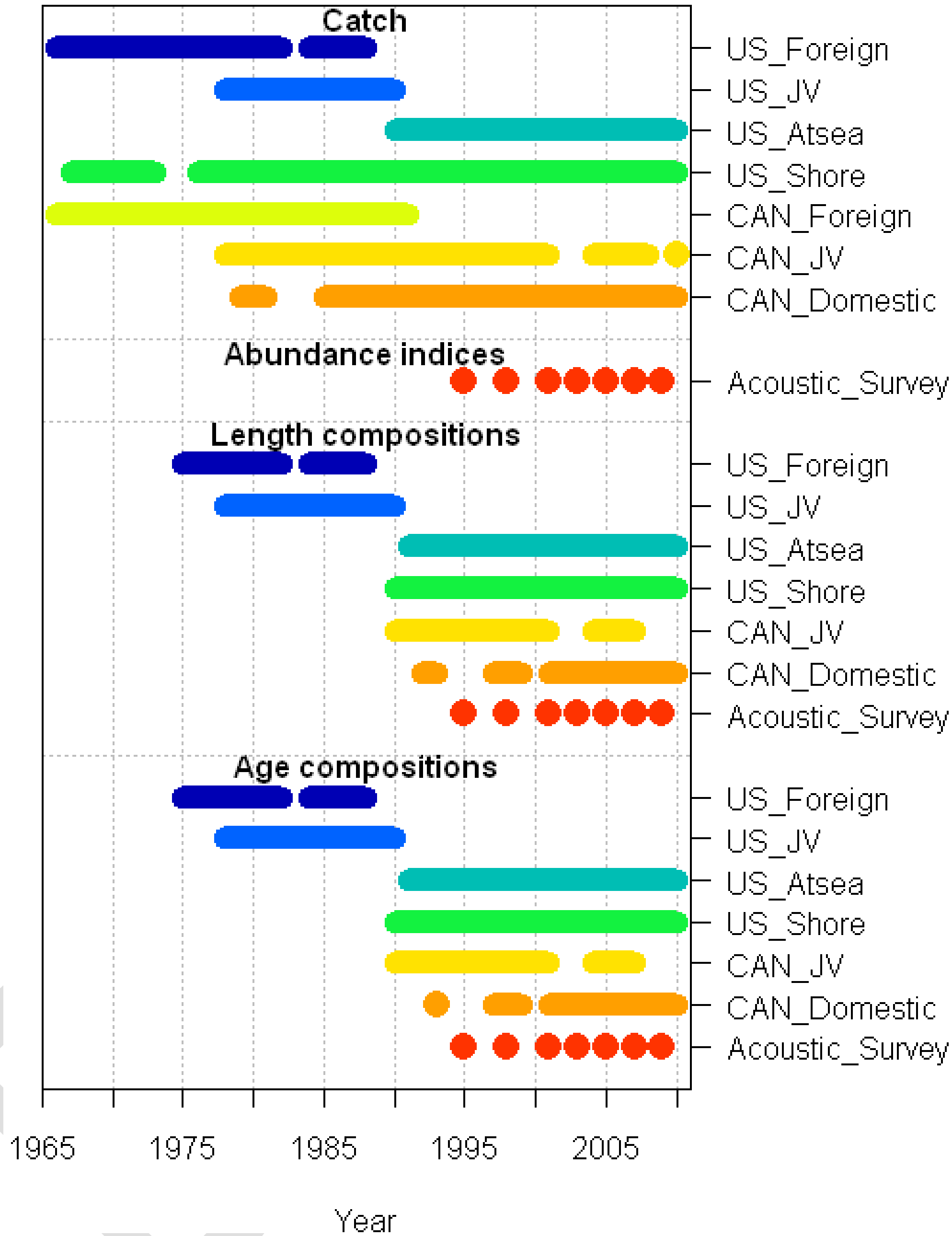


Figure 4. Overview of data sources available for Pacific hake, 1966-2010.

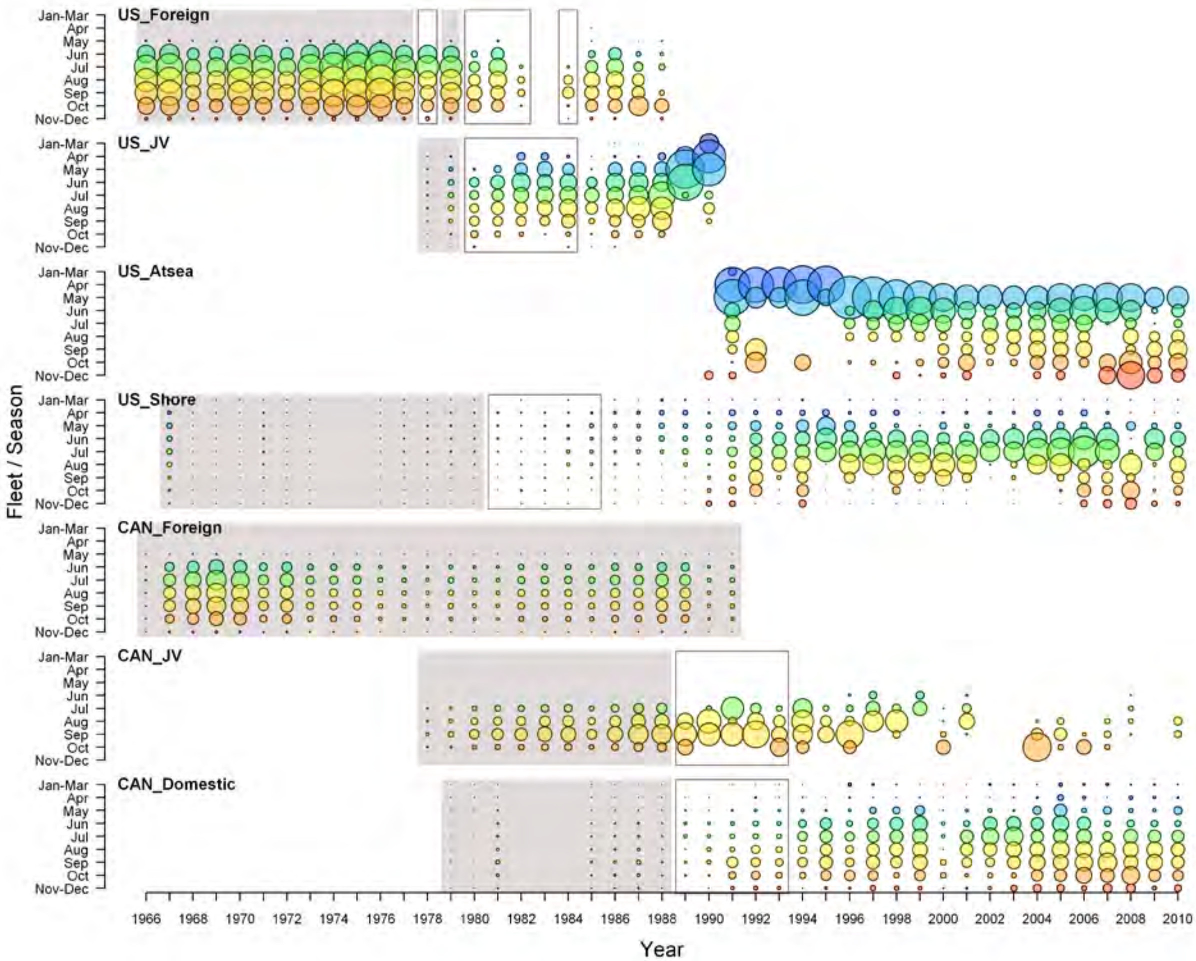


Figure 5. Within and among year temporal patterns in reconstructed Pacific hake landings by sector, 1966-2010. The area of each circle is proportional to catch for that period. Shaded rectangles indicate years in which only annual catch was available, open rectangles indicate 5-year reference period used to calculate average seasonal distribution to distribute annual catch values. The Canadian foreign fleet had no seasonal data available, so the seasonal distribution was assumed to be the same as the U.S. foreign fleet.

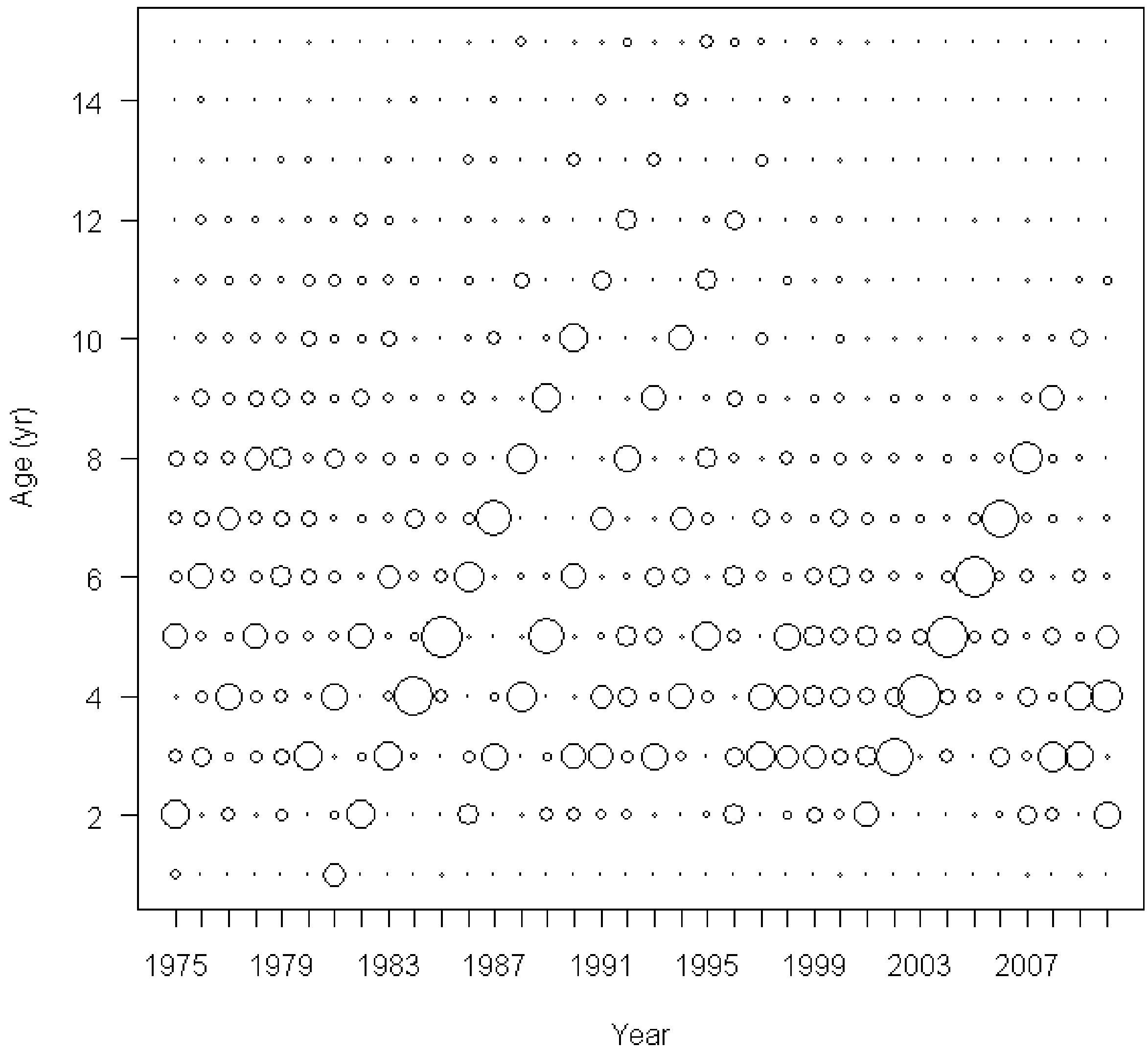


Figure 6. Aggregate fishery (all sectors combined) age compositions, 1975-2010. Proportions in each year sum to 1.0, maximum bubble size represents a value of 0.77.

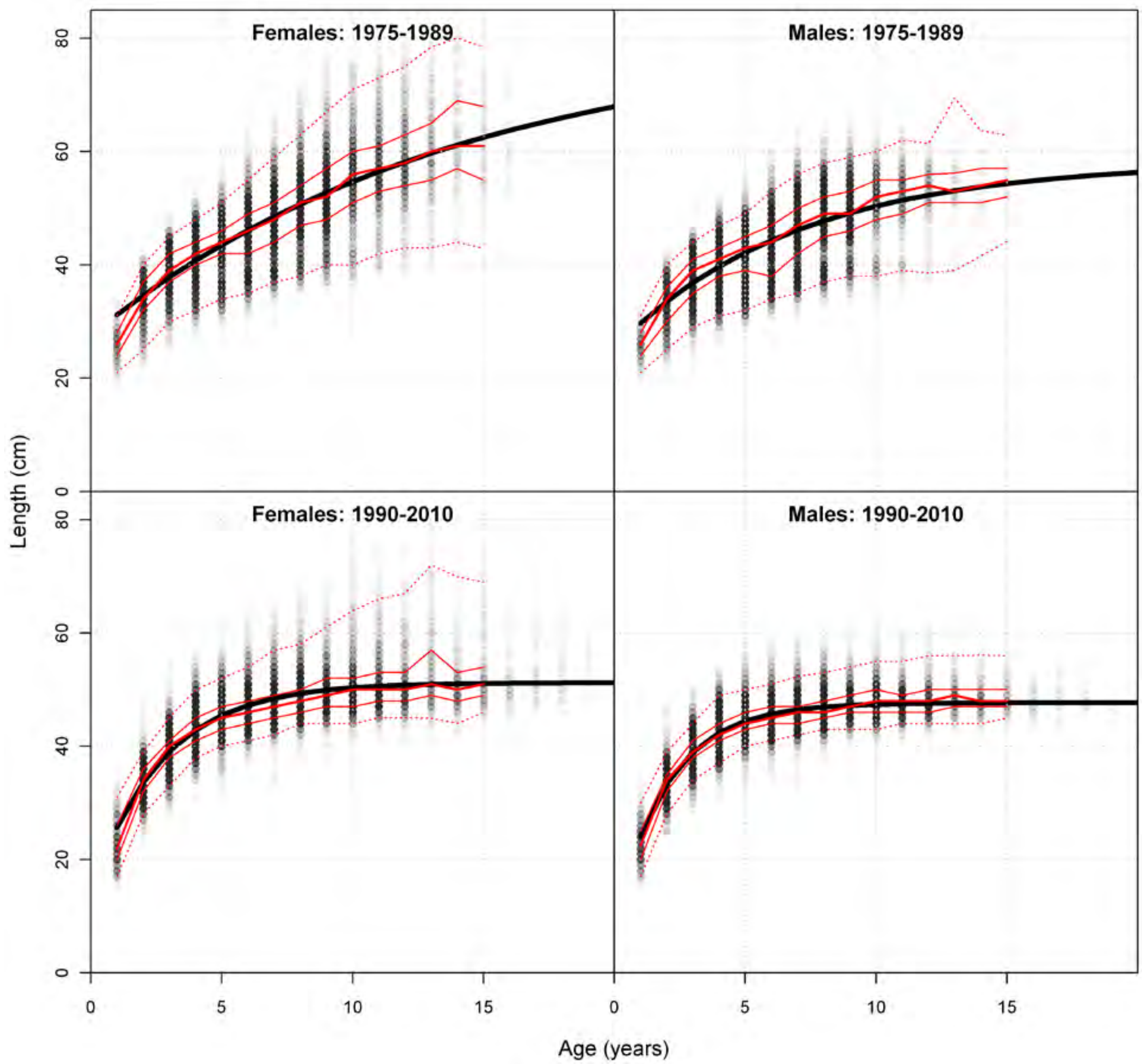


Figure 7. Estimated growth curves for females and males fit to length and age data for the time periods 1975-1989 and 1990-2010. Darkness of grey points indicates the number of samples at each value. Red lines indicate median, as well as 50% and 95% intervals of the observed lengths at each age from 1 to 15.

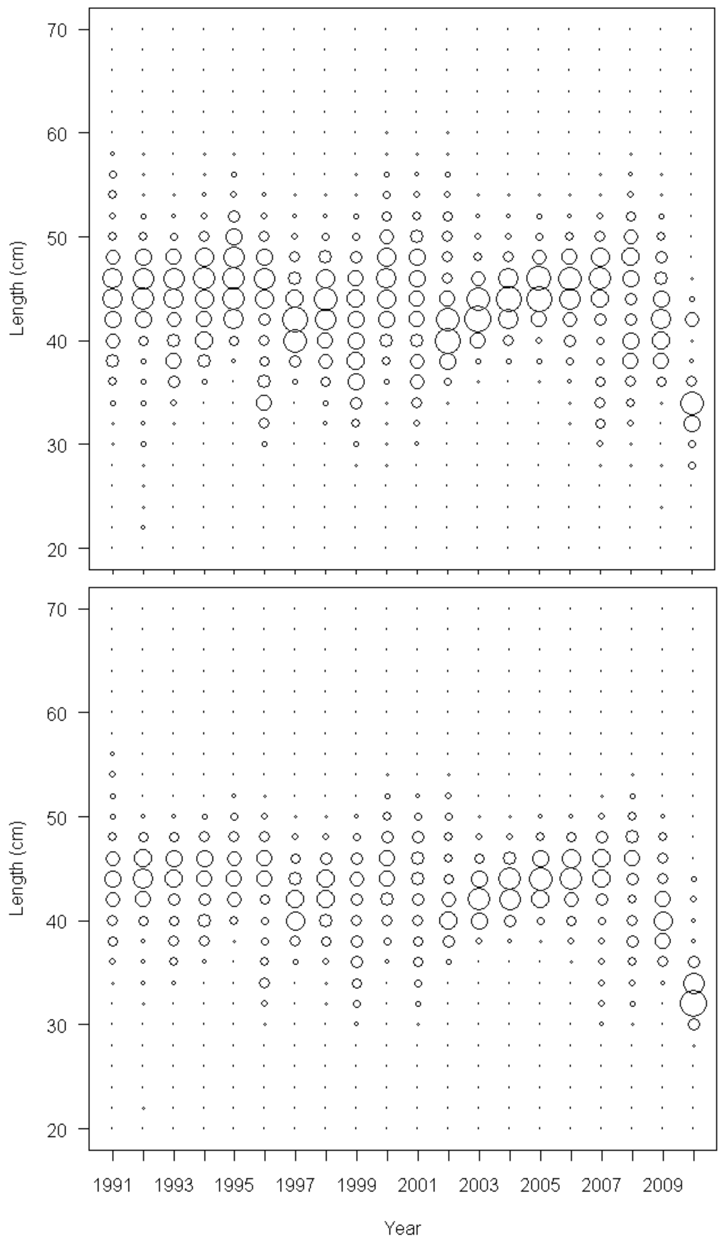


Figure 8. U.S. at-sea fishery length compositions, 1991-2010. Proportions in each year sum to 1.0 across both sexes in each year, maximum bubble size represents a value of 0.17 for females (upper panel) and 0.31 for males (lower panel).

Figure 9. Historical and updated acoustic survey biomass estimates (millions of metric tons). Approximate 95% confidence intervals are based on only sampling variability (1995-2007) and sampling variability as well as squid/hake apportionment uncertainty (2009).

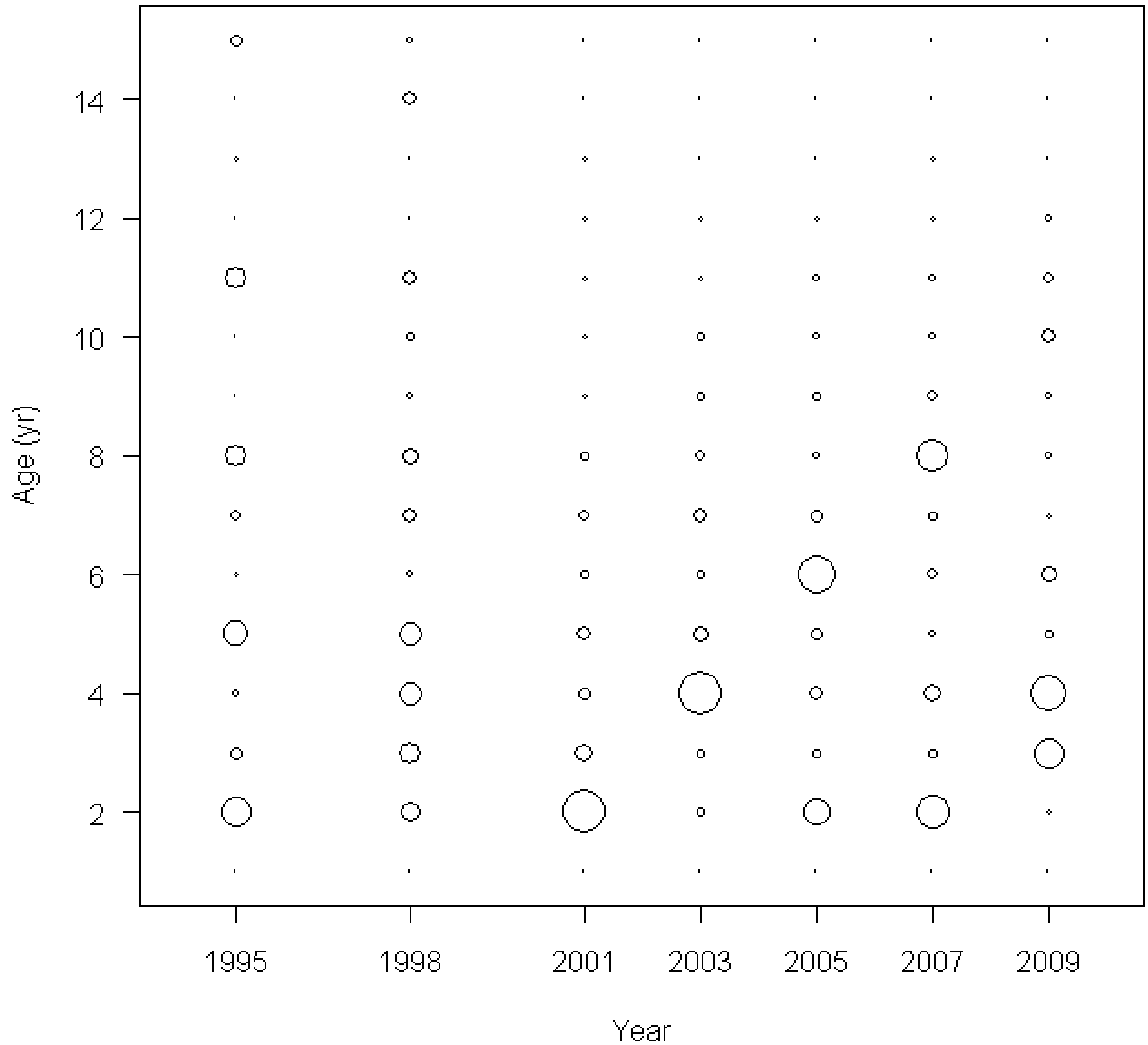


Figure 10. Acoustic survey age compositions, 1995-2009. Proportions in each year sum to 1.0, maximum bubble size represents a value of 0.63.

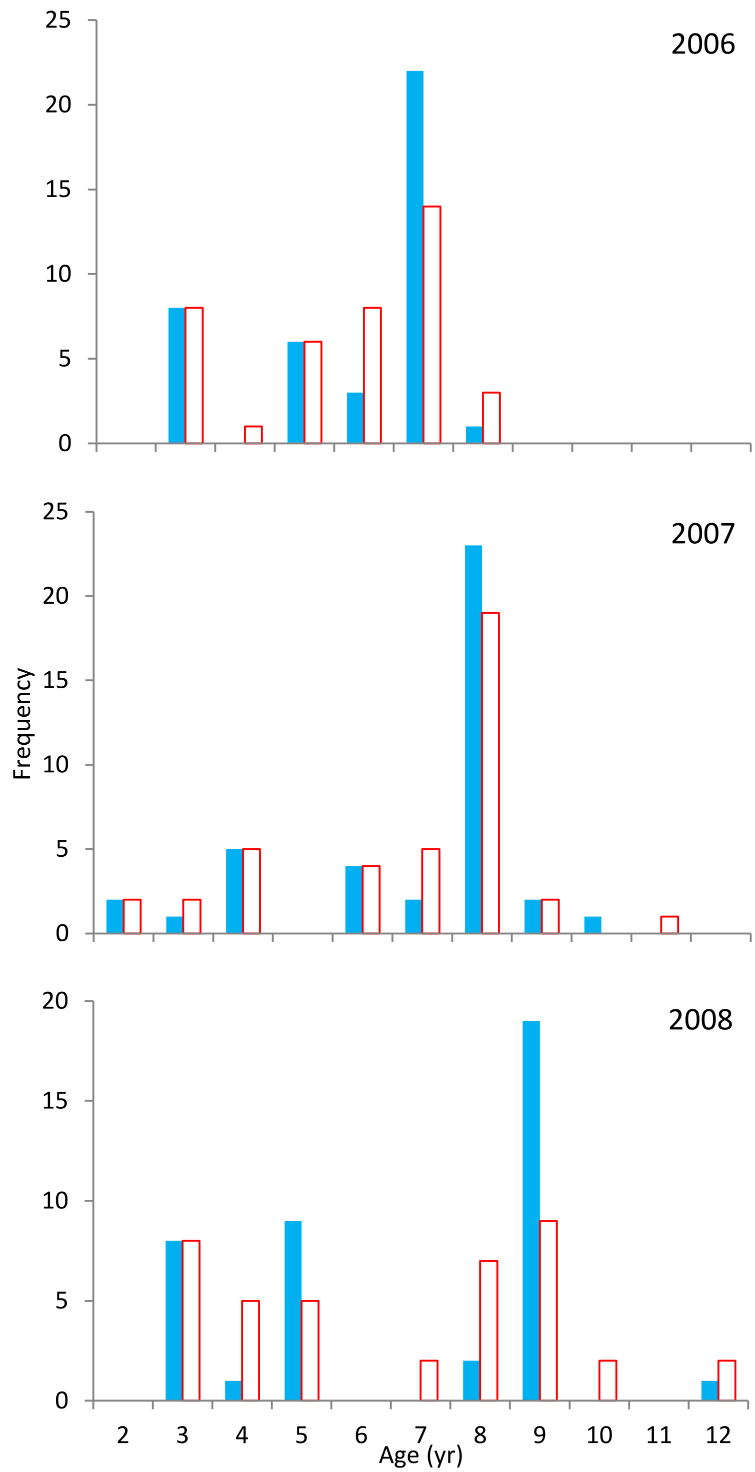


Figure 11. Comparison of age-frequency distributions from three recent years when otoliths were read under normal conditions (filled bars) and when the same set of otoliths was read, but were analyzed in a mixed sample where the reader was unaware of the collection year (open bars).

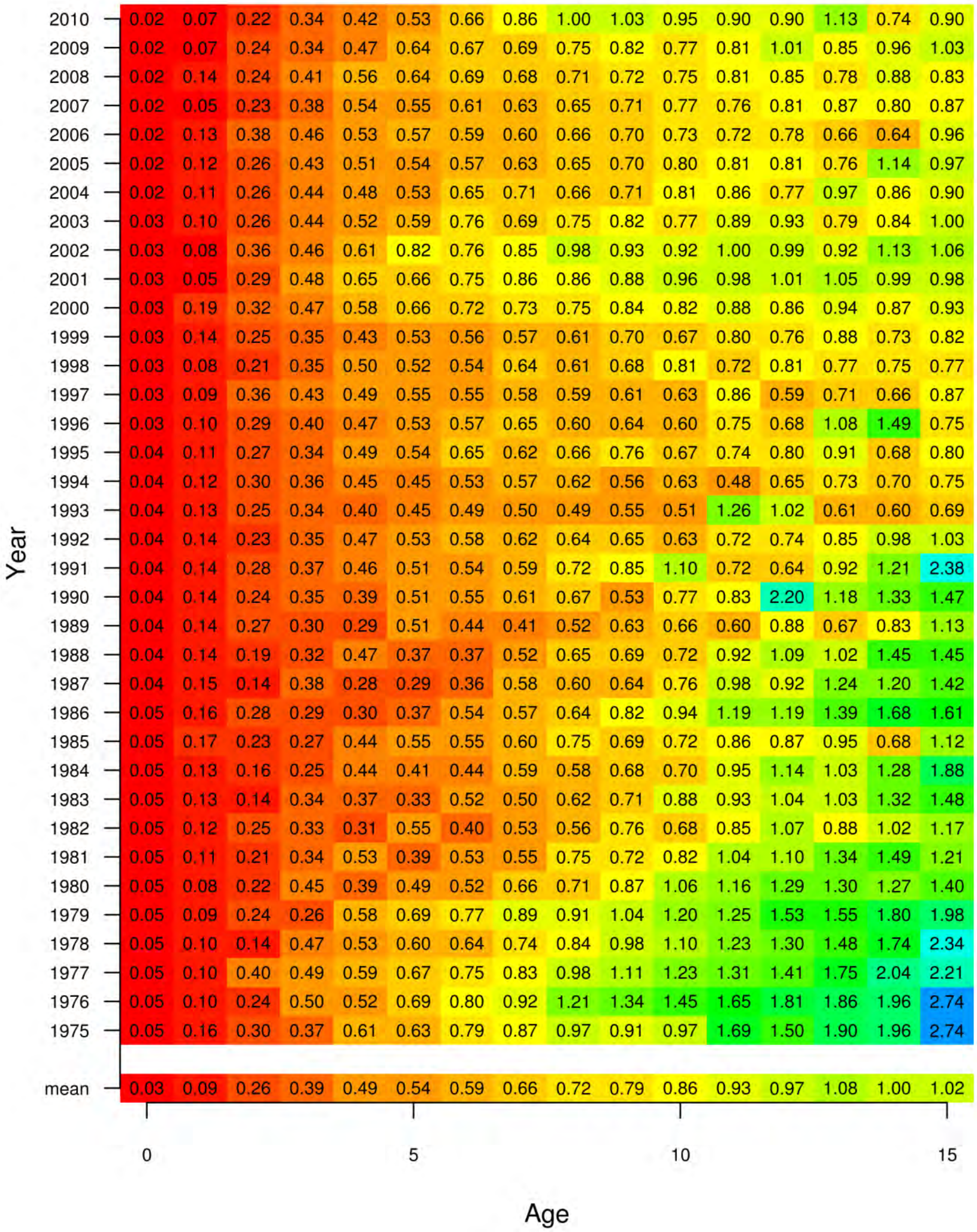


Figure 12. Interpolated matrix of weight at age (kg) used in both models.

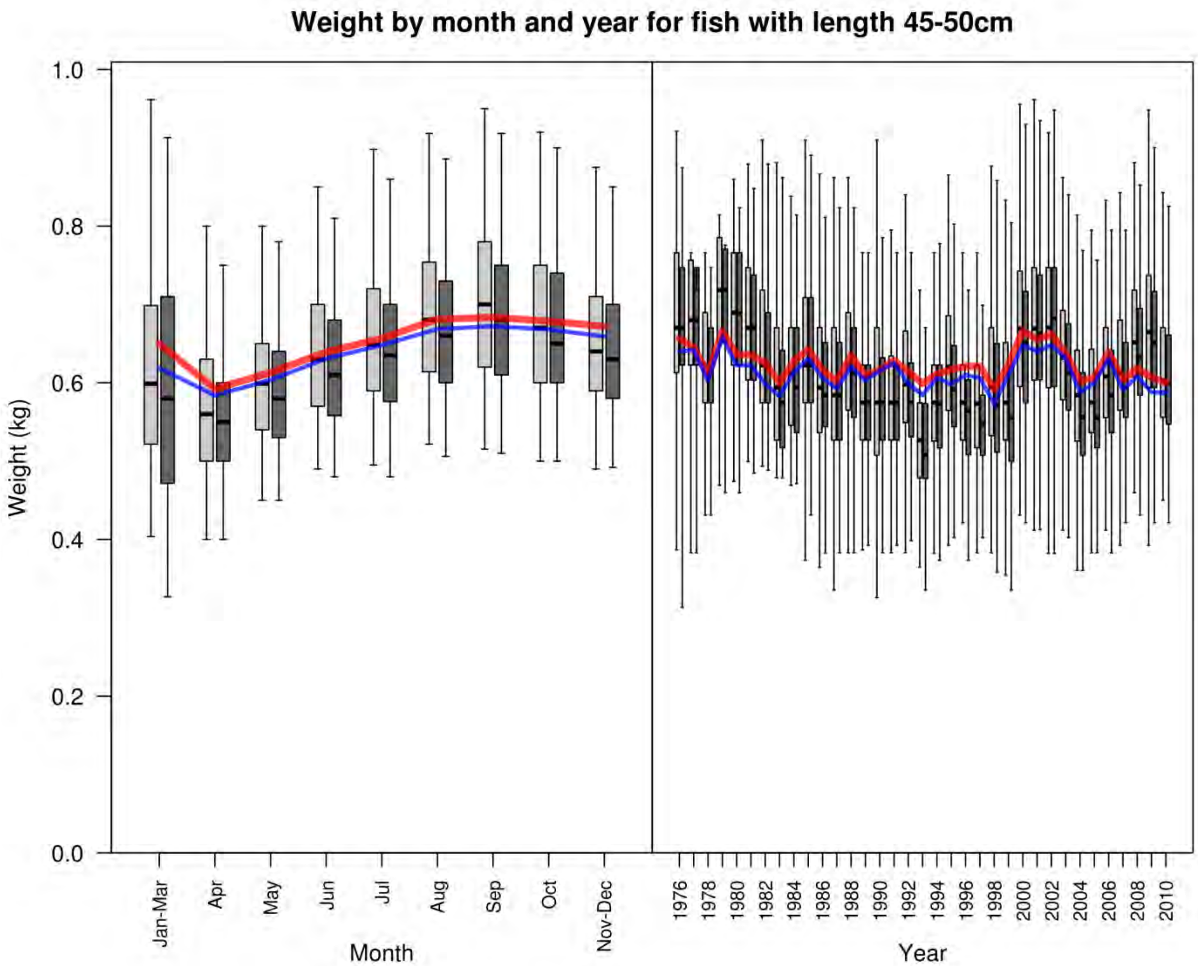


Figure 13. Variability in weight at length (45-50 cm long fish) for females (light boxes) and males (dark boxes) by month and year. The median value (dark line), central 50% of samples (grey box) and 95% intervals (whiskers) are shown for the raw data, and the lines spanning the boxes indicate the average predicted weight by month and year of a 47cm fish calculated from a linear model that relates log(weight) to log(length) (upper line represents females; lower line males.

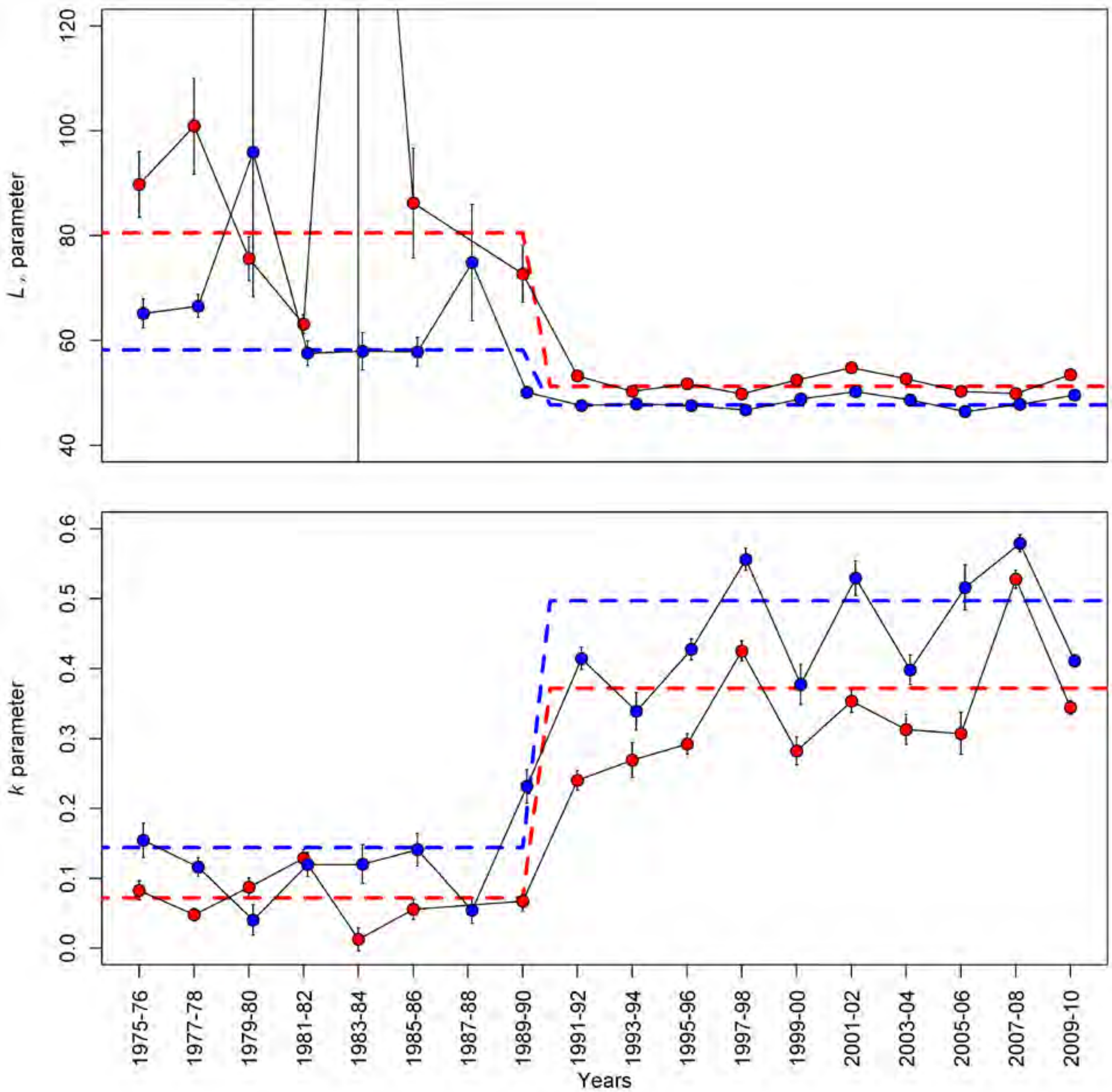


Figure 14. Estimated parameters from von Bertalanffy growth estimates for males (blue) and females (red). Circular points are estimates for each pair of adjacent years with 95% intervals shown around estimates. Thicker dashed lines show estimates of growth curves fit to data that has been divided into the time periods 1975-1989 and 1990-2010.

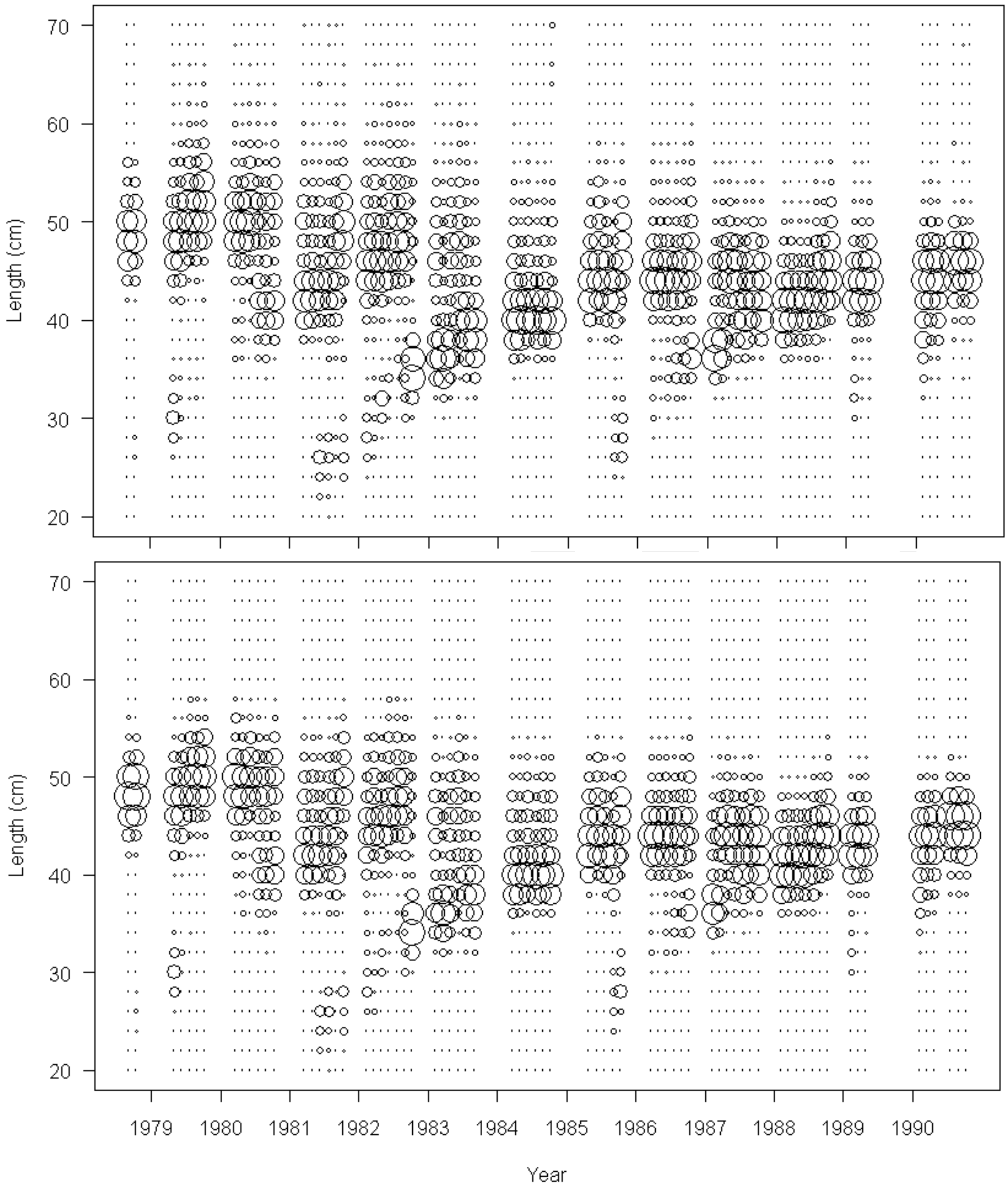


Figure 15. U.S. joint-venture fishery length compositions, 1991-2010 by season. Proportions in each season sum to 1.0 across both sexes in each year, maximum bubble size represents a value of 0.18 for females (upper panel) and 0.20 for males (lower panel).

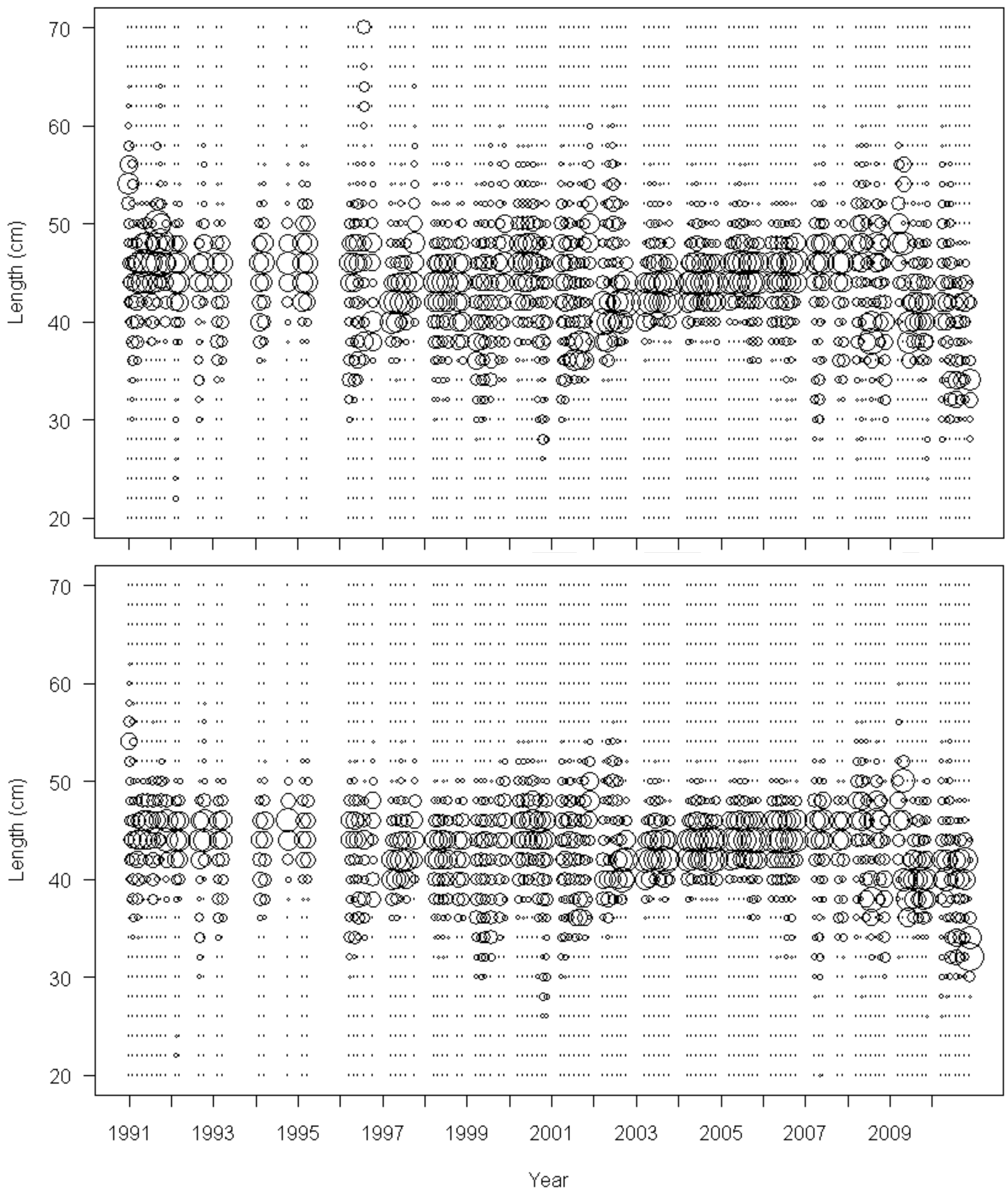


Figure 16. U.S. at-sea fishery length compositions, 1991-2010 by season. Proportions in each season sum to 1.0 across both sexes in each year, maximum bubble size represents a value of 0.24 for females (upper panel) and 0.32 for males (lower panel).

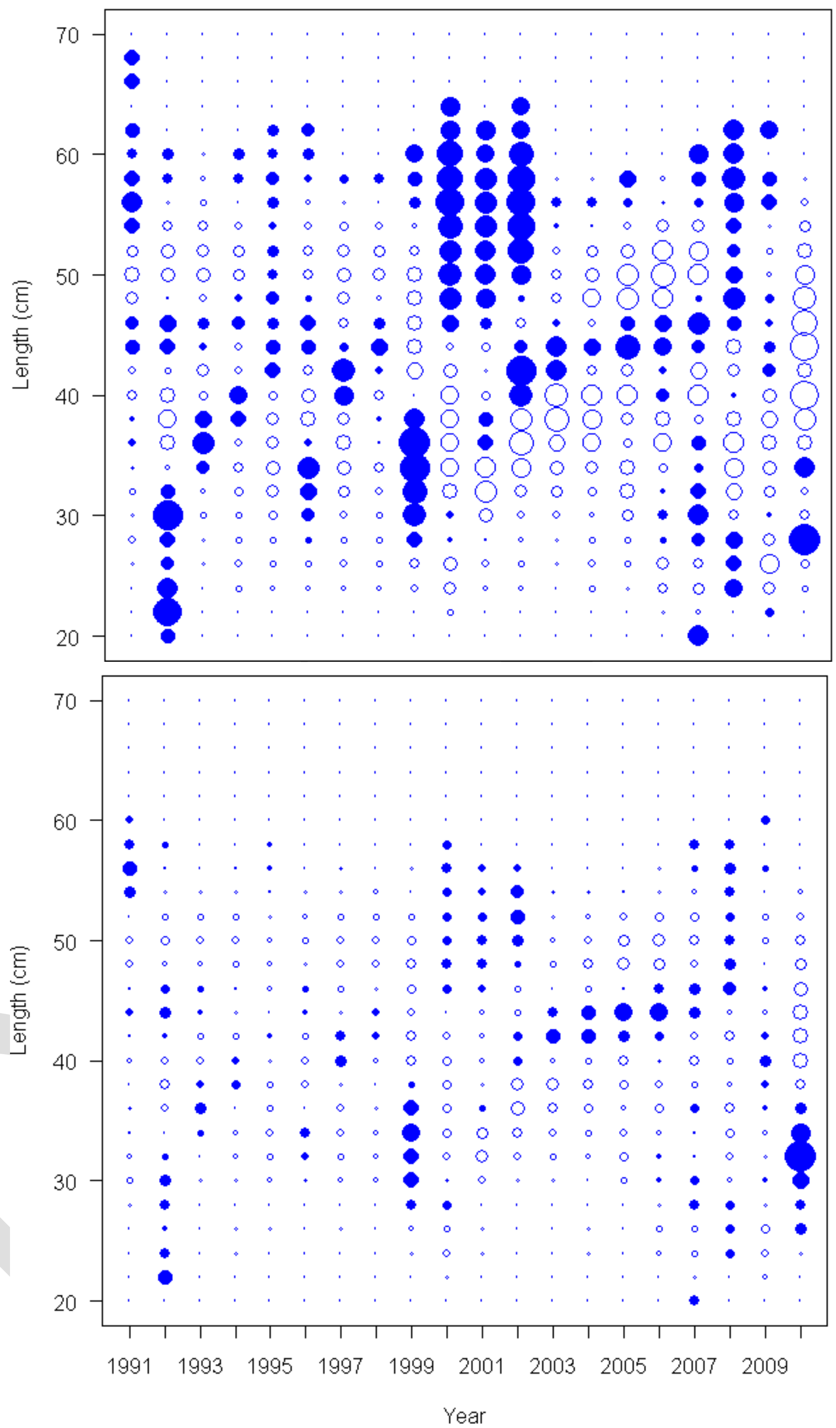


Figure 17. Fits to the observed U.S. at-sea fishery length composition data for females (upper panel) and males (lower panel) from the alternate model estimating growth parameters internally, but still failing to account for the complexity in the growth process.

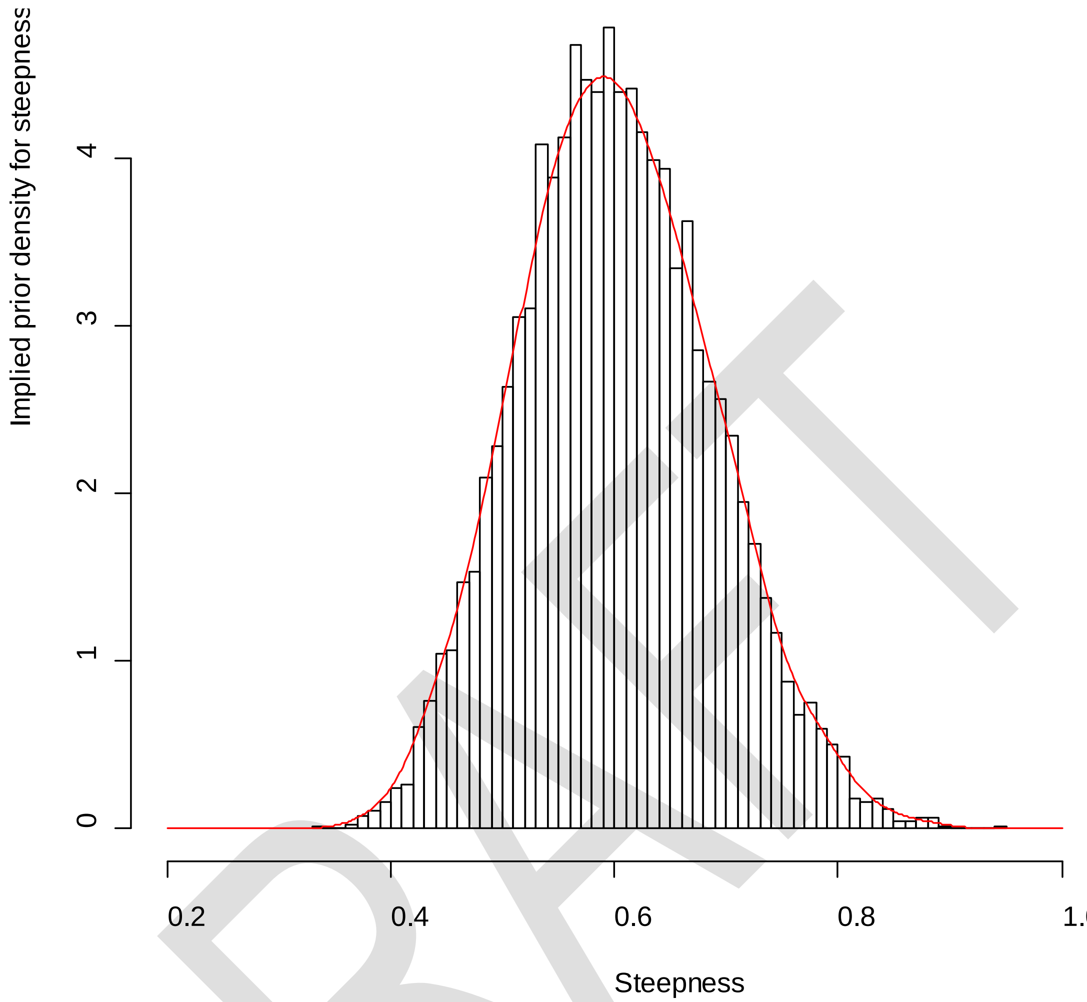


Figure 18. Prior for steepness implied by the transformation of TINSS priors.

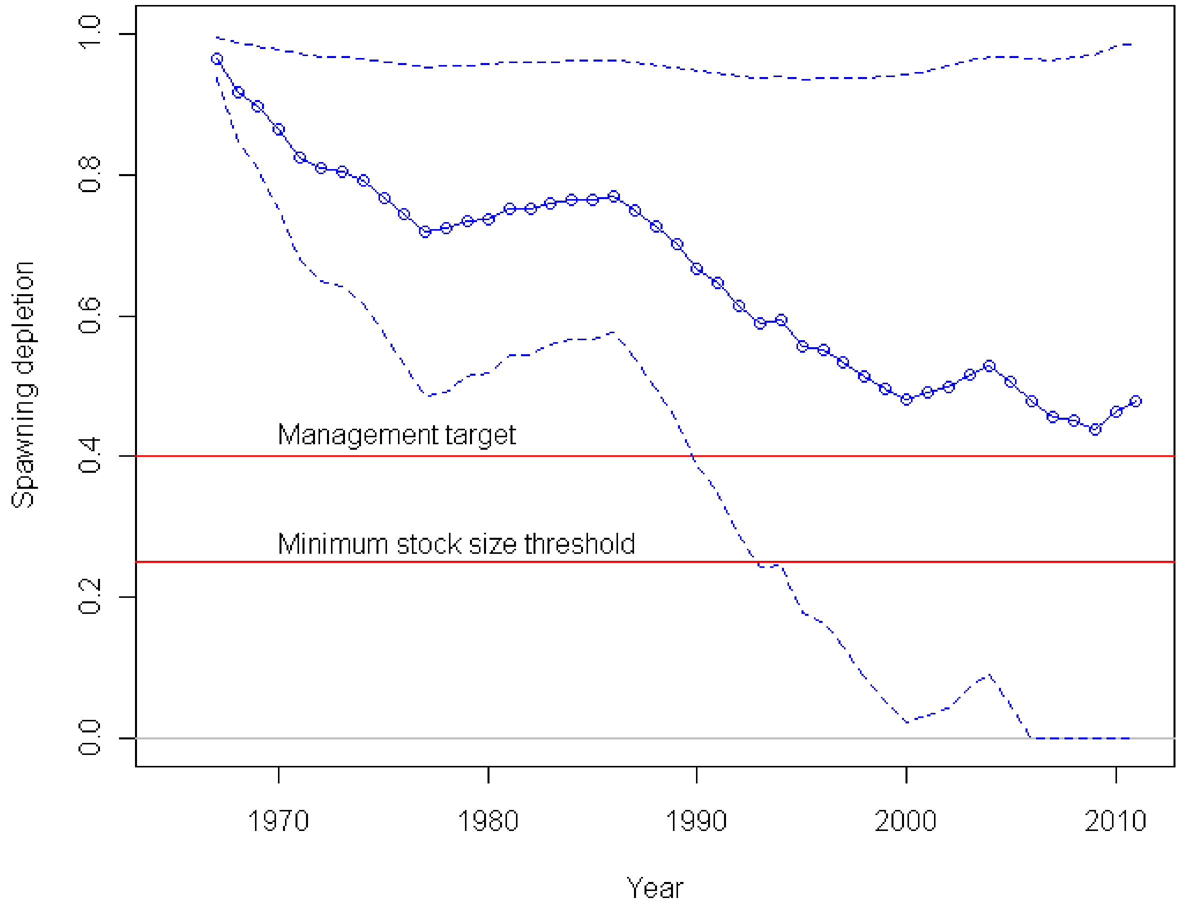


Figure 19. Time-series of relative depletion for a simple 4 parameter production model illustrating the low information content in the acoustic index and the need for fully utilizing the available age data.

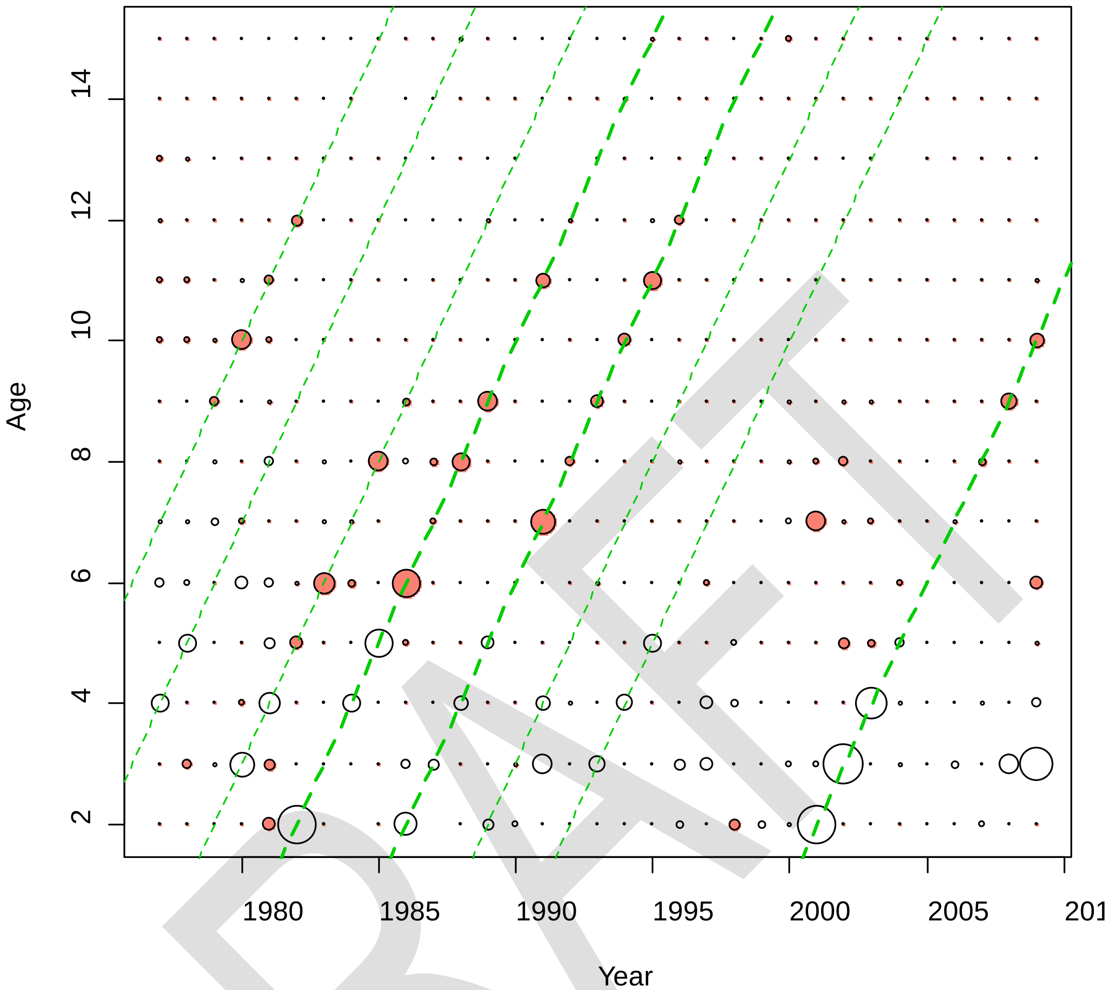


Figure 20. Change in the proportions at age from those used by the TINSS model in 2010 to those used by both models in 2011. Filled circles denote 2011 < 2010.

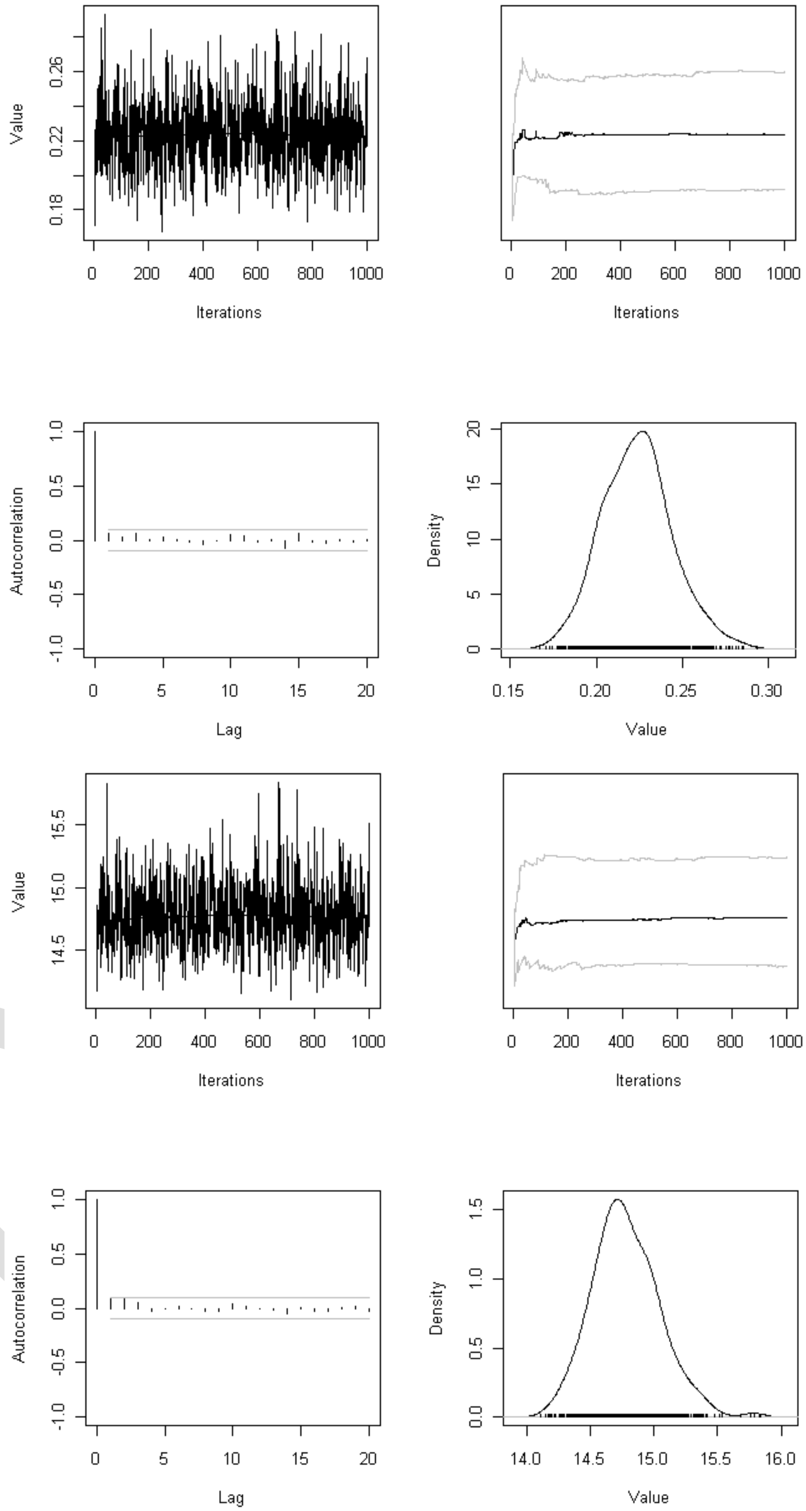


Figure 21. Summary of MCMC diagnostics for natural mortality (upper panels) and log(R_0) (lower panels) in the SS model.

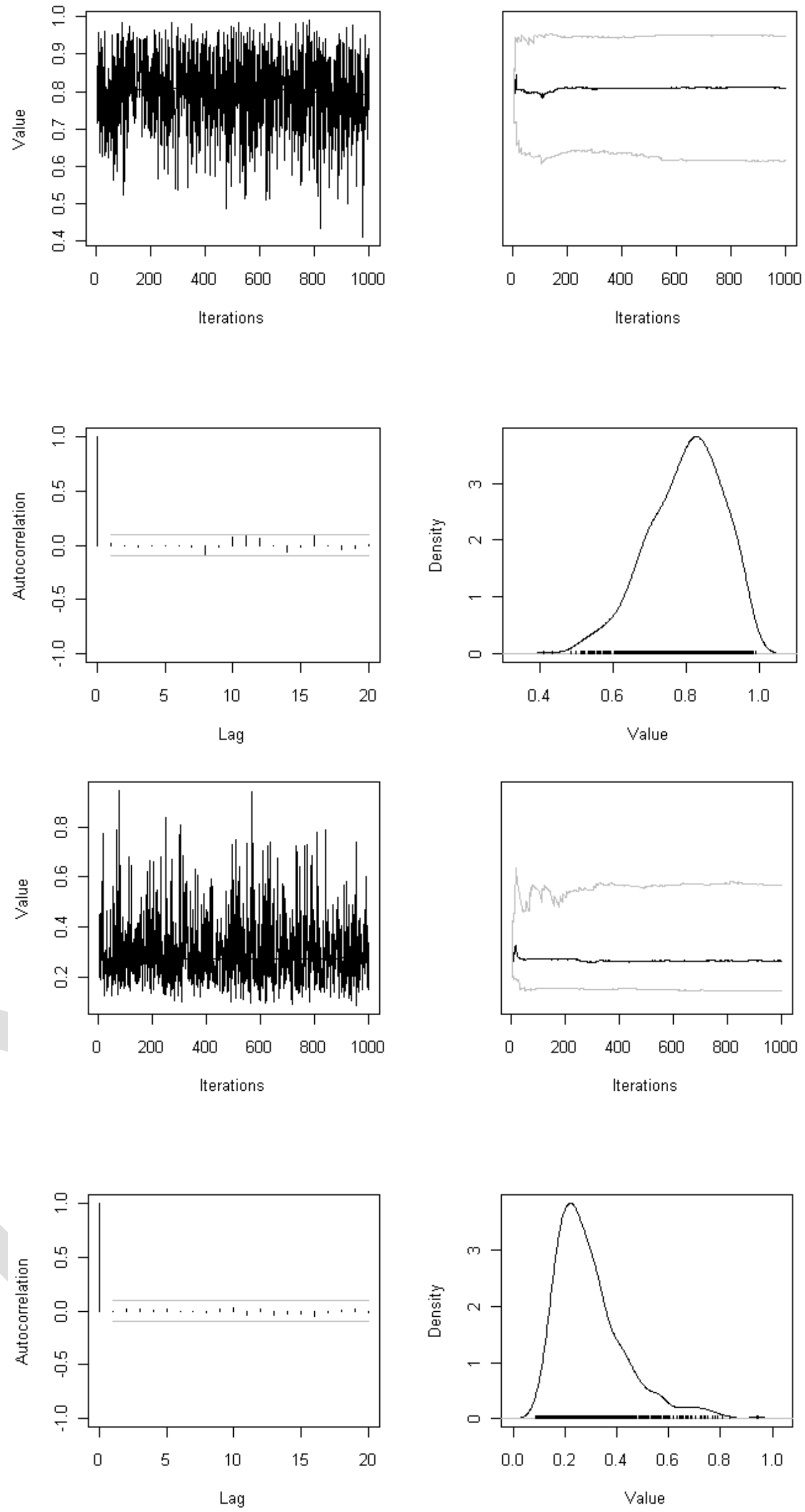


Figure 22. Summary of MCMC diagnostics for steepness (upper panels) and the additional SD for the acoustic survey index (lower panels) in the SS model.

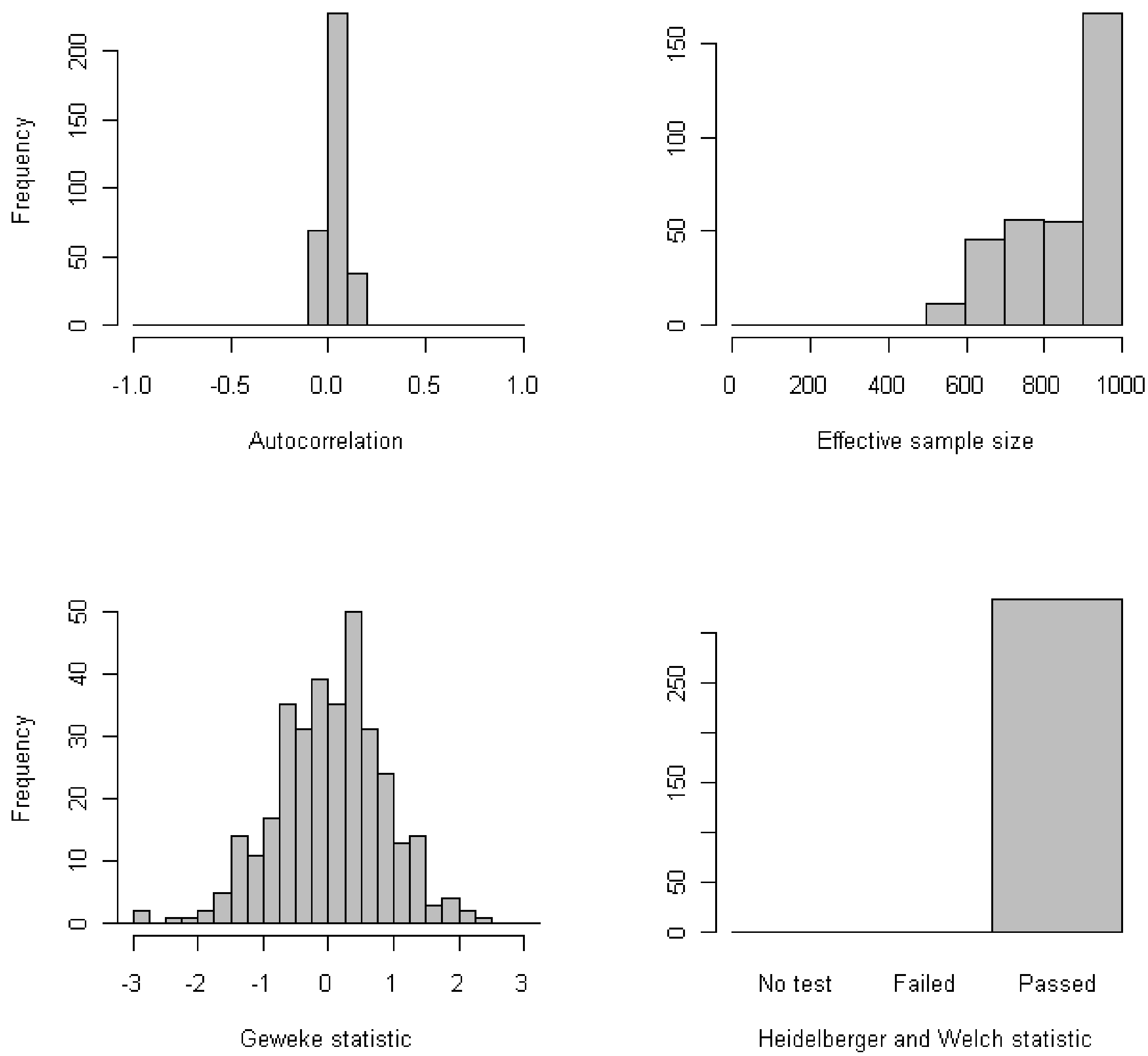


Figure 23. Summary histograms of MCMC diagnostics for all estimated SS parameters and derived quantities including the recruitment, spawning biomass, relative SPR and depletion time-series'.

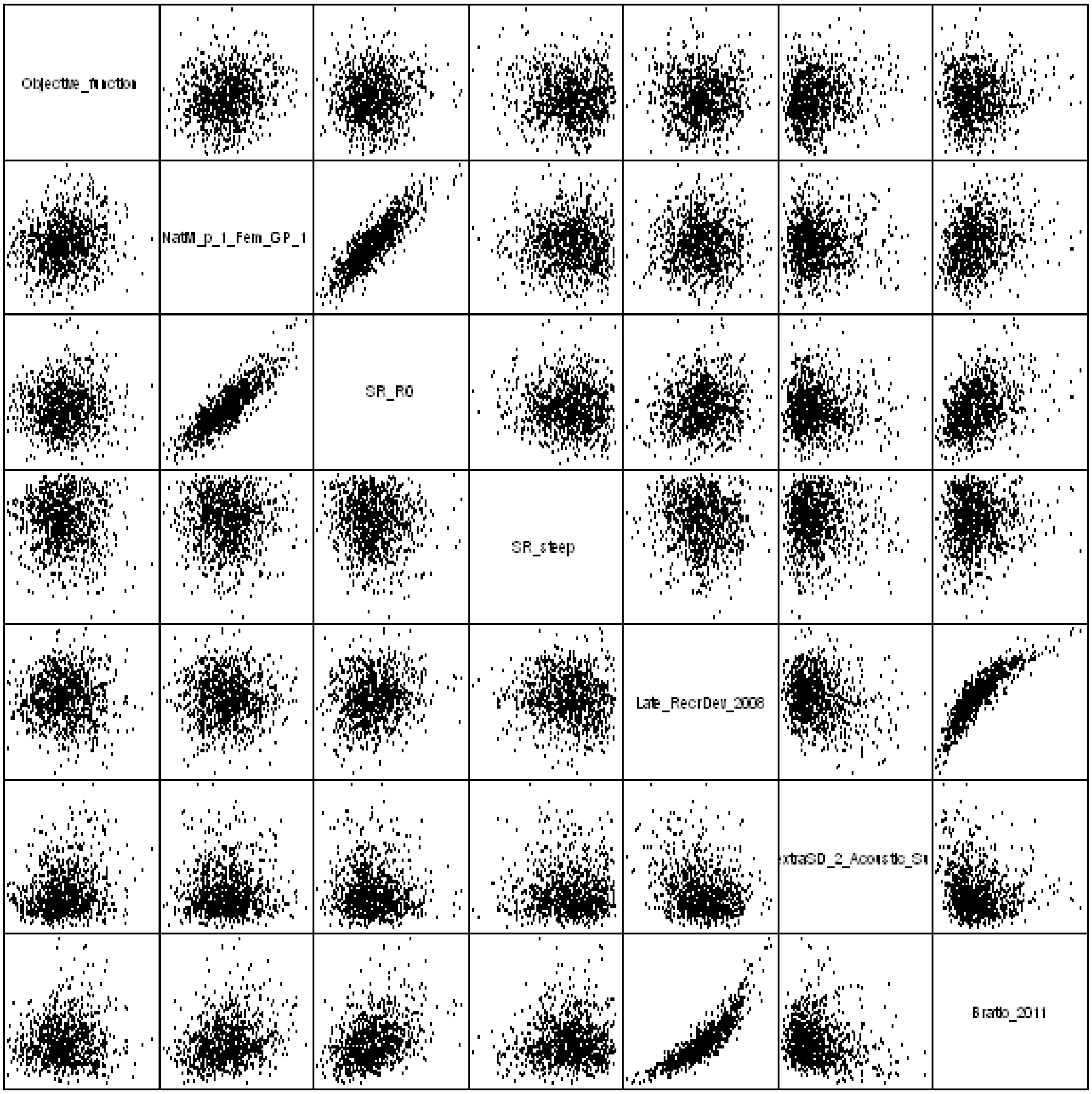


Figure 24. Posterior correlations among key SS model parameters and derived quantities. From the top left the posteriors plotted are: objective function, natural mortality, ln(R_0), Steepness, the 2008 recruitment deviation, the additional SD for the acoustic survey and the depletion level in 2011.

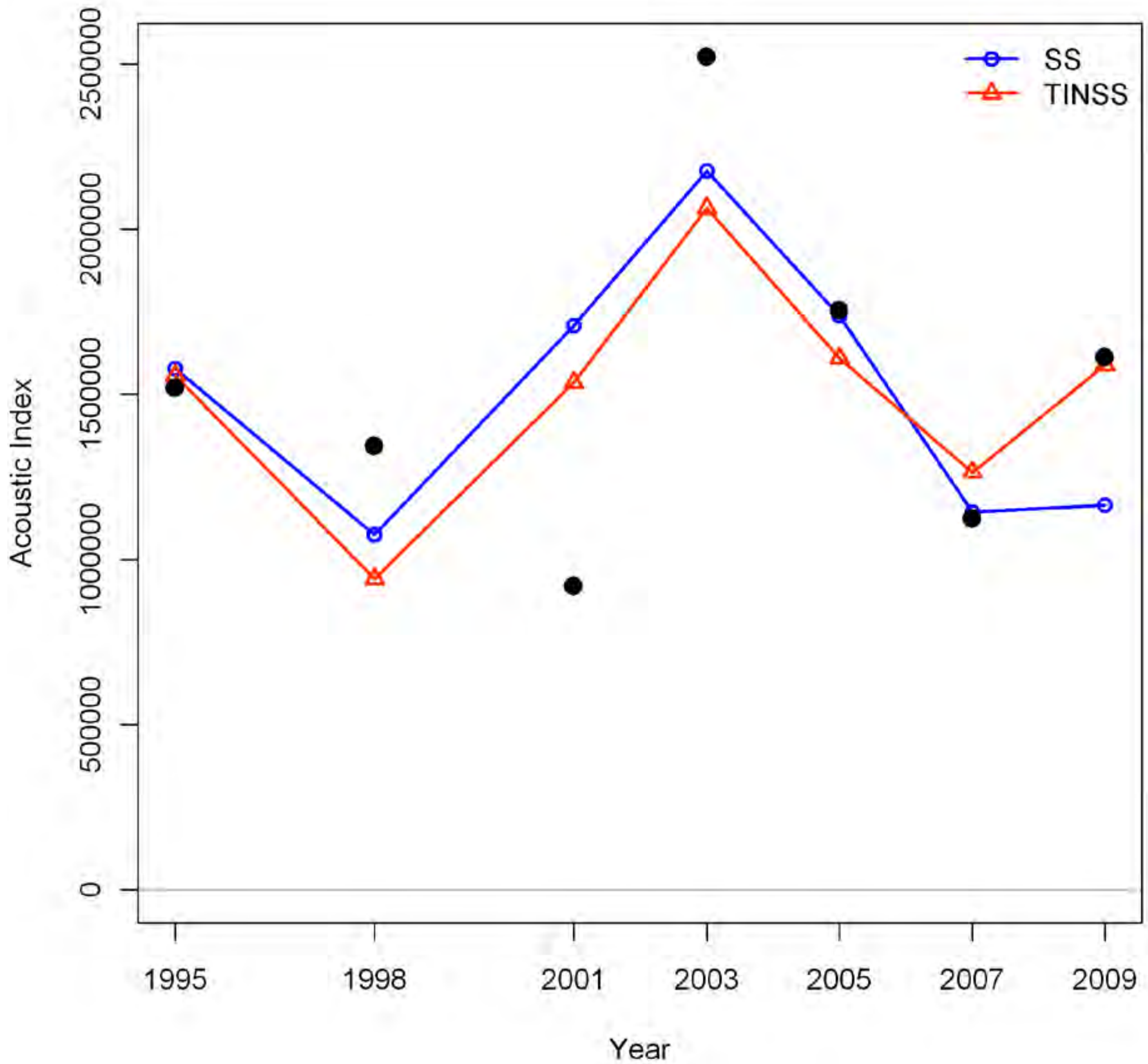


Figure 25. Predicted MLE fit to the acoustic survey biomass index for both models.

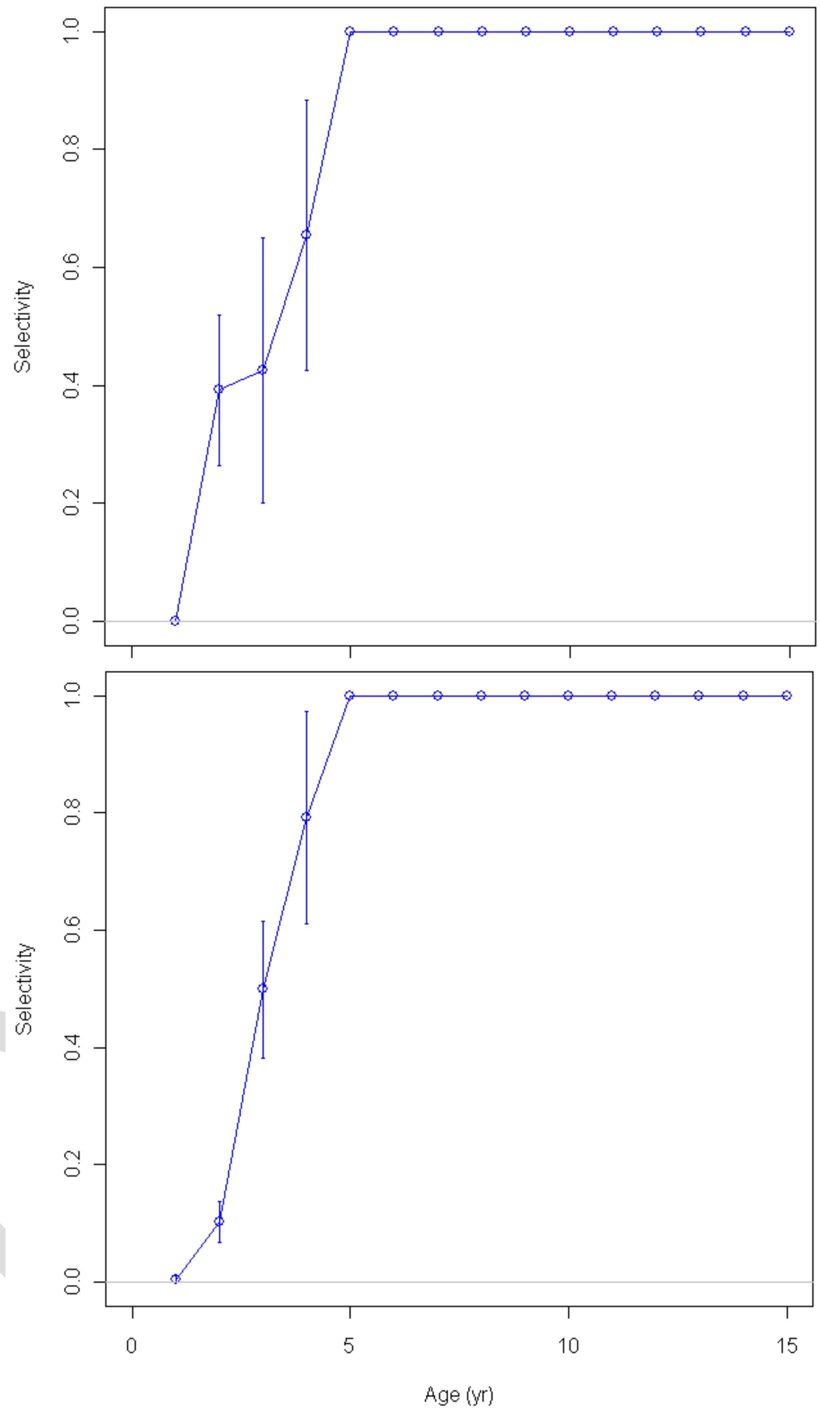


Figure 26. Estimated selectivity curves for the acoustic survey (upper panel) and fishery (lower panel) from the SS model. Vertical bars represent 95% confidence intervals about the MLE.

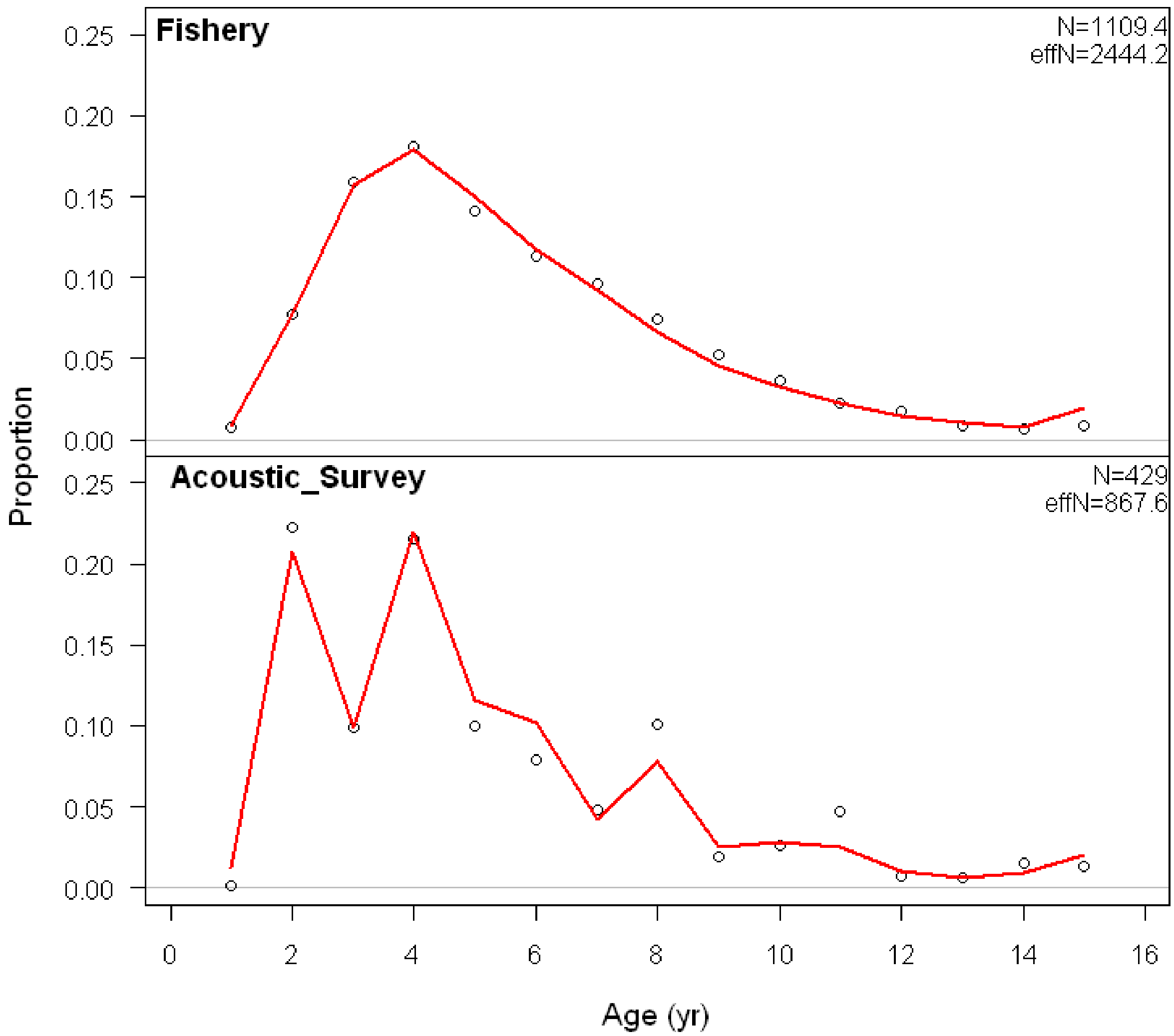


Figure 27. SS model fit to the aggregate fishery and acoustic age composition data.

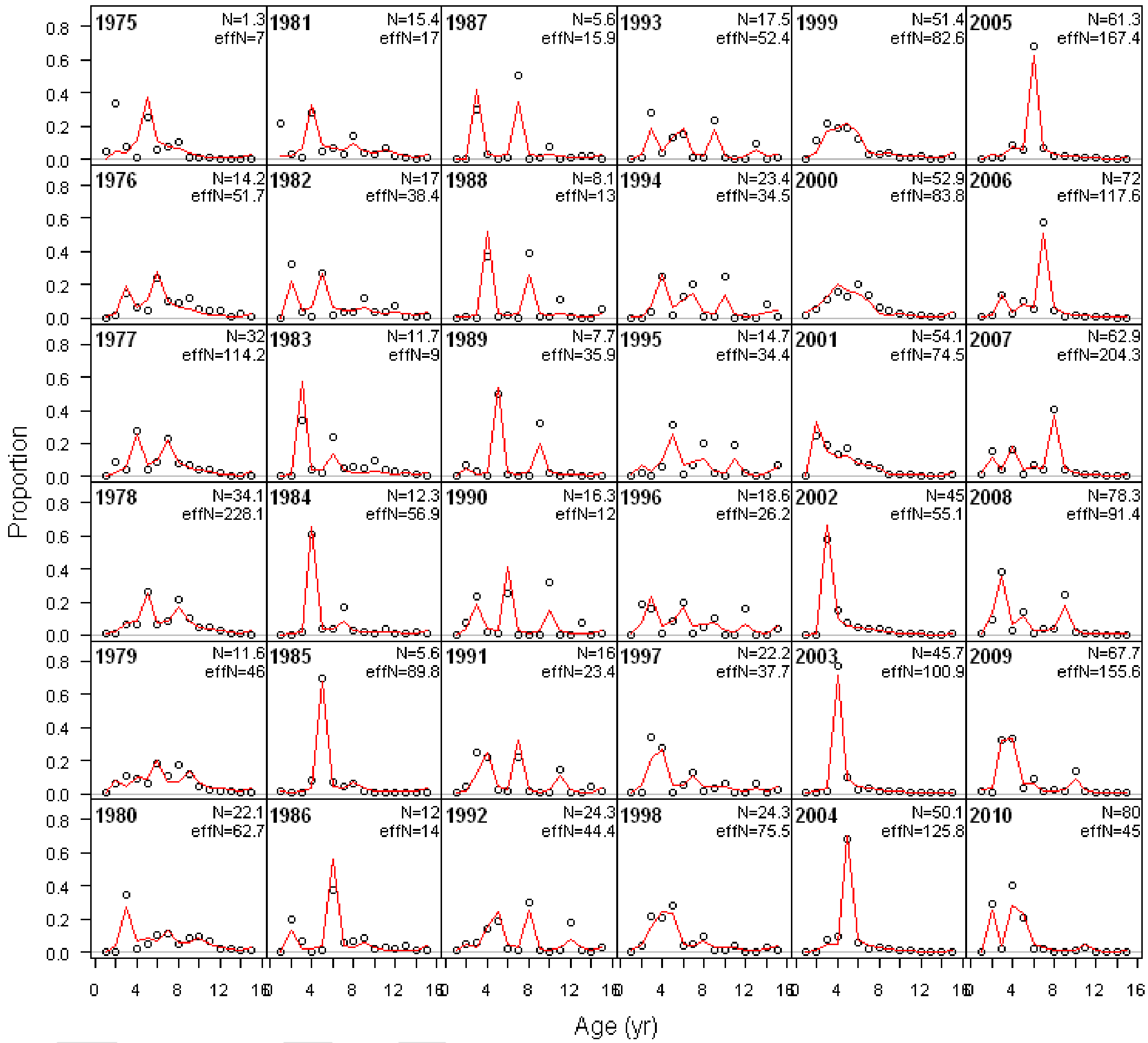


Figure 28. SS model fit to the observed fishery age composition data.

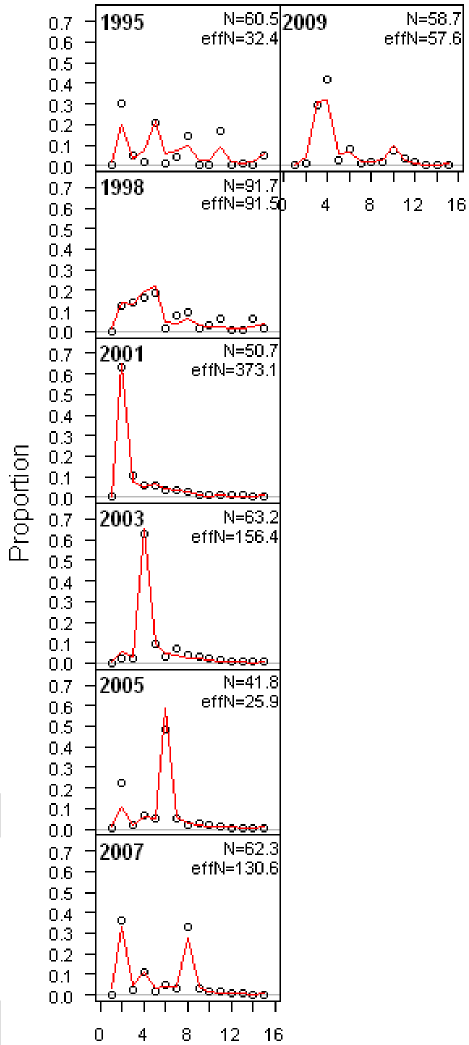


Figure 29. SS model fit to the observed acoustic survey age composition data.

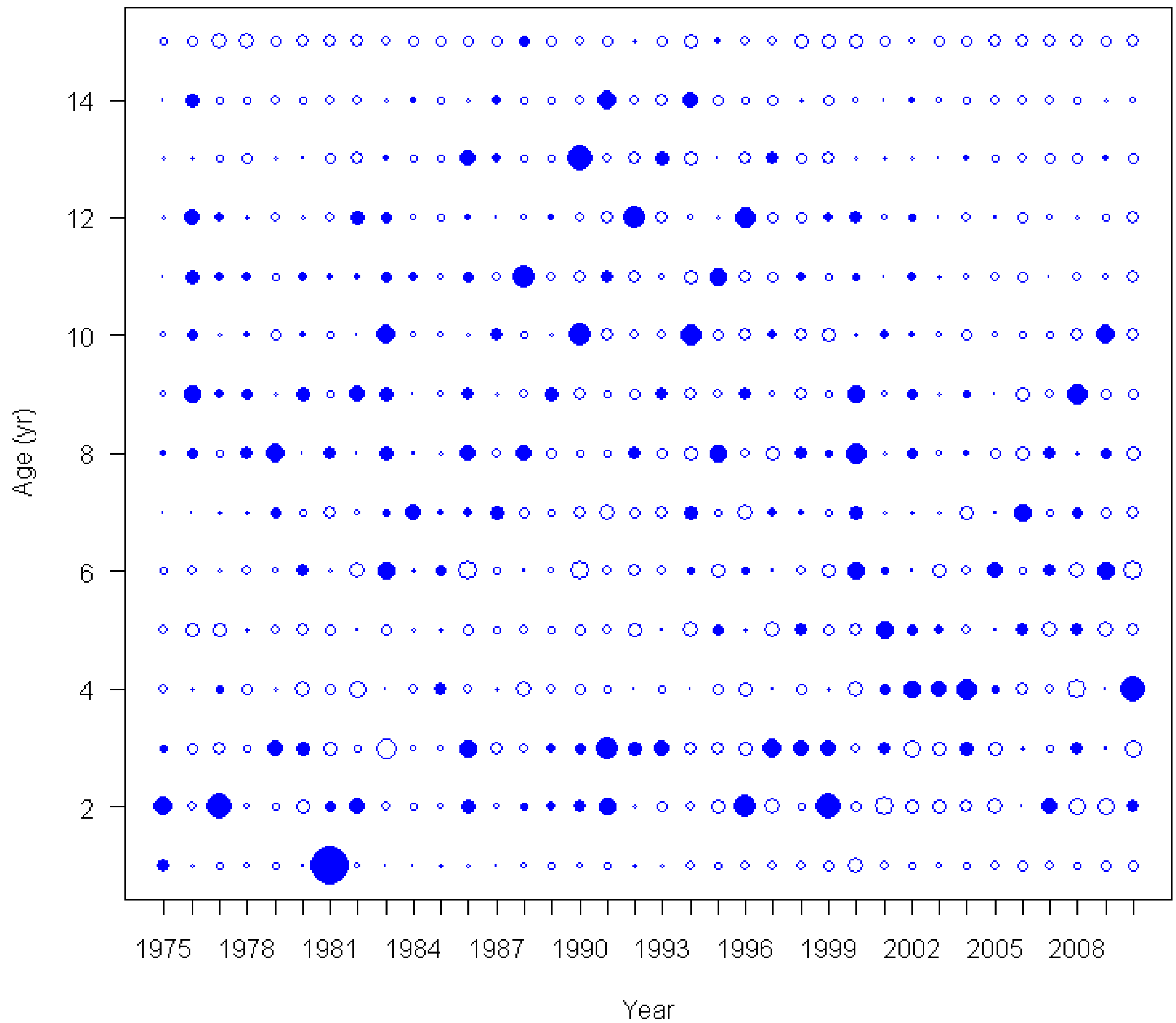


Figure 30. Pearson standardized residuals (observed - predicted) for SS model fits to the fishery age composition data. Maximum bubble size = 5.53; filled circles represent positive values.

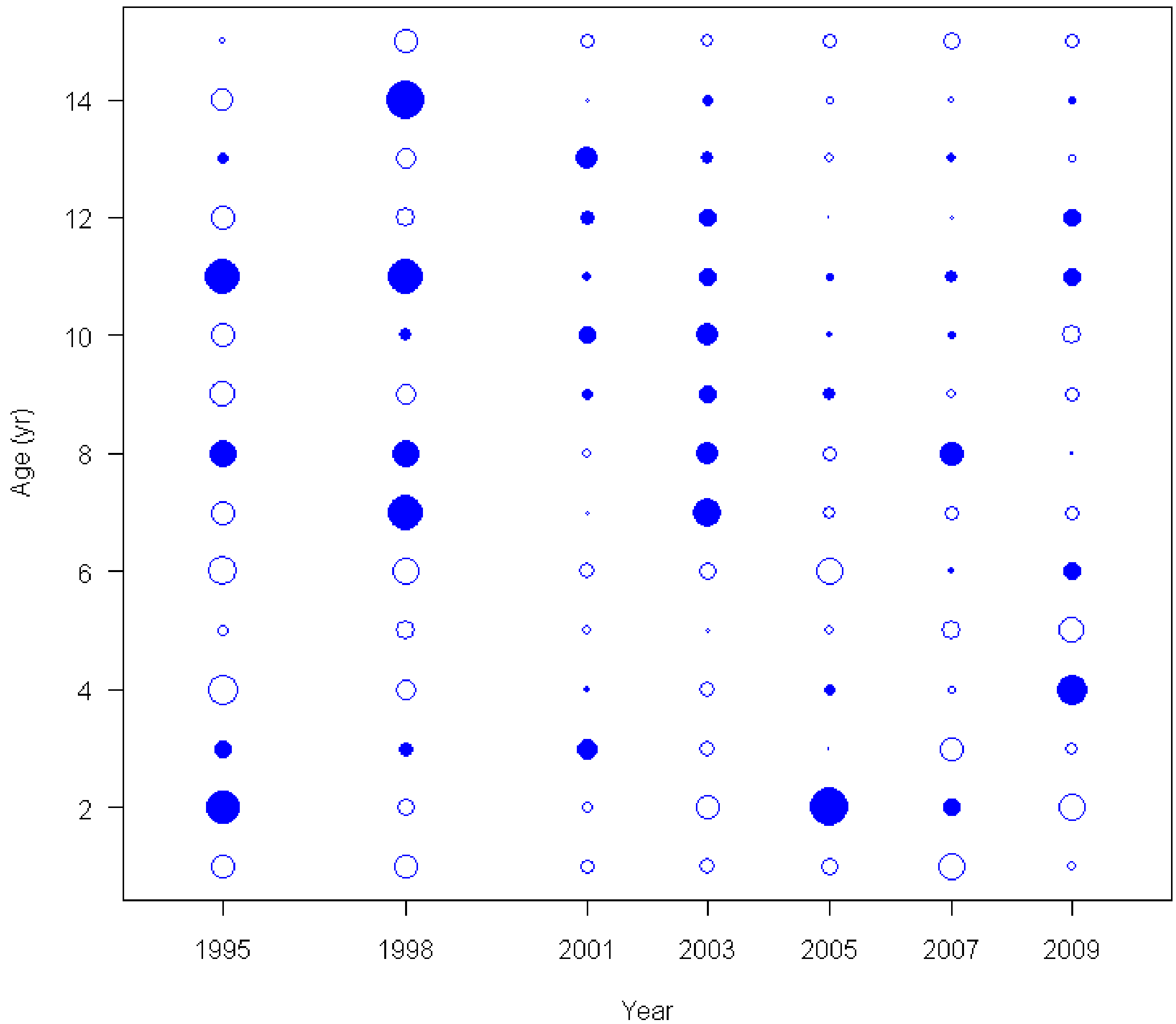


Figure 31. Pearson standardized residuals (observed - predicted) for SS model fits to the acoustic survey age composition data. Maximum bubble size = 2.7; filled circles represent positive values.

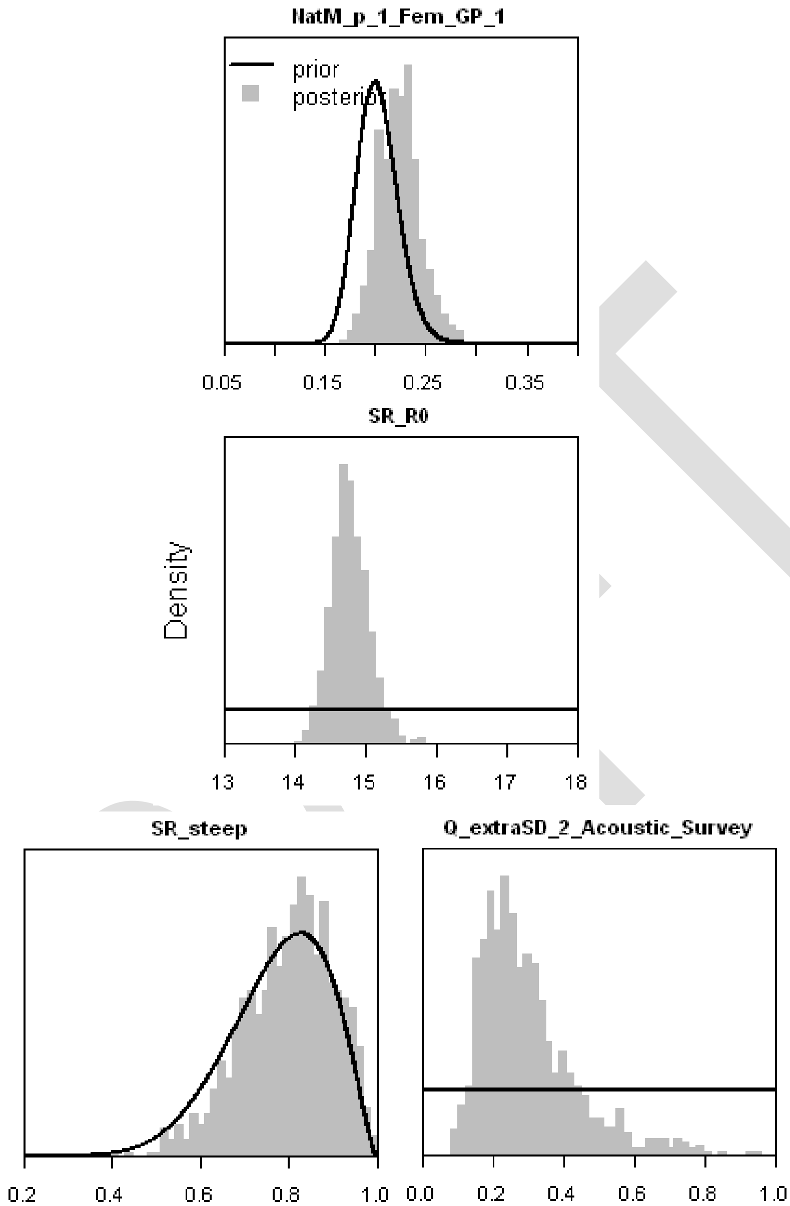


Figure 32. Prior and posterior probability distributions for key parameters in the SS model. From the top, the parameters are: Natural mortality, ln(R_0), steepness and the additional SD for the acoustic survey.

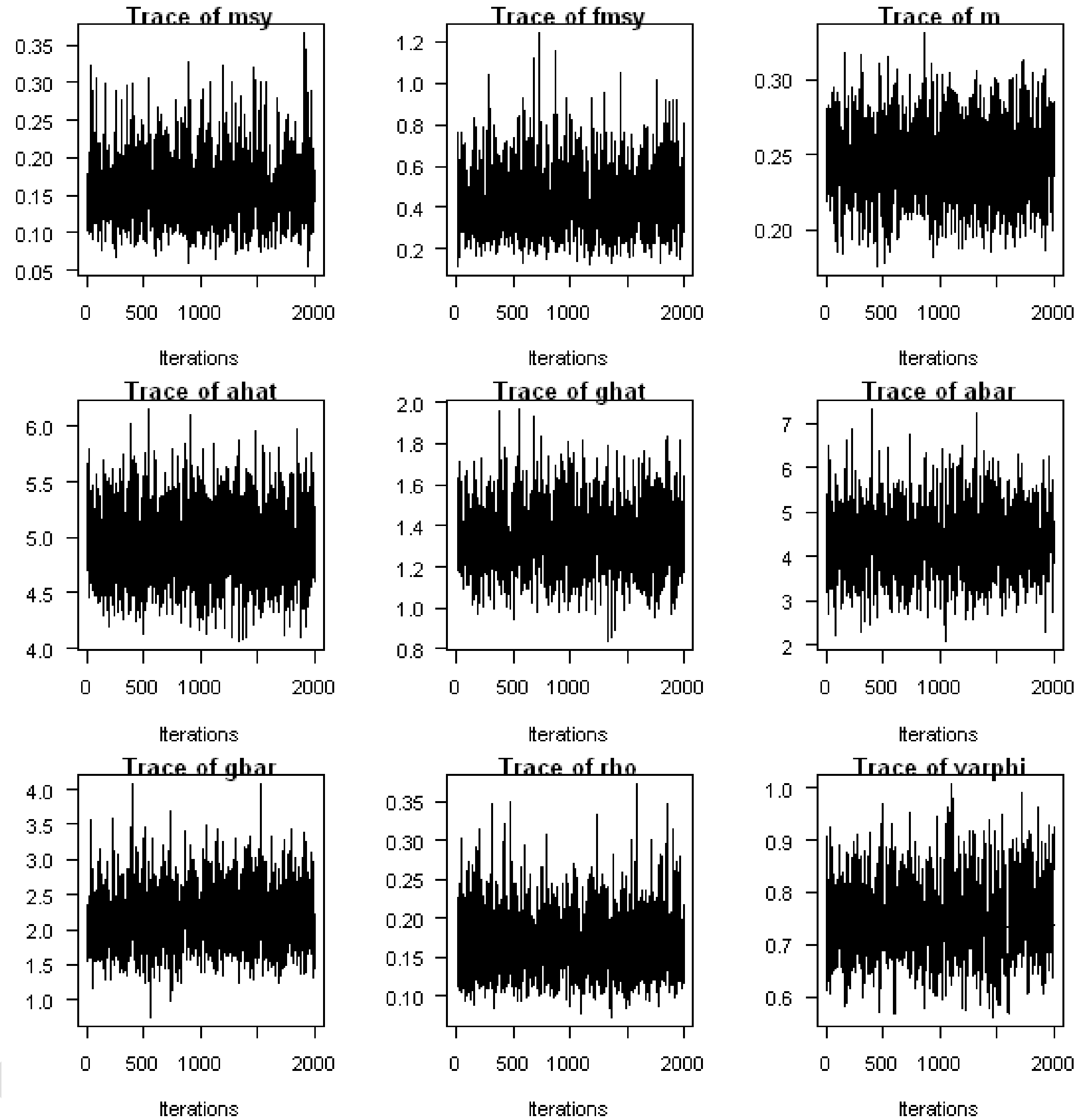


Figure 33. MCMC trace plots for key TINSS model parameters.

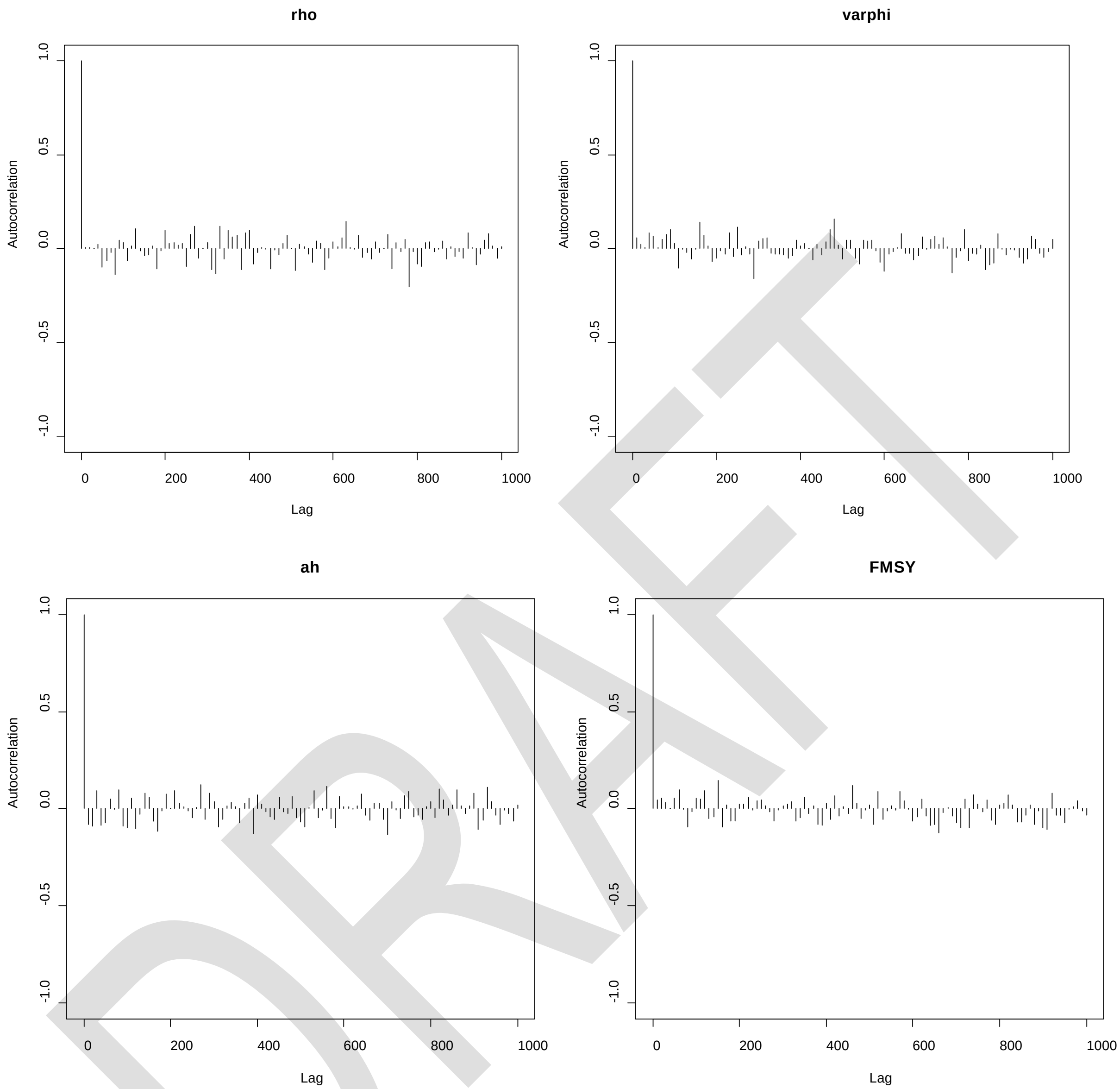


Figure 34. Autocorrelation plots for key TINSS model parameters (clockwise from top left): *rho*, *varphi*, $\hat{a}$ and F_{MSY}.

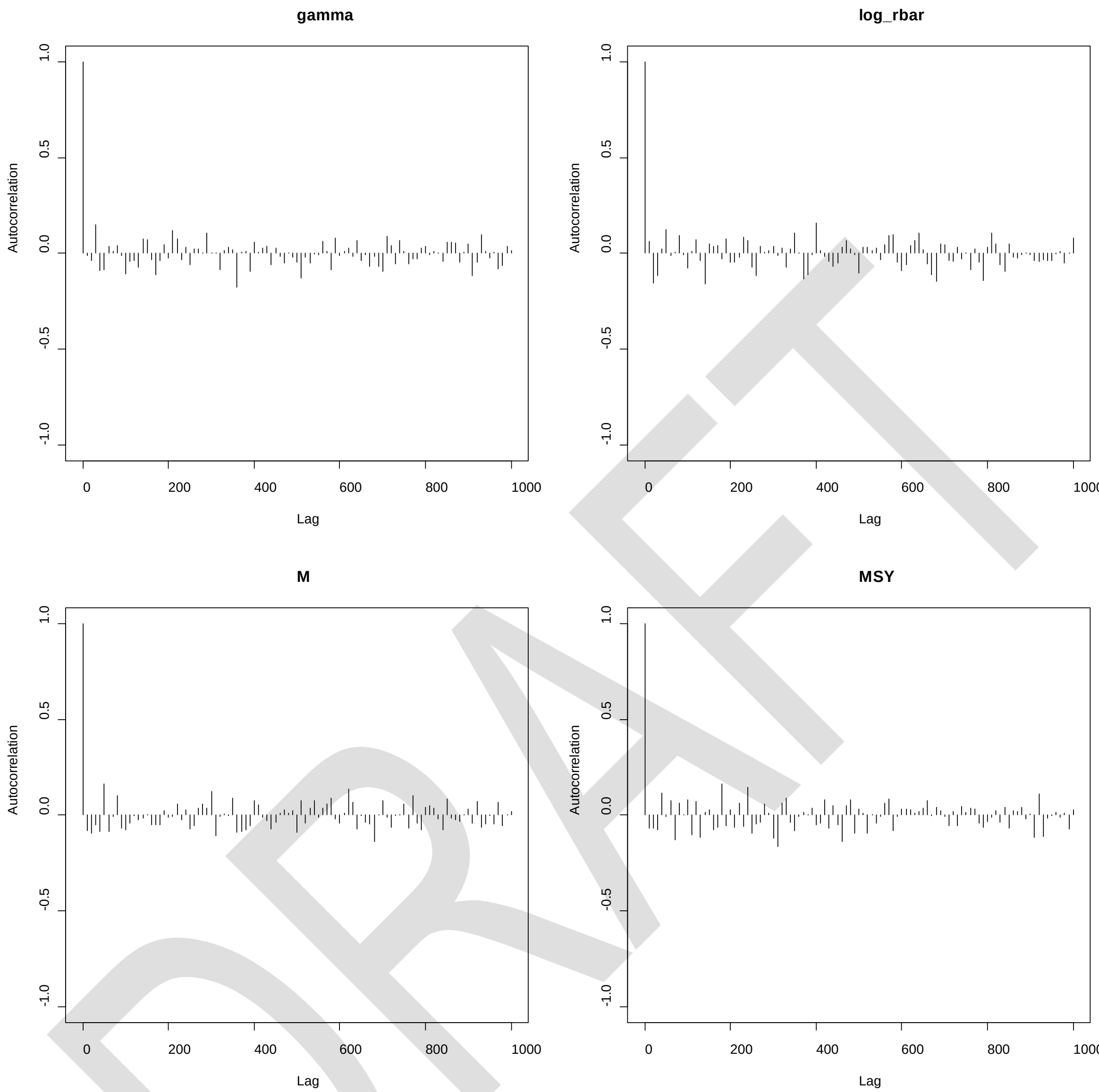


Figure 35. Autocorrelation plots for key TINSS model parameters (clockwise from top left): $\hat{\lambda}$, $\ln \overline{R}$, *M,* and *MSY*.

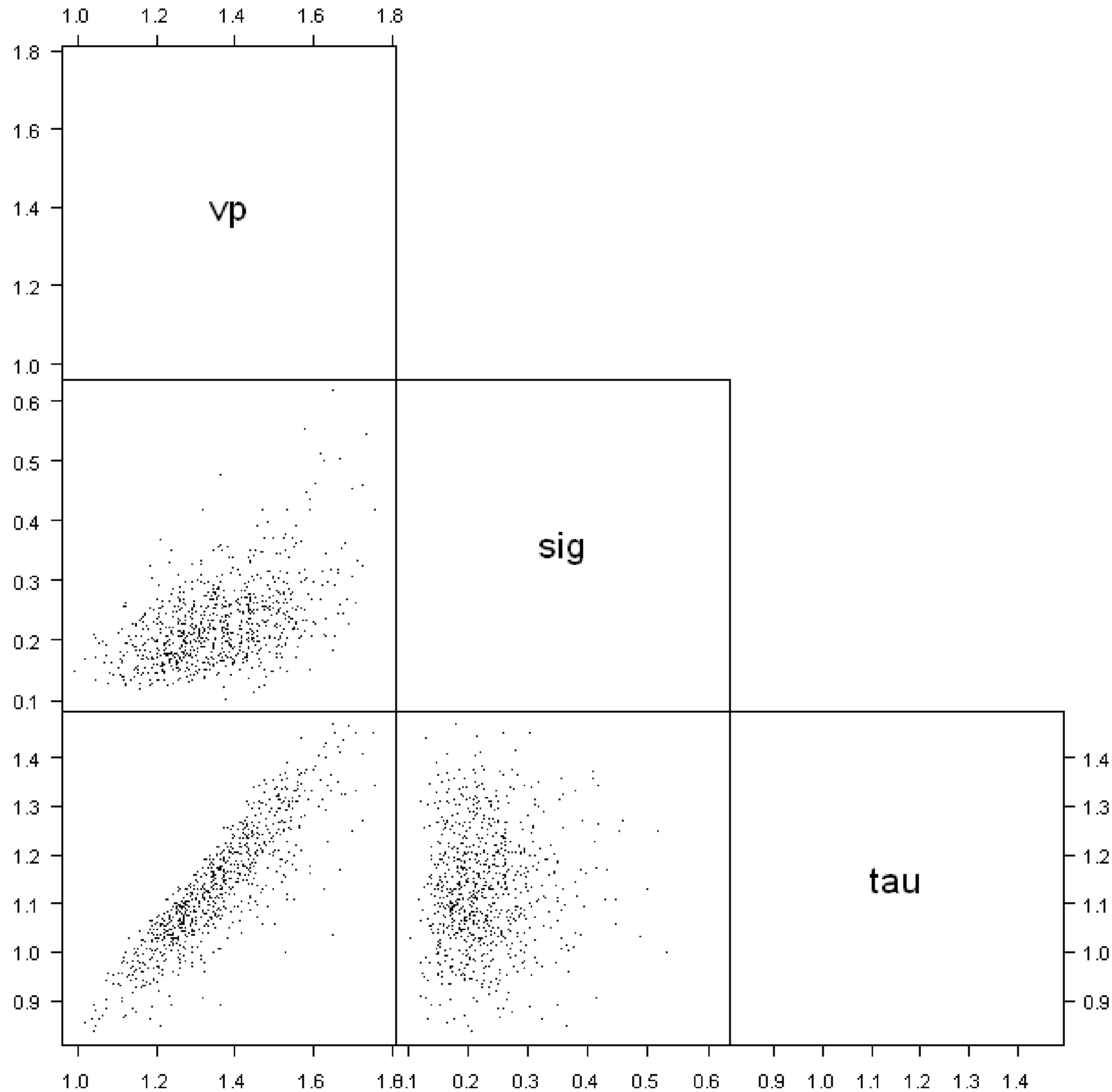


Figure 36. Posterior correlations among key TINSS variance parameters.

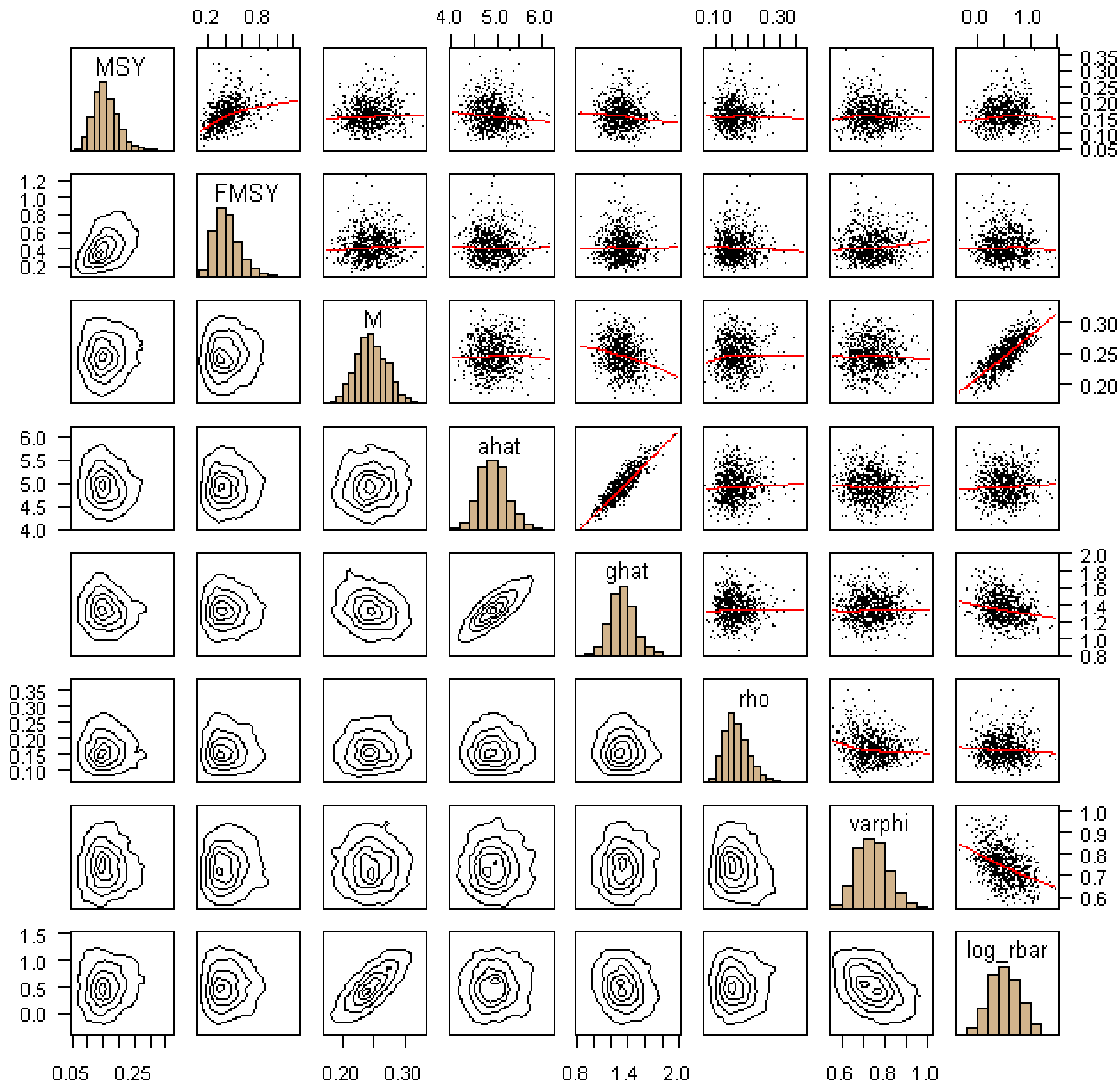


Figure 37. Additional posterior correlations among key TINSS parameters.

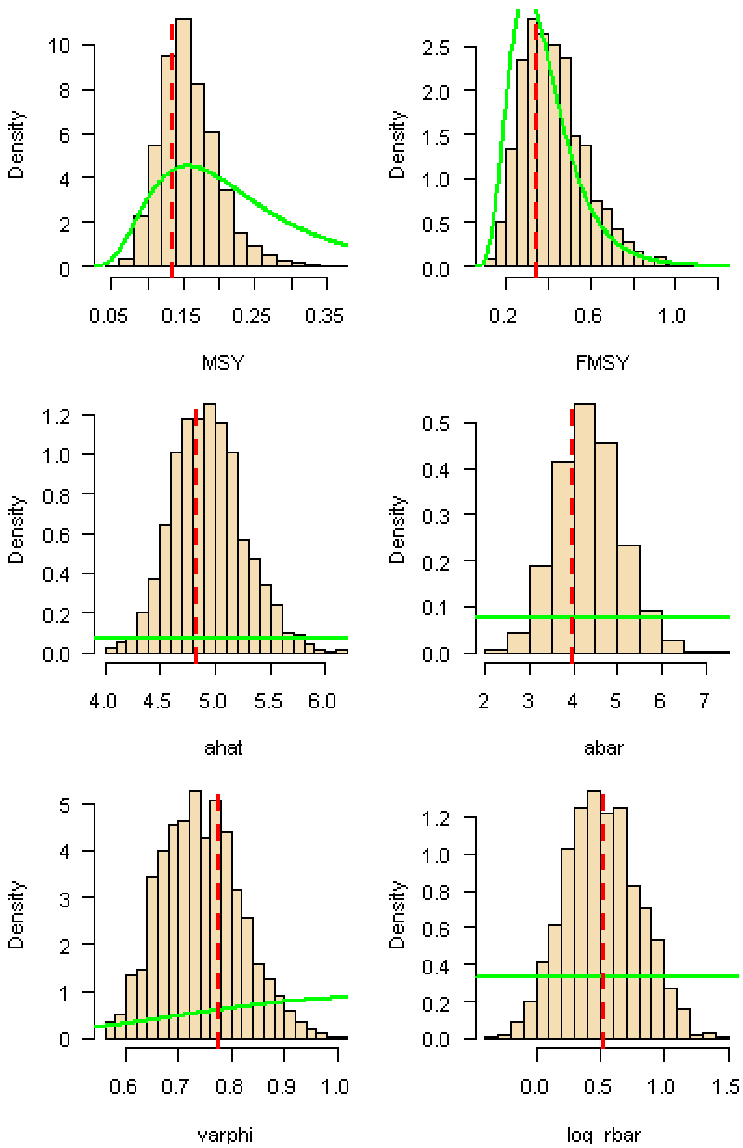


Figure 38. Prior and posterior probability distributions for key parameters in the TINSS model. Lines indicate the prior distribution, bars the posterior density. Vertical dashed lines the MLE estimates.

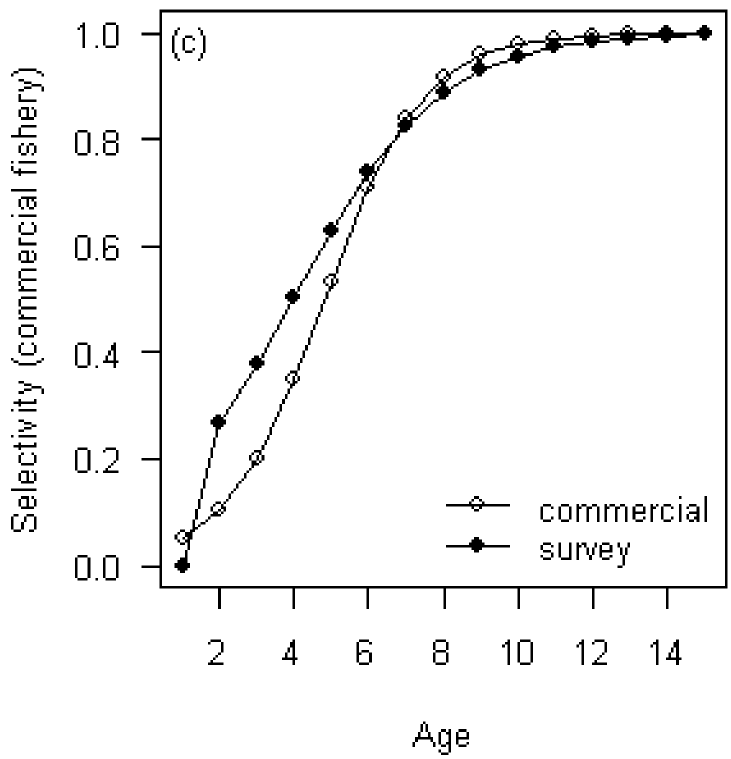


Figure 39. Estimated selectivity curve for the fishery and fixed selectivity curve for the acoustic survey from the TINSS model.

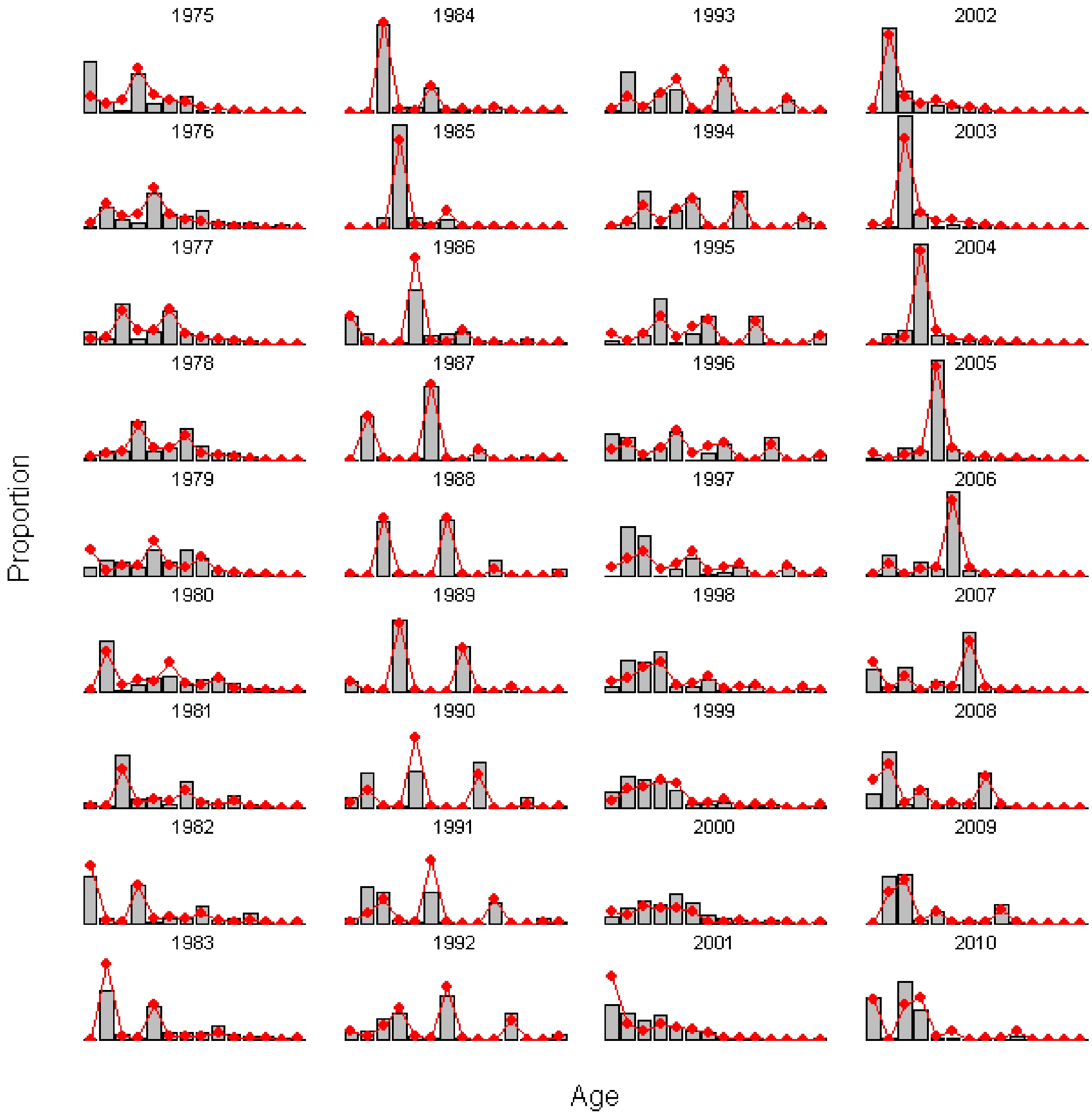


Figure 40. TINSS model fit to the observed fishery age composition data.

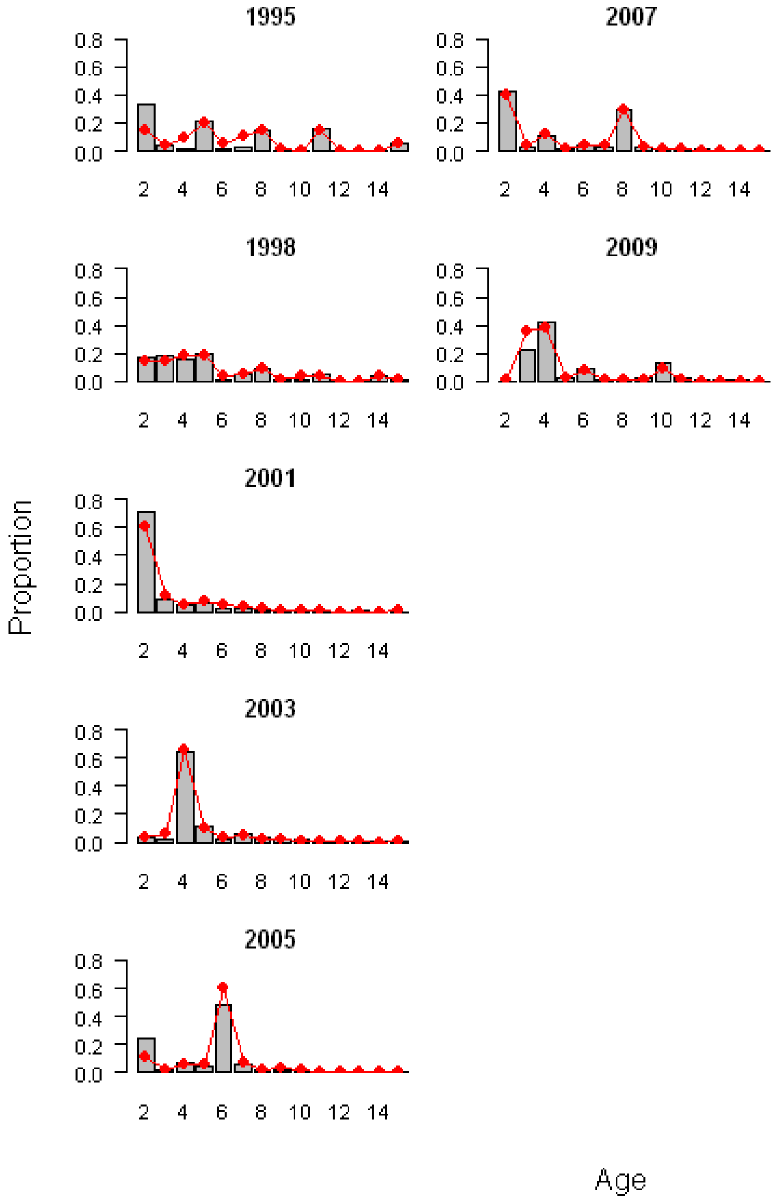


Figure 41. TINSS model fit to the observed acoustic survey age composition data.

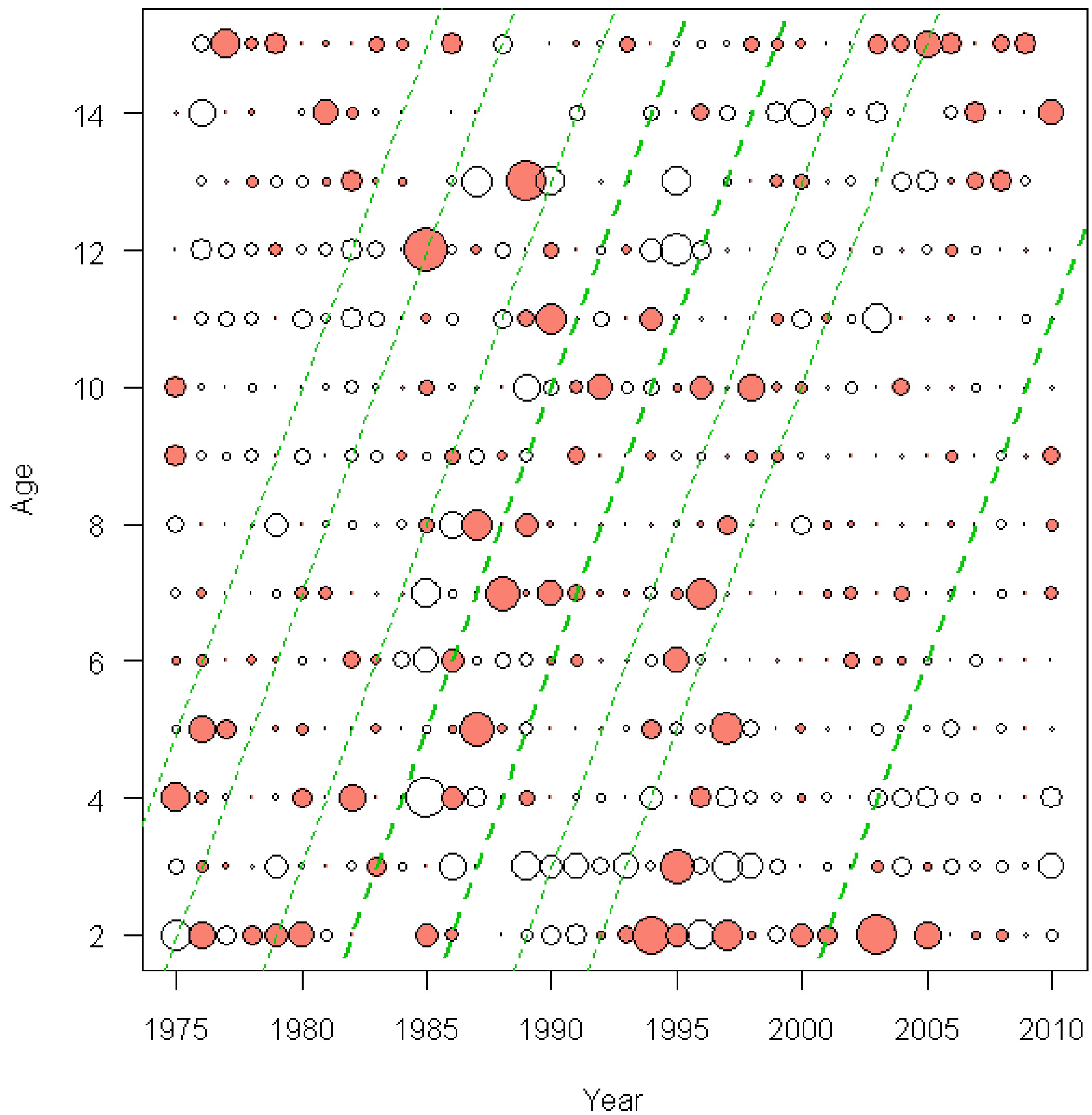


Figure 42. Residuals (filled bubbles denote negative values) for TINSS model fits to the fishery age composition data.

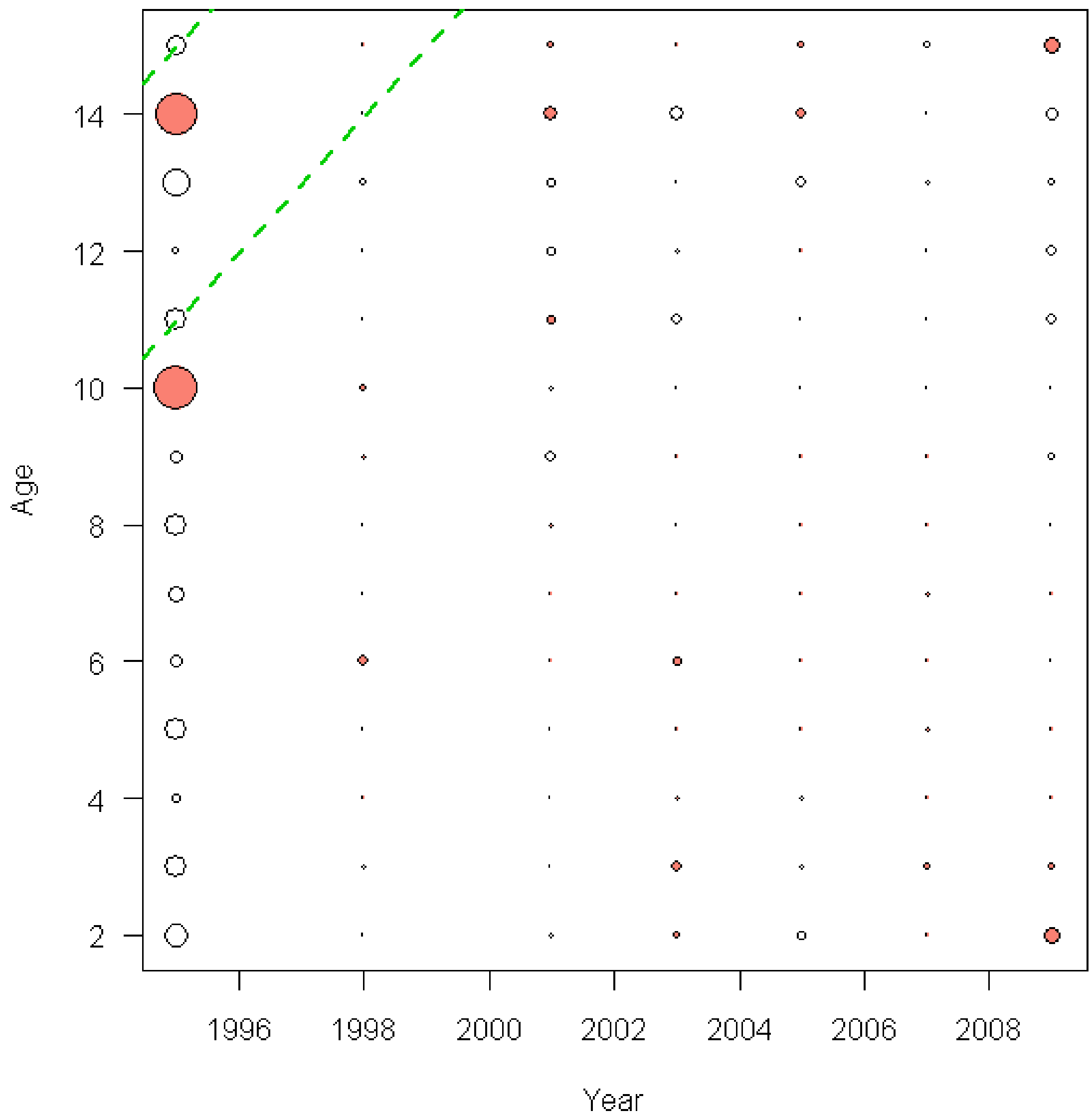


Figure 43. Residuals (filled bubbles denote negative values) for TINSS model fits to the acoustic survey age composition data.

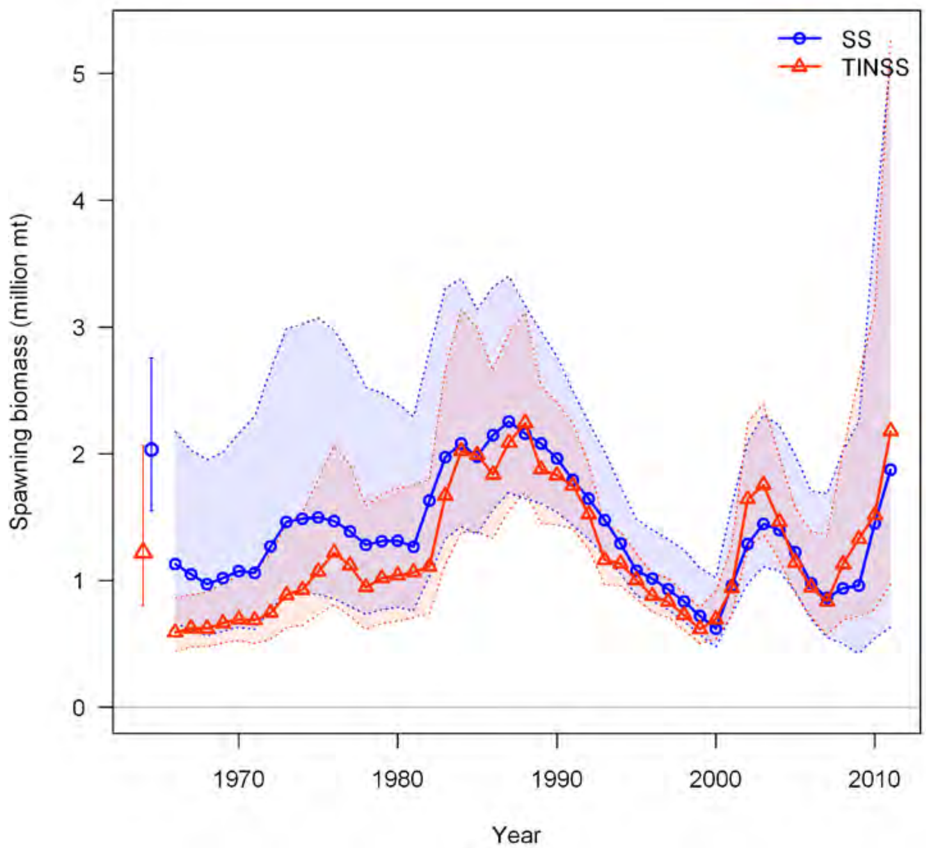


Figure 44. Posterior female spawning biomass time-series for both models with 95% posterior credibility intervals.

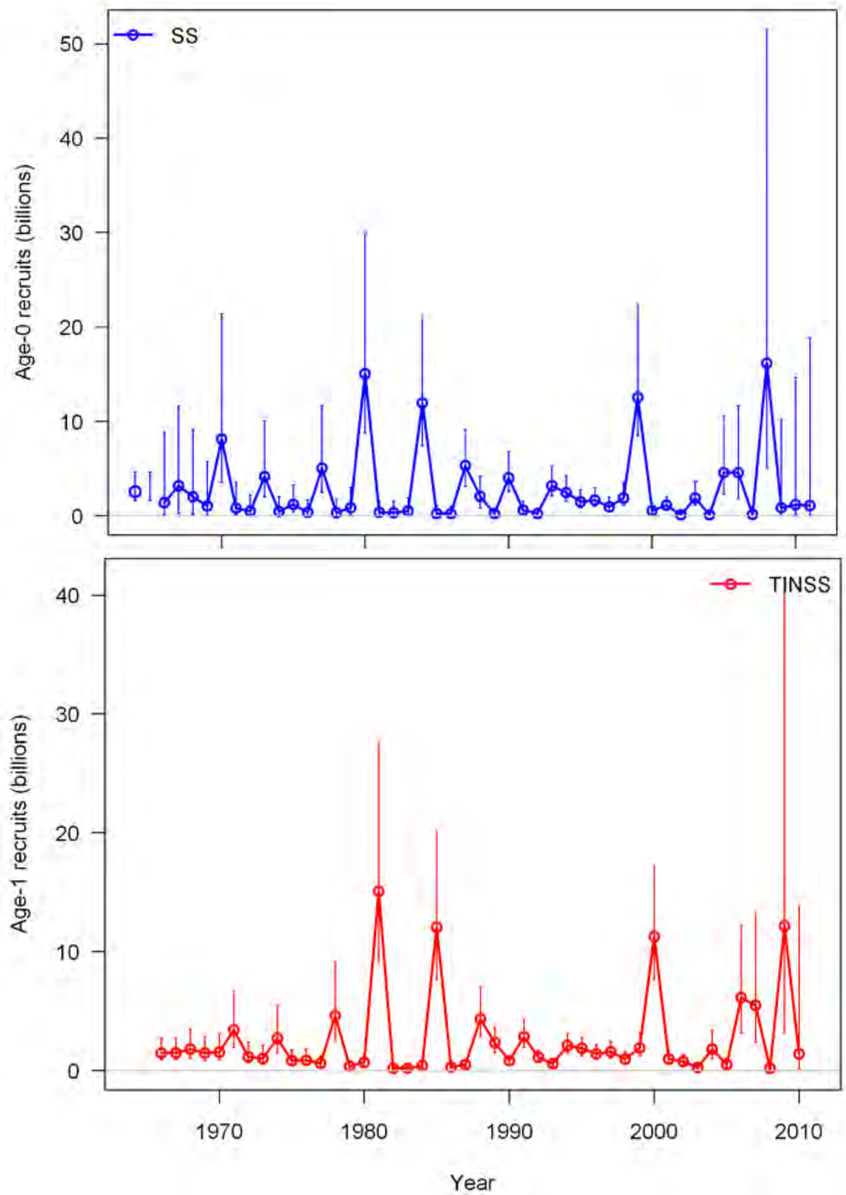


Figure 45. Posterior recruitment time-series for both models (age-0 for SS, upper panel; age-1 for TINSS, lower panel) with 95% posterior credibility intervals.

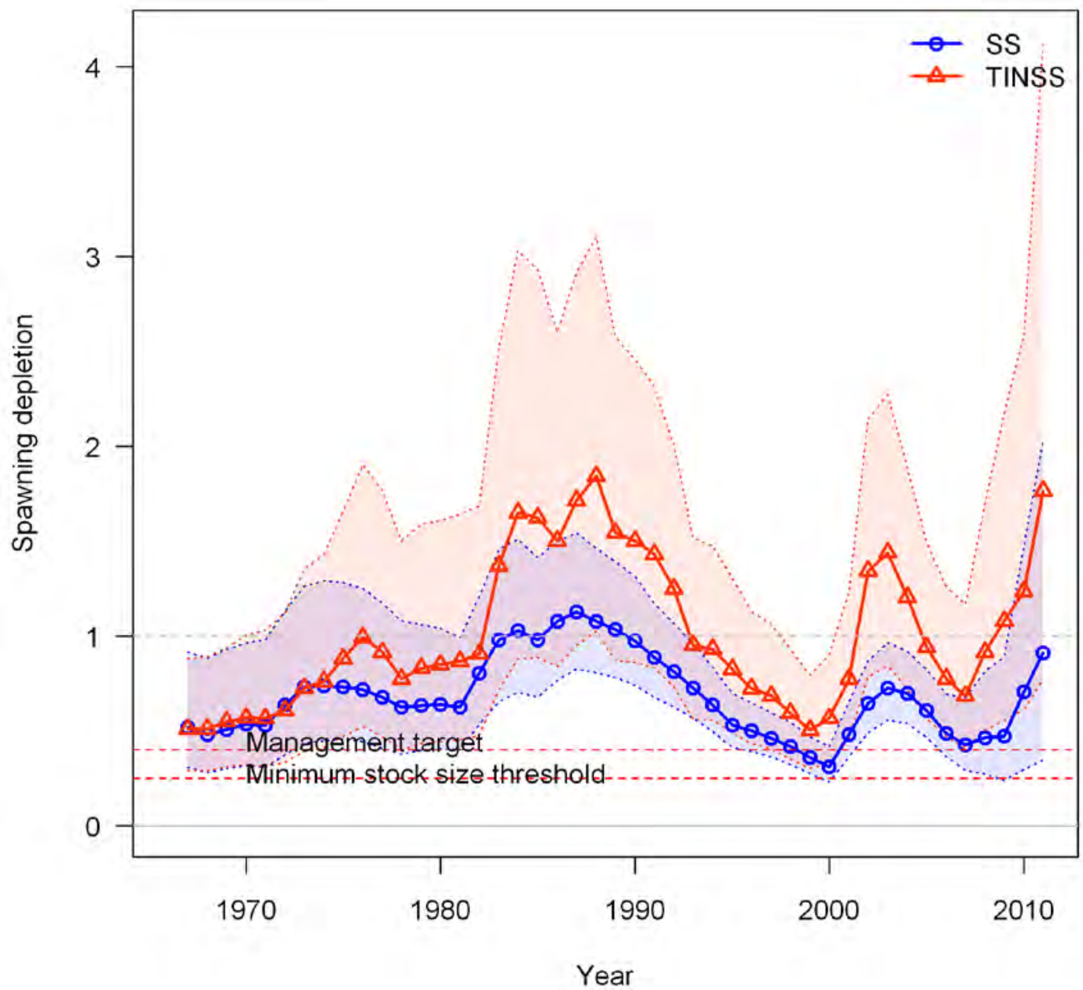


Figure 46. Time-series of posterior relative depletion for both models.

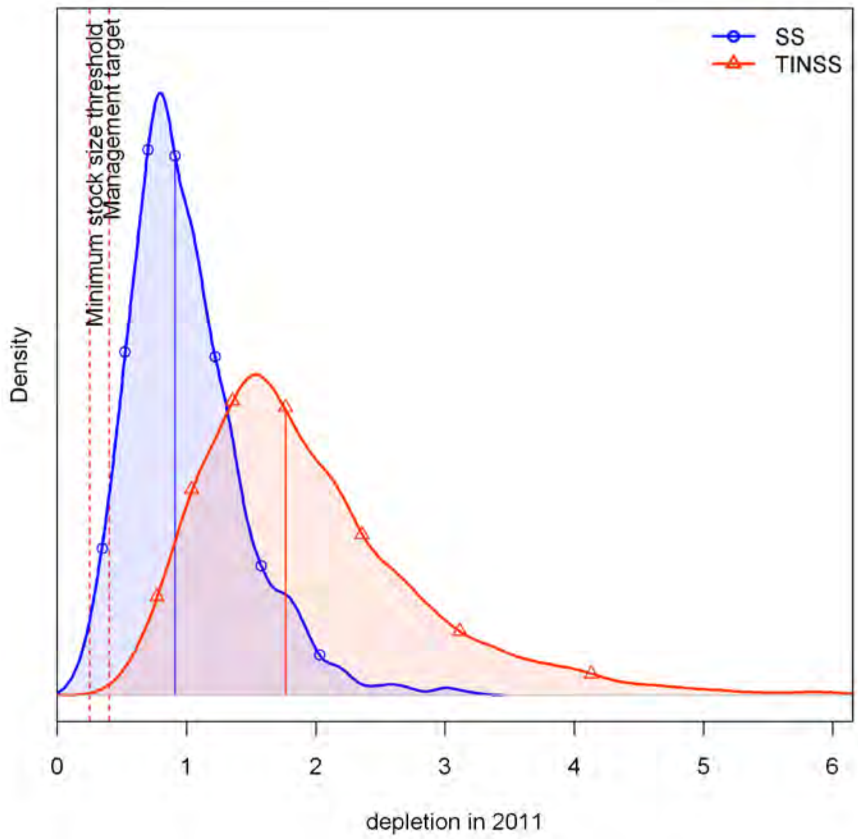


Figure 47. Comparison of posterior probability distributions for 2011 relative depletion for both models.

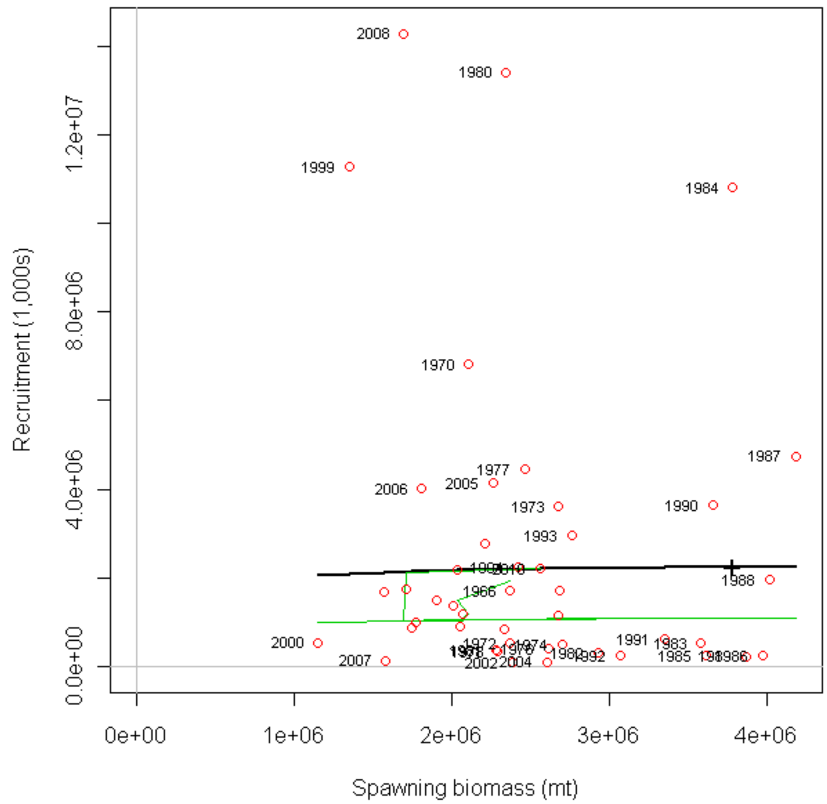


Figure 48. Estimated (MLE) stock-recruit relationship for the SS model.

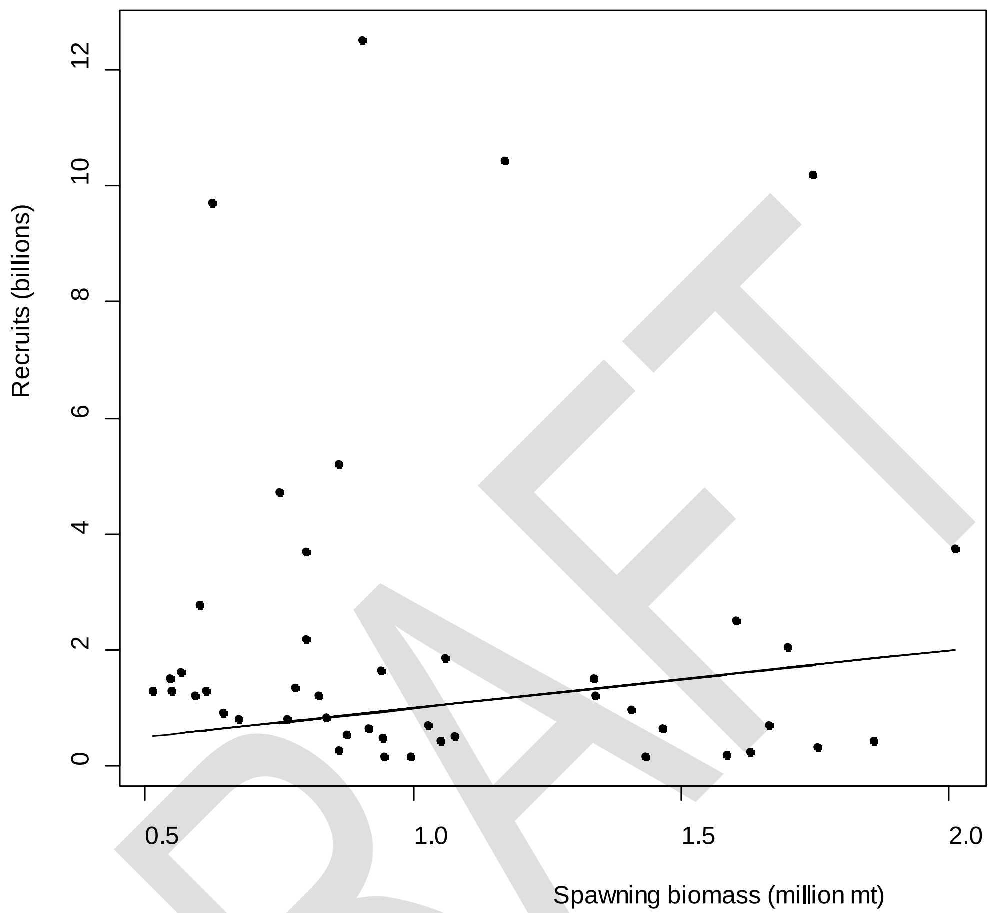


Figure 49. Estimated stock-recruit relationship for the TINSS model.

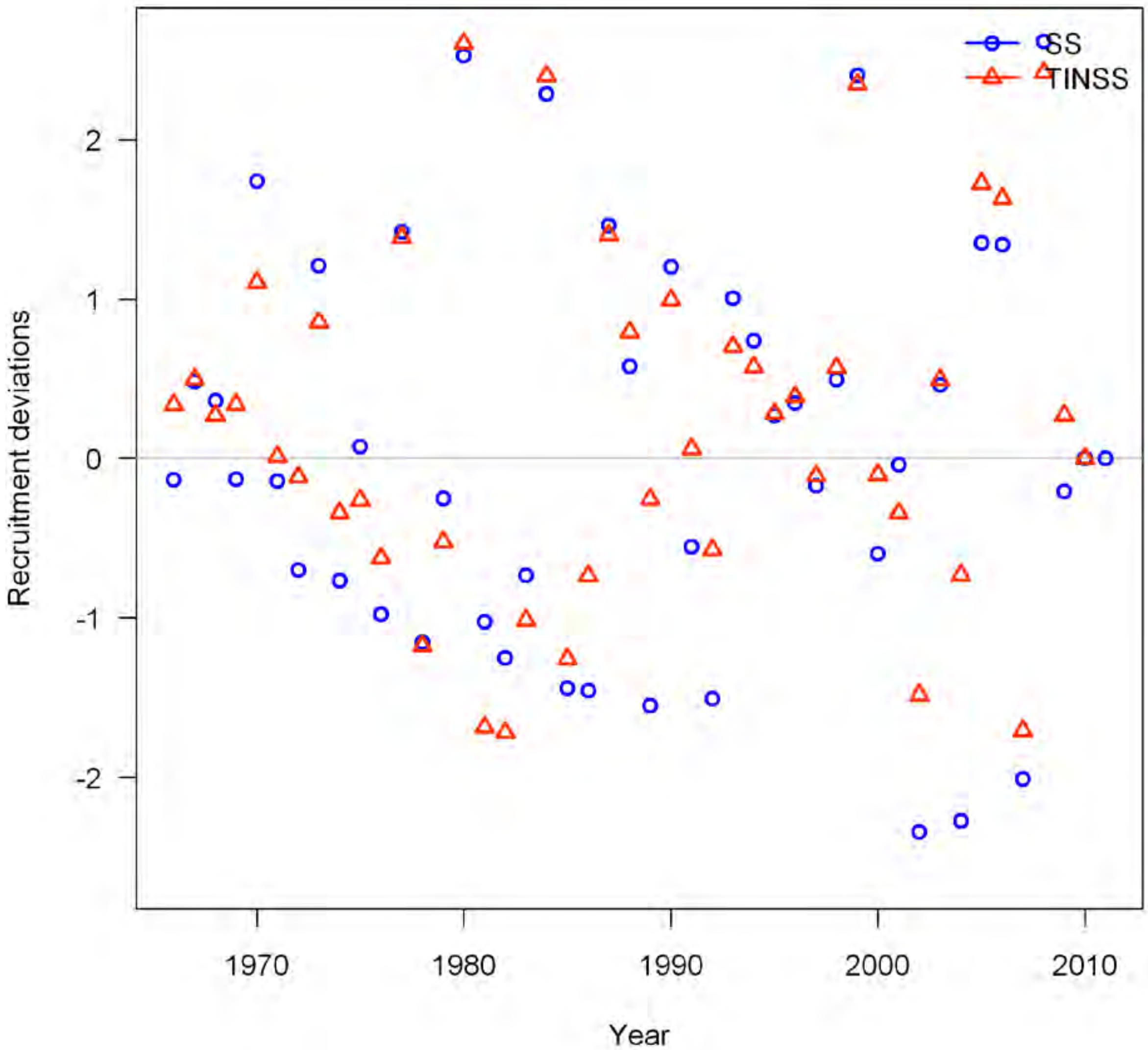


Figure 50. Comparison of the time-series recruitment deviations in both models.

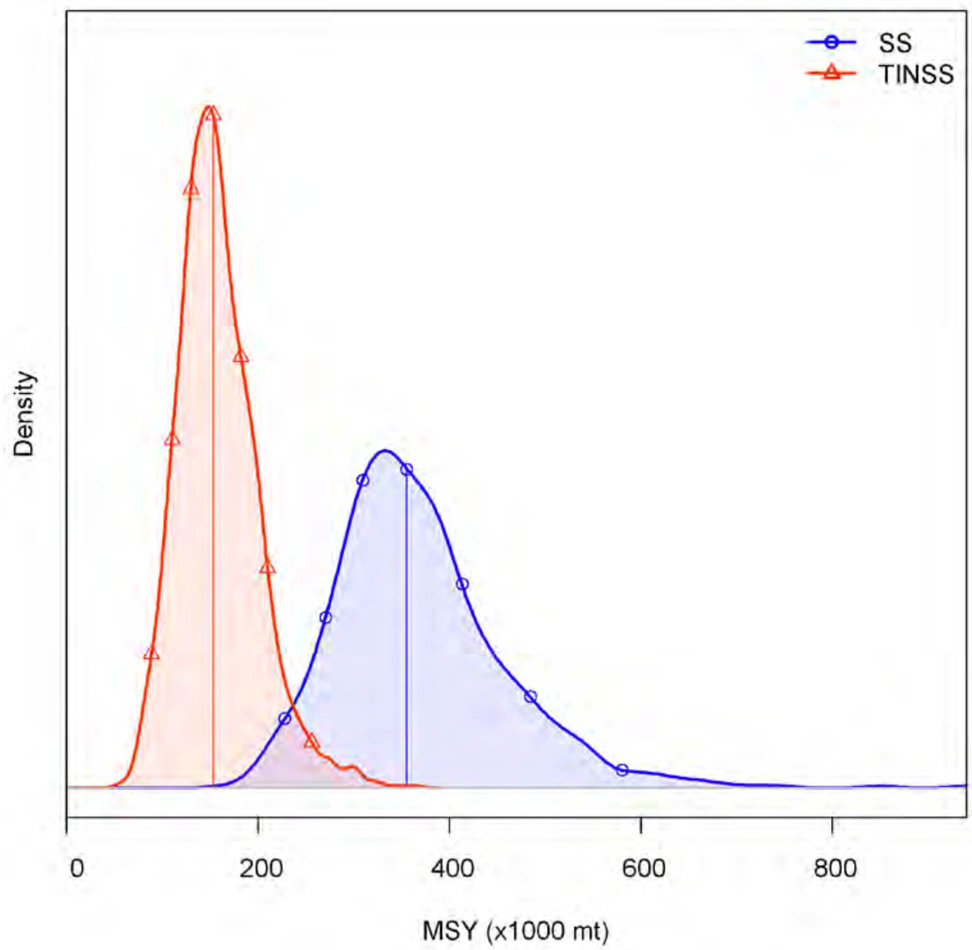


Figure 51. Comparison of posterior probability distributions for MSY for both models.

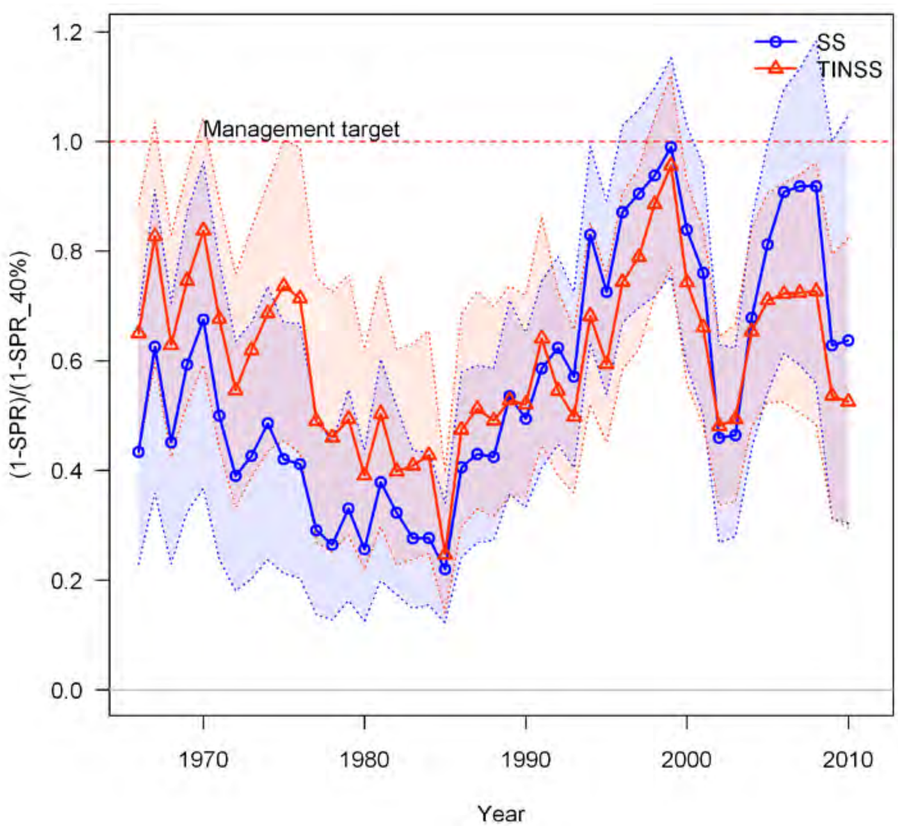


Figure 52. Time-series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) for both models.

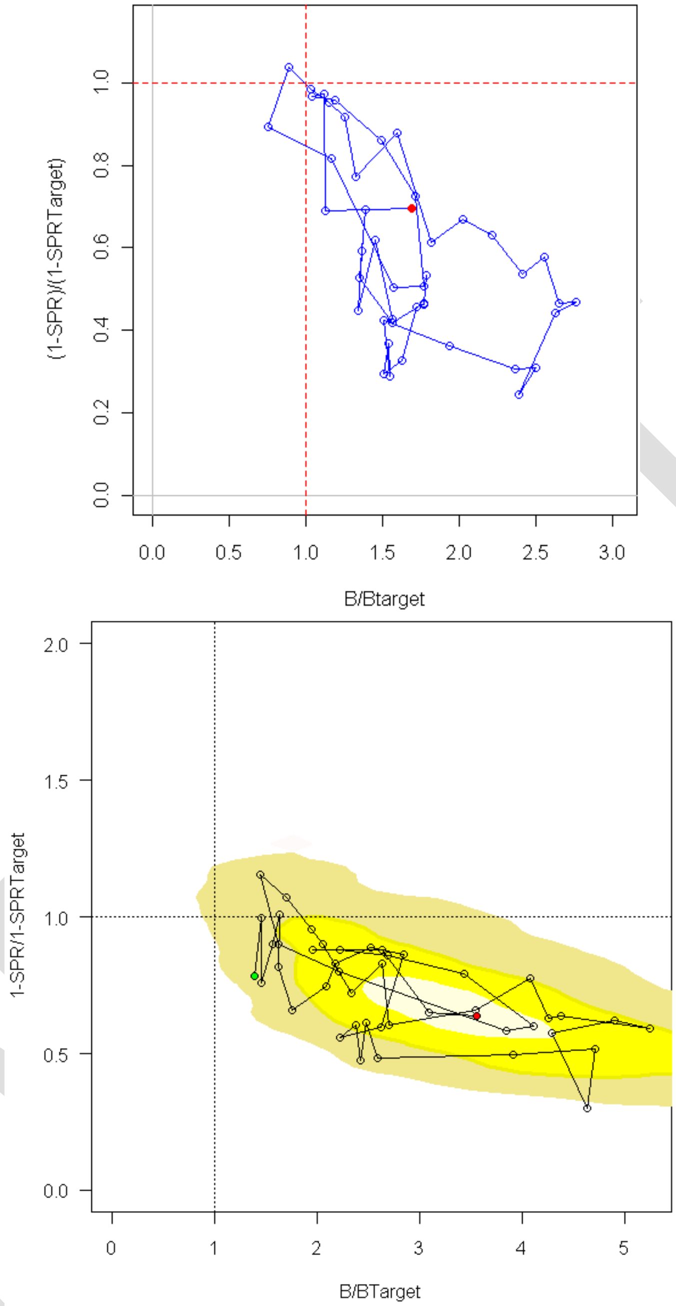


Figure 53. Temporal pattern (phase plot) of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.4}$) vs. estimated spawning biomass relative to the proxy 40% level through 2010 for the SS model (upper panel, note this calculation is based on the MLE). Lower panel shows relative spawning potential ratio (1-SPR/1-SPR_{MSY}) vs. estimated spawning biomass relative to the B_{MSY} level through 2010 for the TINSS model. The filled circle denotes 2010 and the line connects years through the time-series.

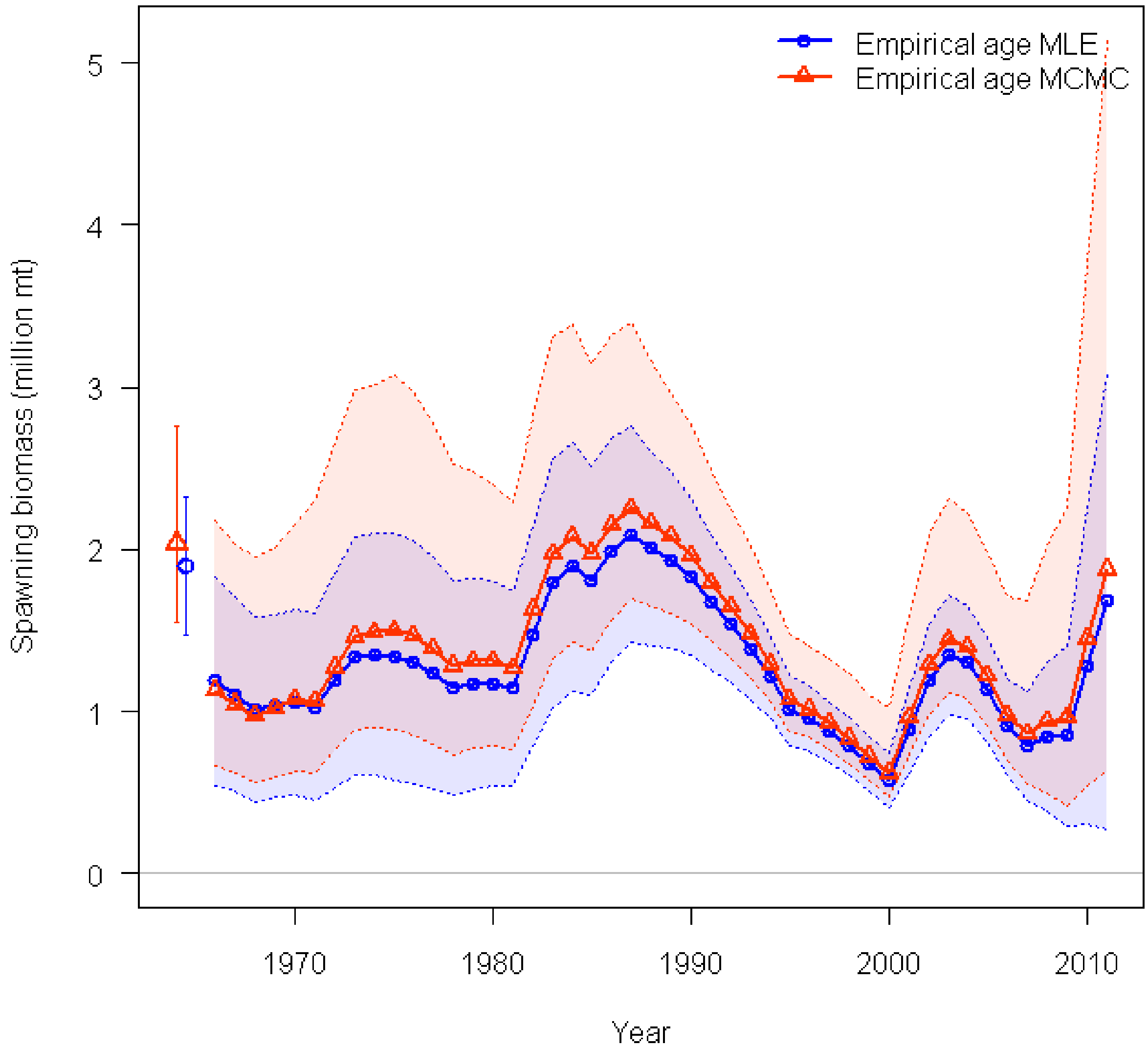


Figure 54. Comparison of maximum likelihood estimates and Bayesian posterior median results for spawning biomass from the SS model.

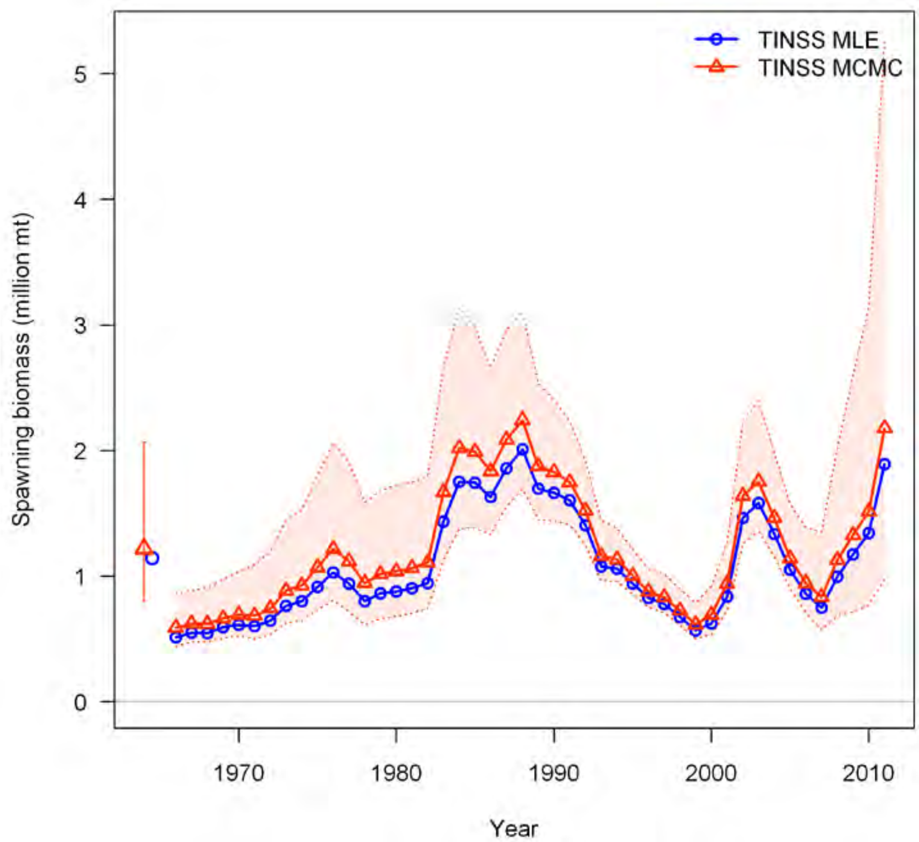


Figure 55. Comparison of maximum likelihood estimates and Bayesian posterior median results for spawning biomass from the TINSS model.

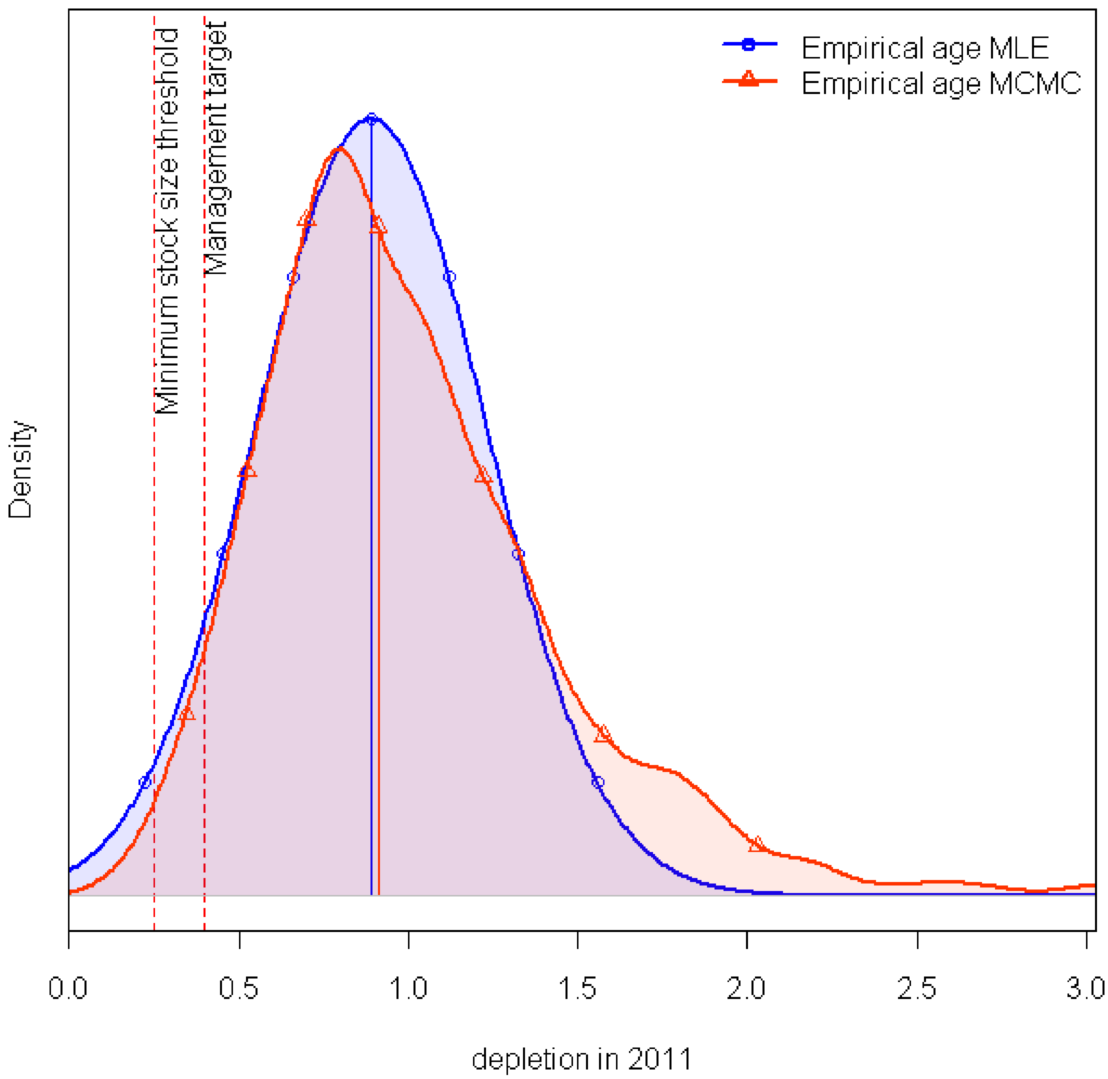


Figure 56. Comparison of maximum likelihood estimates and Bayesian posterior median results for current relative depletion from the SS model.

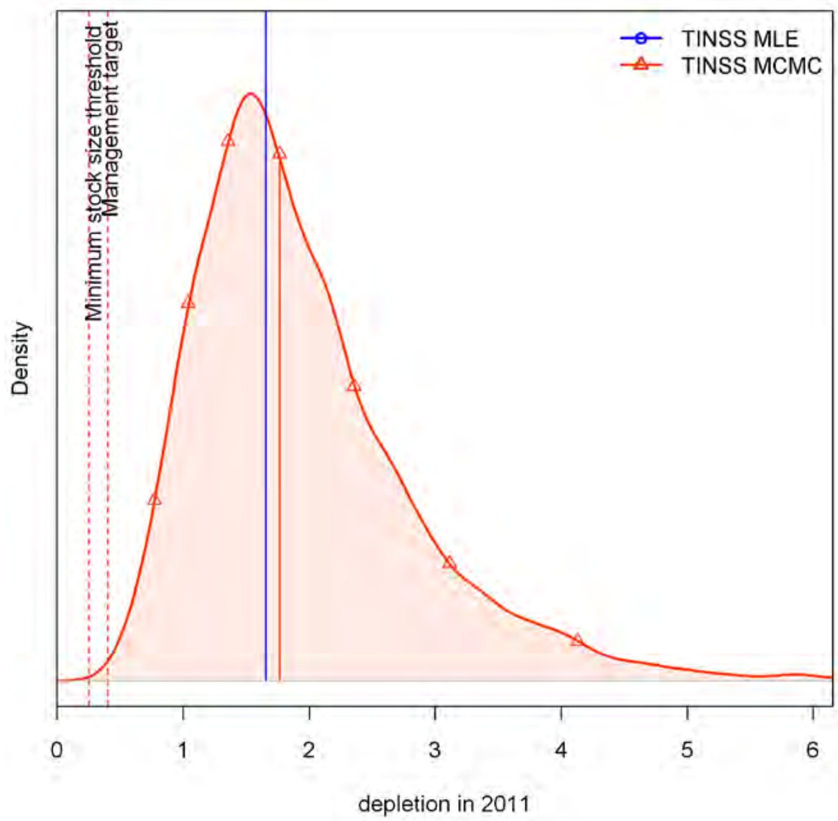


Figure 57. Comparison of maximum likelihood estimates and Bayesian posterior median results for current relative depletion from the TINSS model.

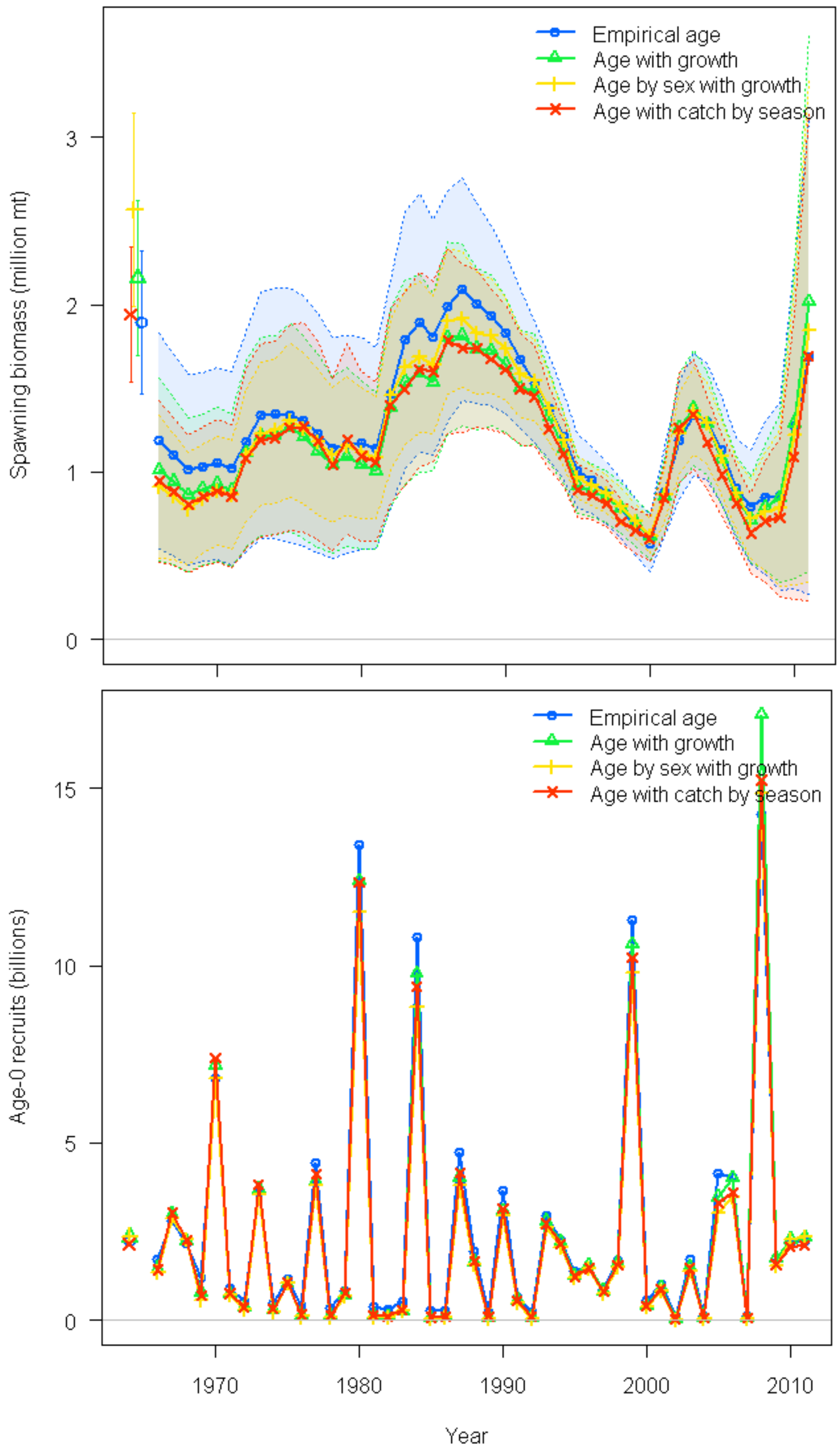


Figure 58. Results of sensitivity analysis among four candidate SS models.

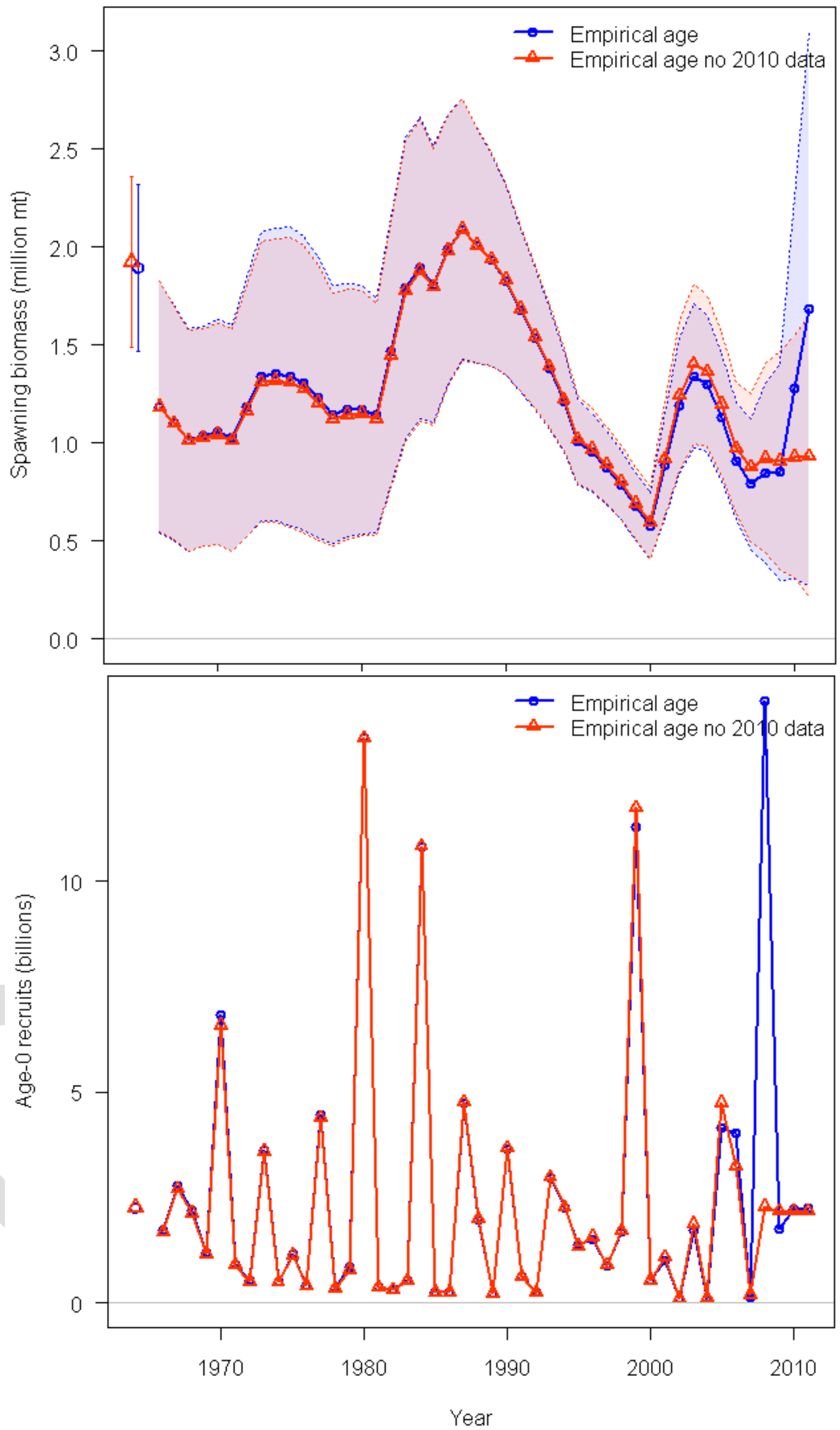


Figure 59. Results of sensitivity analysis for the SS model to exclusion of the 2010 fishery age data.

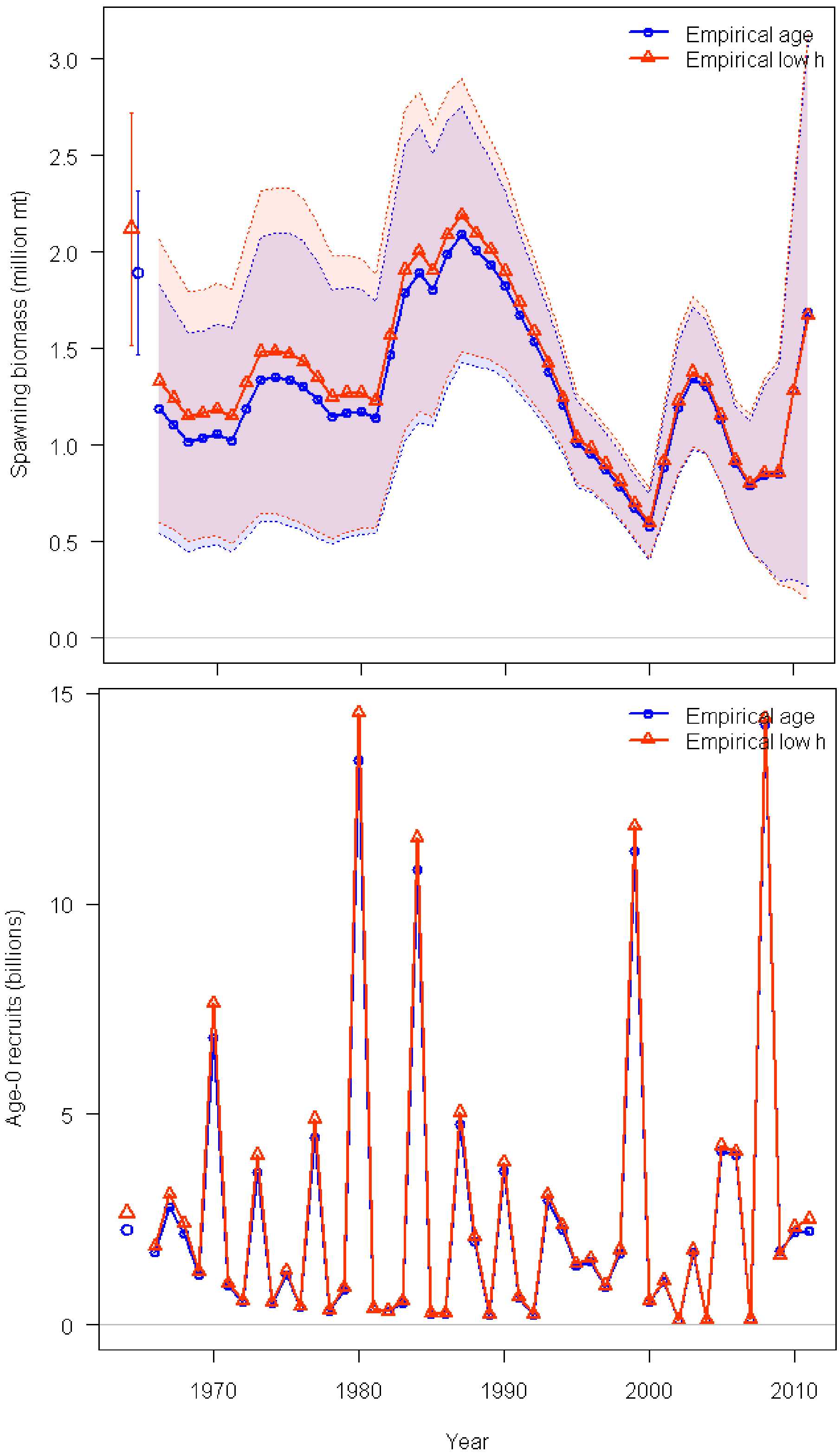


Figure 60. Results of sensitivity analysis for the SS model to the prior for steepness.

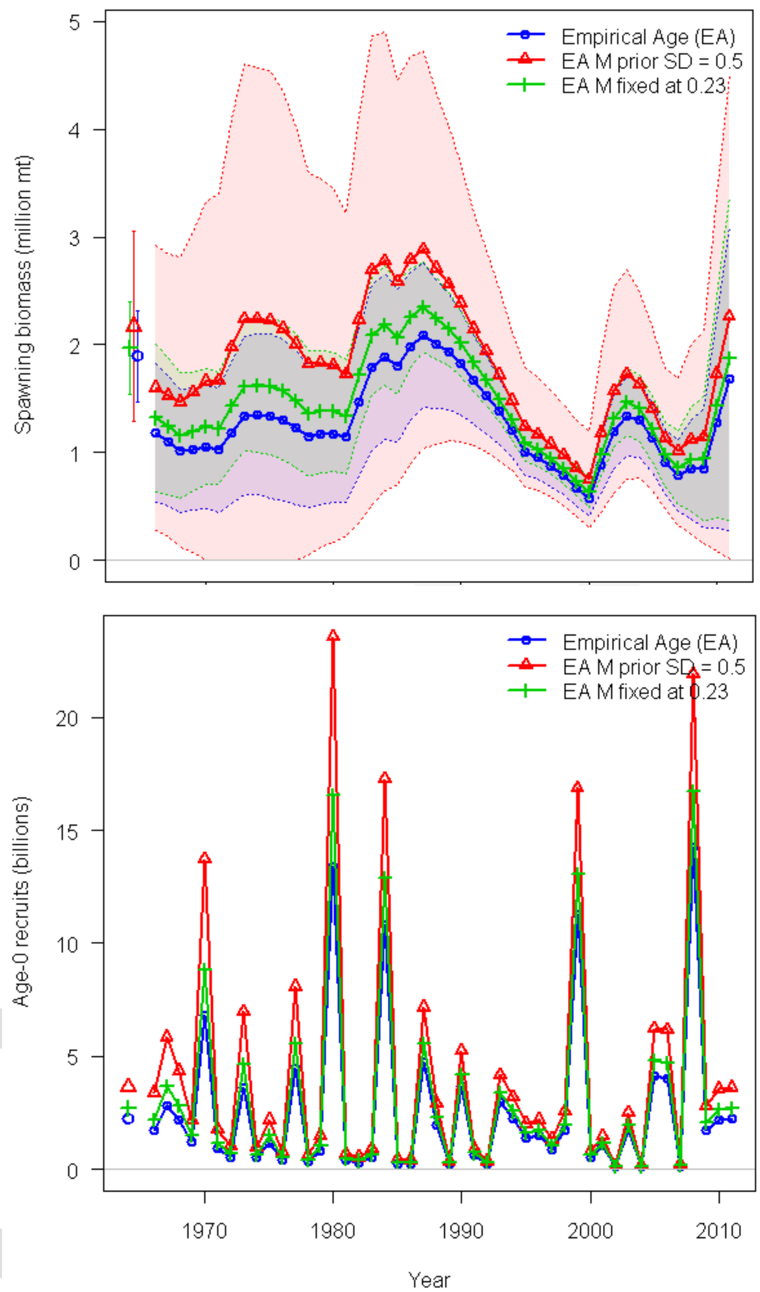


Figure 61. Results of sensitivity analysis for the SS model to the treatment of natural mortality rate.

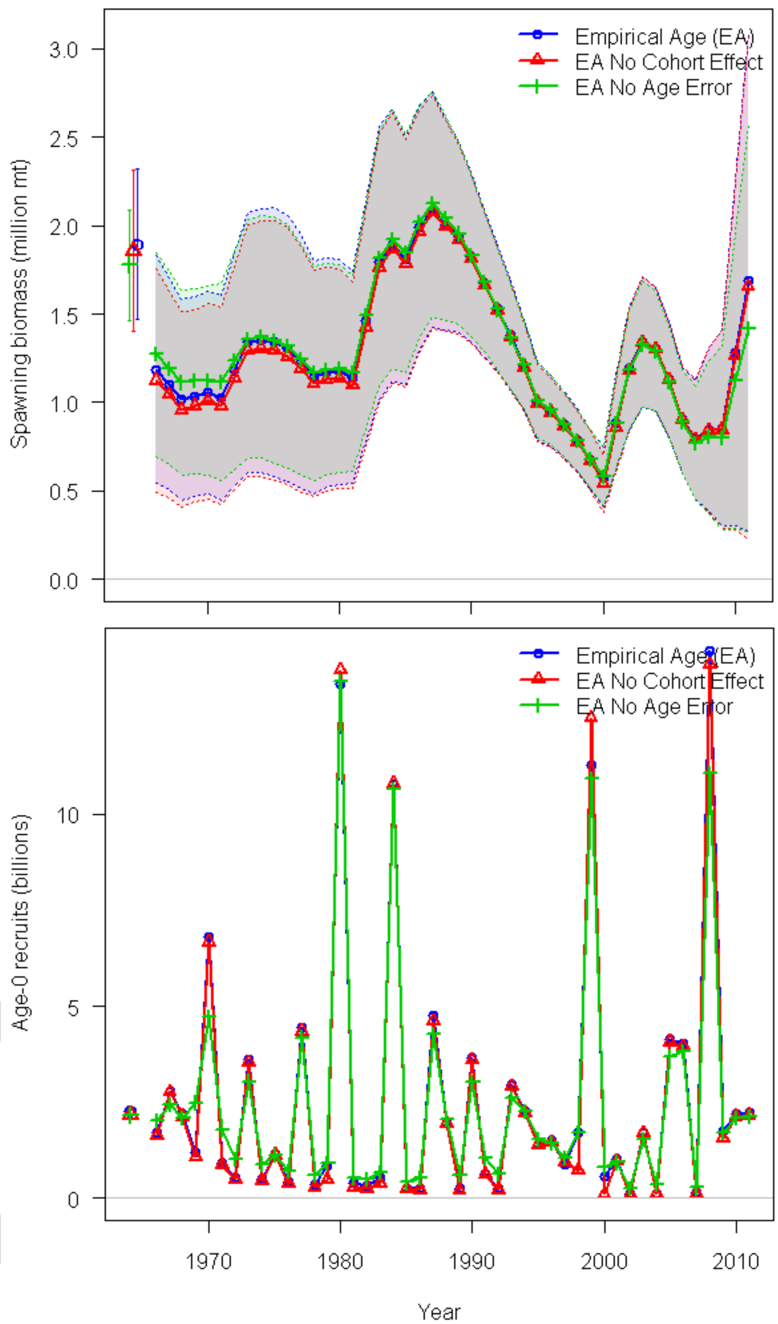


Figure 62. Results of sensitivity analysis for the SS model to the application of alternate ageing error approaches.

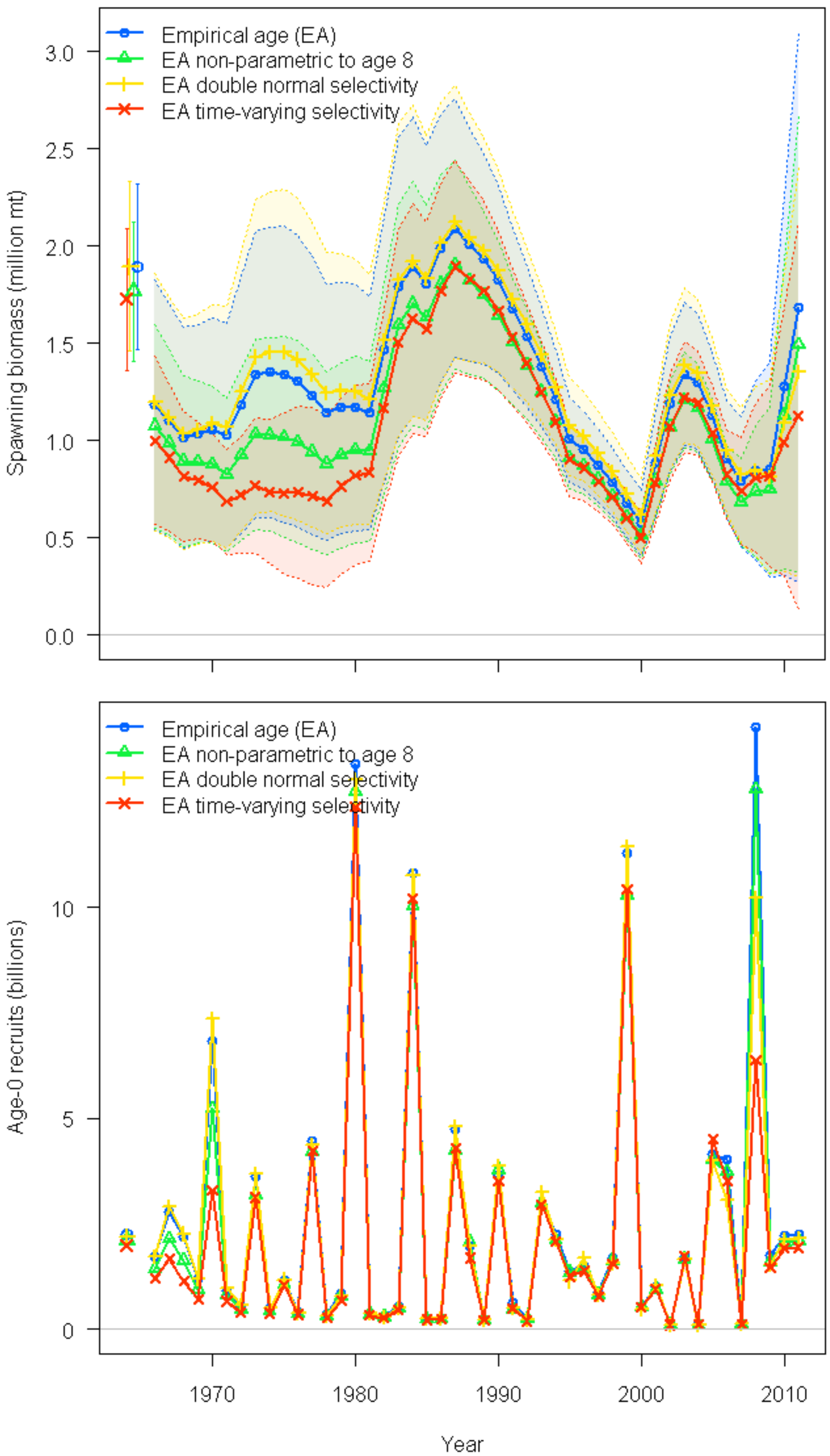


Figure 63. Results of sensitivity analysis for the SS model to fishery and survey selectivity parameterization.

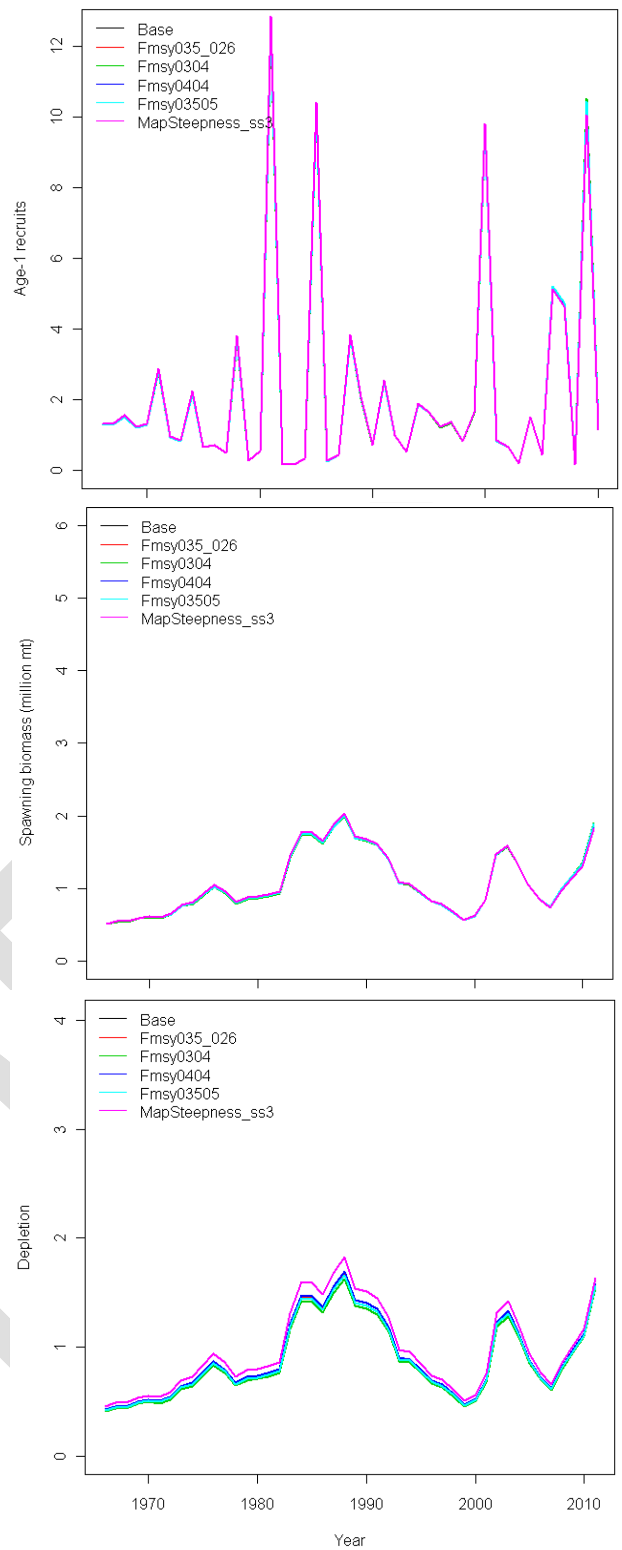


Figure 64. Results of sensitivity analysis for the TINSS model to the prior on F_{MSY}.

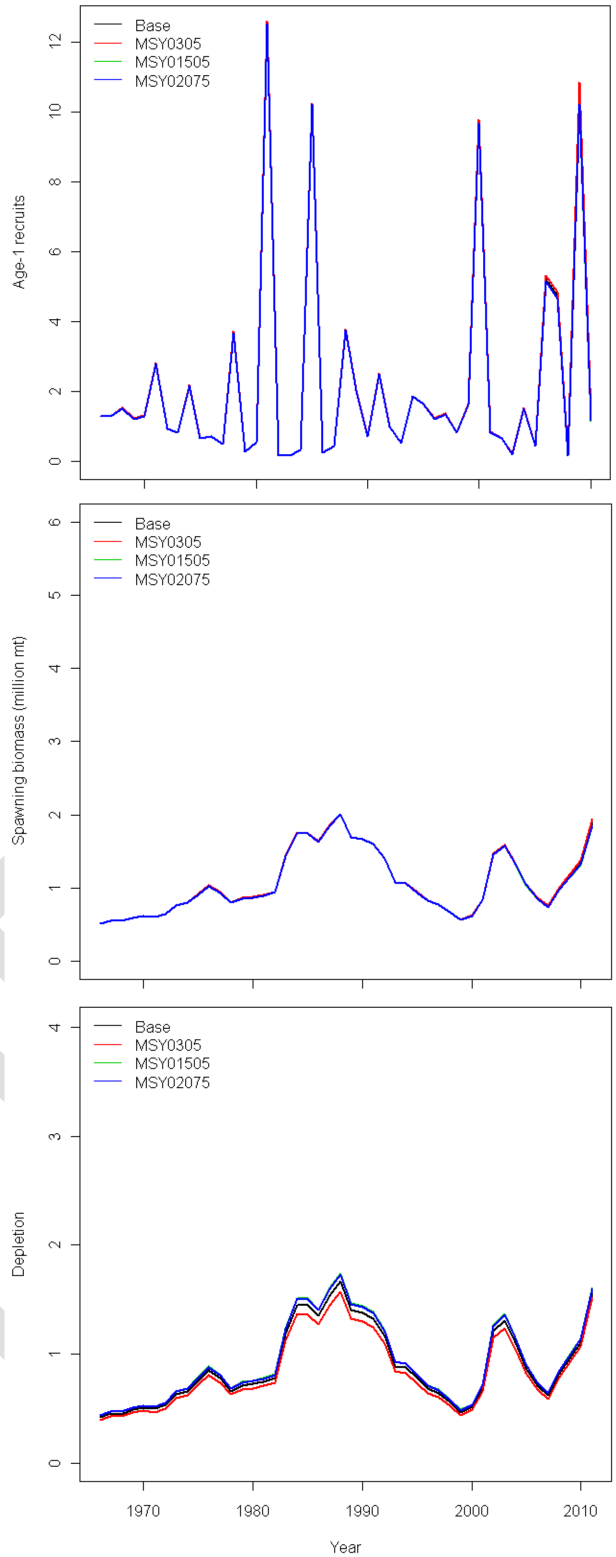


Figure 65. Results of sensitivity analysis for the TINSS model to the prior on *MSY*.

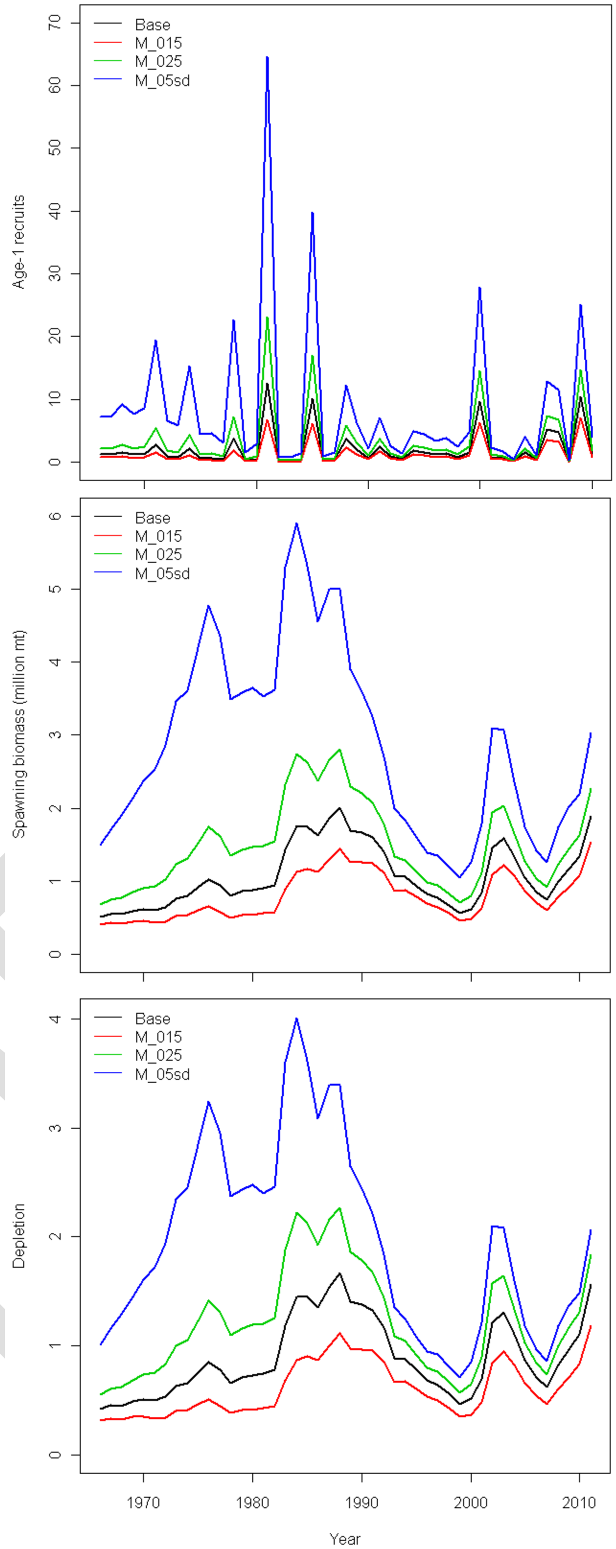


Figure 66. Results of sensitivity analysis for the TINSS model to the prior on *M*.

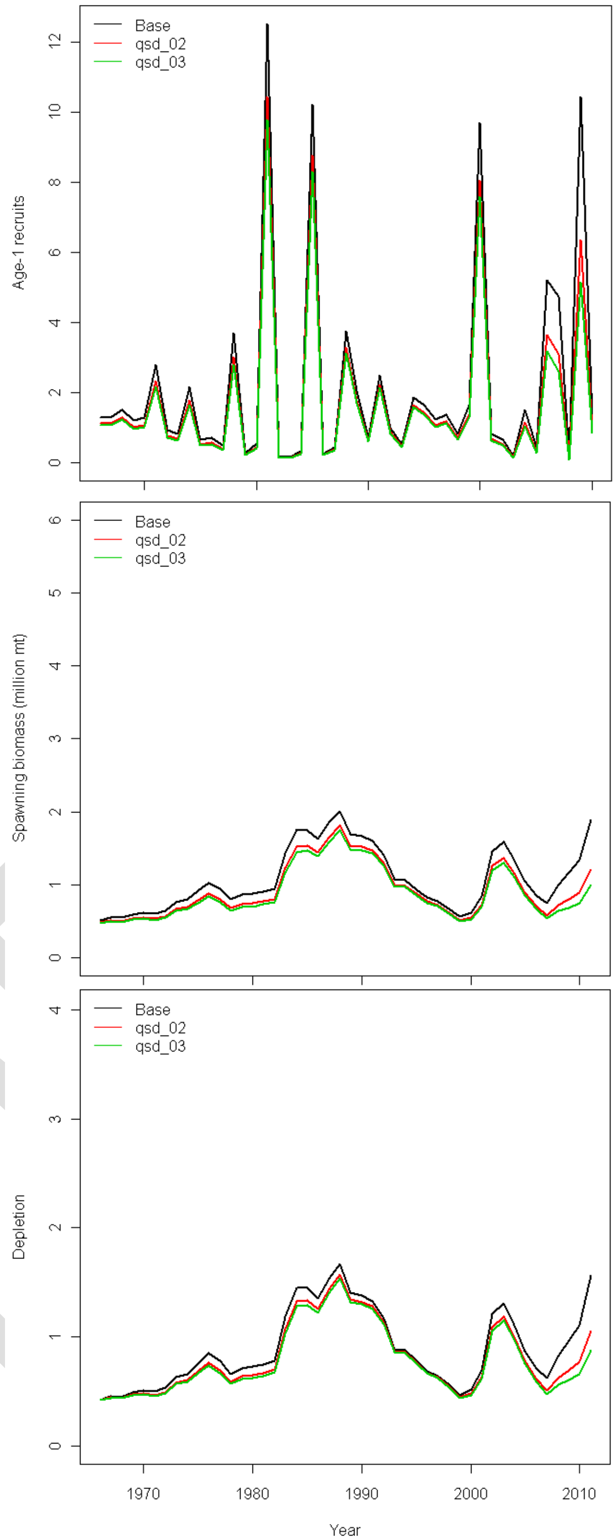


Figure 67. Results of sensitivity analysis for the TINSS model to the prior on *q*.

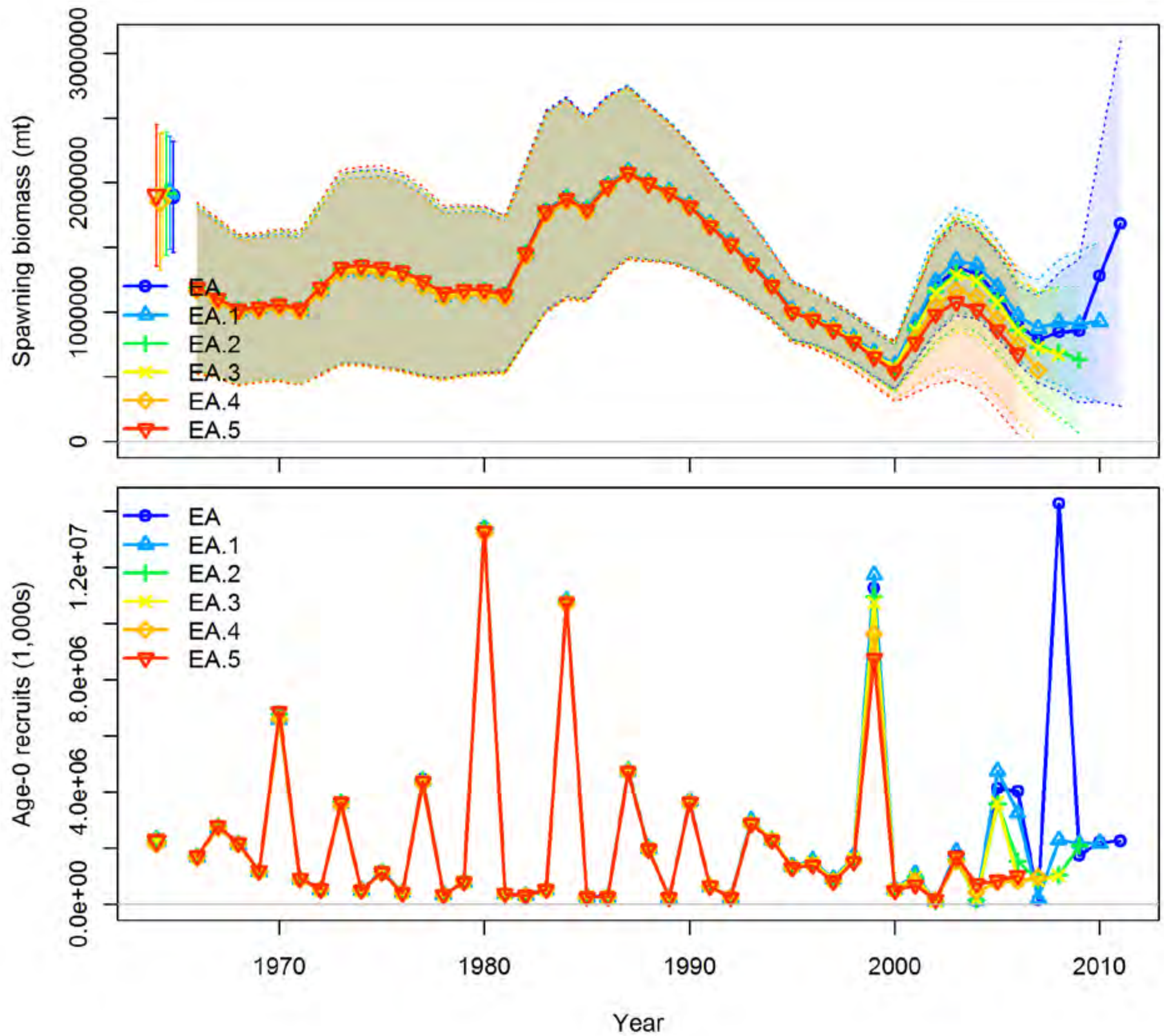
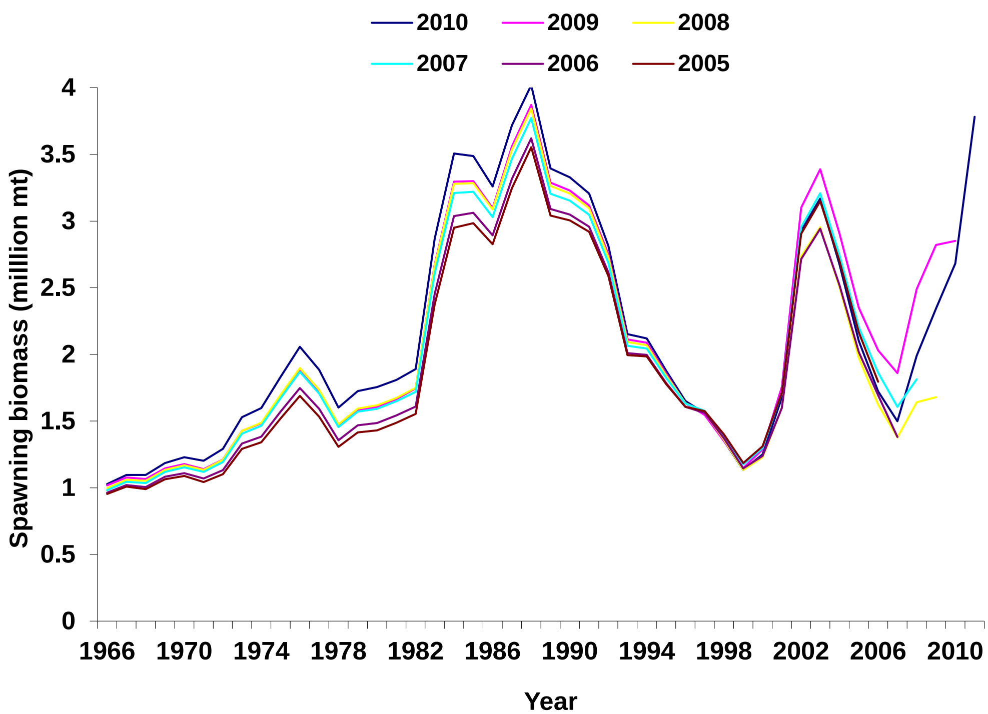


Figure 68. Retrospective pattern for the SS model over the terminal years 2011 to 2006 as data from each terminal year are sequentially removed from the model.



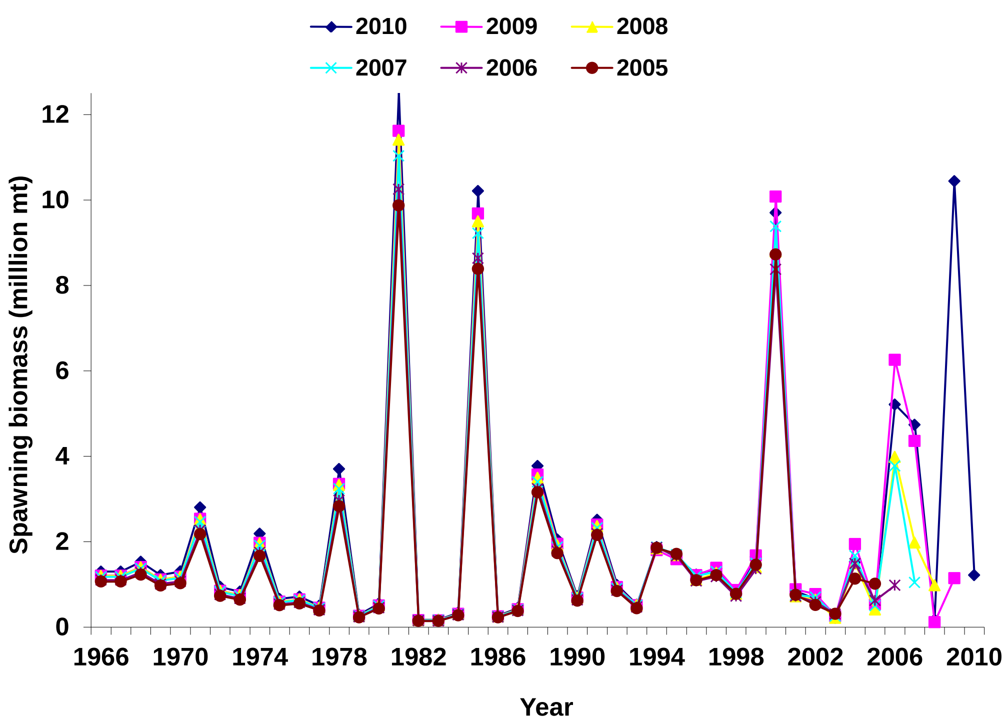


Figure 69. Retrospective pattern for the TINSS model over the terminal years 2011 to 2006 as data from each terminal year are sequentially removed from the model.

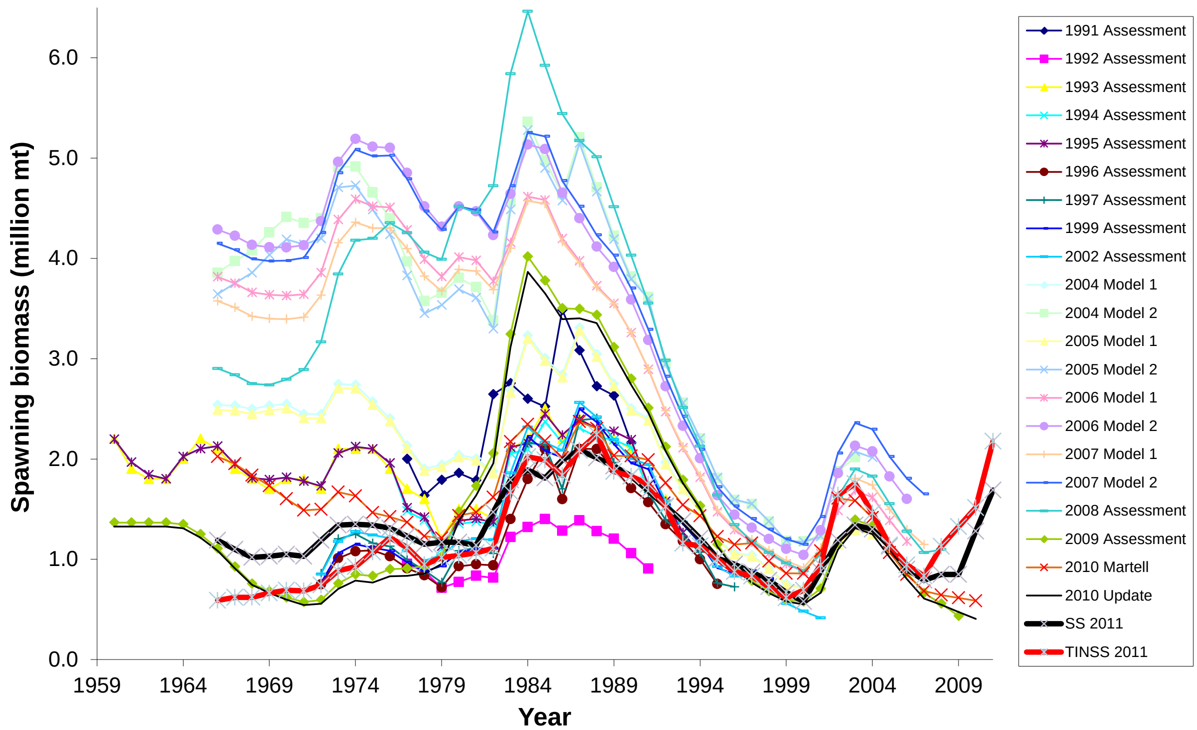


Figure 70. Posterior medians for both the SS (thick black line) and TINSS (thick red line) models in a retrospective comparing 2011 model results with previous stock assessments since 1991 (updates in 1998, 2000, 2001, 2003 are not included).

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

Note: Many of these definitions are drawn from the Pacific Fishery Management Council's list (http://www.pcouncil.org/wp-content/uploads/Acronyms-7-14-10.pdf)

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 $SB_{10\%}$.

ABC: Acceptable biological catch. See below.

Acceptable biological catch: The ABC is a scientific calculation of the sustainable harvest level of a fishery and is used to set the upper limit of the optimum yield (see below). 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).

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.

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.

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).

$F_{40\%}$: 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 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.

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).

PFMC: Pacific Fishery Management Council.

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 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 this stock assessment analysis (This Is Not Stock Synthesis; see also SS).

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

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	MLE	MCMC median
NatM_p_1_Fem_GP_1	0.21	0.22
SR_R0	14.63	14.76
SR_steep	0.85	0.81
Early_InitAge_20	-0.27	-0.18
Early_InitAge_19	-0.08	0.04
Early_InitAge_18	-0.10	-0.06
Early_InitAge_17	-0.12	-0.03
Early_InitAge_16	-0.14	-0.16
Early_InitAge_15	-0.17	-0.18
Early_InitAge_14	-0.20	-0.05
Early_InitAge_13	-0.24	-0.18
Early_InitAge_12	-0.29	-0.09
Early_InitAge_11	-0.34	-0.18
Early_InitAge_10	-0.39	-0.30
Early_InitAge_9	-0.45	-0.31
Early_InitAge_8	-0.50	-0.32
Early_InitAge_7	-0.56	-0.30
Early_InitAge_6	-0.62	-0.30
Early_InitAge_5	-0.66	-0.48
Early_InitAge_4	-0.67	-0.43
Early_InitAge_3	-0.64	-0.32
Early_InitAge_2	-0.57	-0.11
Early_InitAge_1	-0.39	0.03
Early_RecrDev_1966	-0.13	0.24
Early_RecrDev_1967	0.48	1.14
Early_RecrDev_1968	0.36	0.69
Early_RecrDev_1969	-0.13	0.04
Main_RecrDev_1970	1.74	2.07
Main_RecrDev_1971	-0.14	-0.26
Main_RecrDev_1972	-0.70	-0.73
Main_RecrDev_1973	1.21	1.36
Main_RecrDev_1974	-0.77	-0.84
Main_RecrDev_1975	0.08	0.16
Main_RecrDev_1976	-0.98	-1.08
Main_RecrDev_1977	1.42	1.55
Main_RecrDev_1978	-1.15	-1.13
Main_RecrDev_1979	-0.25	-0.27
Main_RecrDev_1980	2.53	2.65
Main_RecrDev_1981	-1.03	-1.03
Main_RecrDev_1982	-1.25	-1.28

Parameter	MLE	MCMC median
Main_RecrDev_1983	-0.73	-0.81
Main_RecrDev_1984	2.29	2.38
Main_RecrDev_1985	-1.44	-1.51
Main_RecrDev_1986	-1.45	-1.50
Main_RecrDev_1987	1.46	1.55
Main_RecrDev_1988	0.58	0.59
Main_RecrDev_1989	-1.55	-1.61
Main_RecrDev_1990	1.20	1.28
Main_RecrDev_1991	-0.55	-0.62
Main_RecrDev_1992	-1.51	-1.57
Main_RecrDev_1993	1.01	1.08
Main_RecrDev_1994	0.74	0.82
Main_RecrDev_1995	0.27	0.36
Main_RecrDev_1996	0.35	0.46
Main_RecrDev_1997	-0.17	-0.06
Main_RecrDev_1998	0.50	0.61
Main_RecrDev_1999	2.40	2.55
Main_RecrDev_2000	-0.60	-0.57
Main_RecrDev_2001	-0.04	0.07
Main_RecrDev_2002	-2.34	-2.31
Main_RecrDev_2003	0.46	0.56
Main_RecrDev_2004	-2.28	-2.26
Main_RecrDev_2005	1.35	1.47
Main_RecrDev_2006	1.34	1.48
Main_RecrDev_2007	-2.01	-2.07
Late_RecrDev_2008	2.62	2.73
Late_RecrDev_2009	-0.21	-0.20
Late_RecrDev_2010	0.00	0.09
ForeRecr_2011	0.00	-0.01
ForeRecr_2012	0.00	-0.01
ForeRecr_2013	0.00	0.08
Q_extraSD_2_Acoustic_Survey	0.20	0.26
AgeSel_1P_3_Fishery	2.90	2.98
AgeSel_1P_4_Fishery	1.57	1.58
AgeSel_1P_5_Fishery	0.46	0.47
AgeSel_1P_6_Fishery	0.23	0.22
AgeSel_2P_4_Acoustic_Survey	0.08	0.06
AgeSel_2P_5_Acoustic_Survey	0.43	0.45
AgeSel_2P_6_Acoustic_Survey	0.42	0.40

10. Appendix C. List of all estimated parameters in the TINSS model

Parameter	MLE	MCMC median
MSY	0.20	0.22
FMSY	0.32	0.36
M	0.18	0.19
Age at 50% 1st harvest	4.73	4.73
SD fishery selectivity	1.66	1.64
Observation error	0.13	0.14
Inverse total variance	0.85	0.85
Mean recruitment #1 - 1952	-2.12	-2.30
Mean recruitment #2 - 1953	-1.12	-1.58
Mean recruitment #3 - 1954	-1.23	-1.72
Mean recruitment #4 - 1955	-1.30	-1.85
Mean recruitment #5 - 1956	-1.36	-1.85
Mean recruitment #6 - 1957	-1.40	-1.90
Mean recruitment #7 - 1958	-1.39	-1.92
Mean recruitment #8 - 1959	-1.30	-1.85
Mean recruitment #9 - 1960	-1.05	-1.70
Mean recruitment #10 - 1961	1.68	1.67
Mean recruitment #11 - 1962	-1.42	-2.03
Mean recruitment #12 - 1963	-1.55	-2.14
Mean recruitment #13 - 1964	-2.23	-2.52
Mean recruitment #14 - 1965	0.70	0.86
Mean recruitment #15 - 1966	0.40	0.58
Mean recruitment #16 - 1967	0.58	0.76
Mean recruitment #17 - 1968	0.37	0.55
Mean recruitment #18 - 1969	0.37	0.56
Mean recruitment #19 - 1970	1.04	1.24
Mean recruitment #20 - 1971	0.29	0.49
Mean recruitment #21 - 1972	-0.09	0.11
Mean recruitment #22 - 1973	0.93	1.13
Mean recruitment #23 - 1974	-0.29	-0.09
Mean recruitment #24 - 1975	-0.11	0.08
Mean recruitment #25 - 1976	-0.56	-0.37
Mean recruitment #26 - 1977	1.00	1.18
Mean recruitment #27 - 1978	-0.49	-0.31
Mean recruitment #28 - 1979	-0.06	0.12
Mean recruitment #29 - 1980	2.28	2.45
Mean recruitment #30 - 1981	0.38	0.54
Mean recruitment #31 - 1982	-3.91	-3.78
Mean recruitment #32 - 1983	-0.15	0.00
Mean recruitment #33 - 1984	1.63	1.78
Mean recruitment #34 - 1985	1.32	1.46
Mean recruitment #35 - 1986	-0.47	-0.33
Mean recruitment #36 - 1987	1.39	1.53
Mean recruitment #37 - 1988	0.80	0.94
Mean recruitment #38 - 1989	-0.02	0.11
Mean recruitment #39 - 1990	1.10	1.23
Mean recruitment #40 - 1991	-0.04	0.08
Mean recruitment #41 - 1992	-0.31	-0.19
Mean recruitment #42 - 1993	0.91	1.02
Mean recruitment #43 - 1994	0.99	1.11
Mean recruitment #44 - 1995	0.58	0.69
Mean recruitment #45 - 1996	0.43	0.55
Mean recruitment #46 - 1997	0.03	0.14
Mean recruitment #47 - 1998	0.59	0.70
Mean recruitment #48 - 1999	2.45	2.57
Mean recruitment #49 - 2000	0.05	0.16
Mean recruitment #50 - 2001	-0.03	0.08
Mean recruitment #51 - 2002	-1.60	-1.50
Mean recruitment #52 - 2003	0.30	0.41
Mean recruitment #53 - 2004	-1.15	-1.05
Mean recruitment #54 - 2005	1.15	1.25
Mean recruitment #55 - 2006	0.12	0.22
Mean recruitment #56 - 2007	1.23	1.32
Mean recruitment #57 - 2008	1.62	1.72
Mean recruitment #58 - 2009	0.04	0.13
Mean recruitment #59 - 2010	0.00	-0.24

11. Appendix D. SS model input files

```
# 2011 hake Empirical age model starter file

2011_hake_EA_data.SS        # Data file
2011_hake_EA_control.SS # Control file

0        # Read initial values from .par file: 0=no,1=yes
1        # 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

# 2011 hake Empirical Age 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
2005 2010 2005 2010 2005 2010 # 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
2005 2010 2005 2010 # 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
0 # 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)

999 # verify end of input

# 2011 hake Empirical age data file

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

### Global model specifications ###
1966	# Start year
2010	# 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 sexes
20	# Number of ages in population dynamics

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

45 # 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
139158	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
290545	2007	1
322145	2008	1
177459	2009	1
216912	2010	1

7 # 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

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

7 #_N_Length_obs
Marginal acoustic lengths to show implied fit

1995	1	2	0	0	-106	0.000	0.000	0.000	0.000	0.000	0.005	0.060
	0.186	0.108	0.023	0.021	0.086	0.166	0.173	0.109	0.041	0.013	0.004	0.002
	0.001	0.001	0.000	0.000	0.000	0.000	0.000					
1998	1	2	0	0	-127	0.000	0.000	0.002	0.006	0.027	0.047	0.061
	0.049	0.047	0.075	0.087	0.140	0.170	0.139	0.082	0.037	0.017	0.007	0.004
	0.001	0.001	0.001	0.000	0.000	0.000	0.000					
2001	1	2	0	0	-77	0.000	0.000	0.000	0.001	0.006	0.063	0.233
	0.309	0.121	0.033	0.035	0.037	0.039	0.040	0.037	0.019	0.011	0.005	0.003
	0.002	0.002	0.001	0.001	0.001	0.001	0.001					

2003	1	2	0	0	-81	0.000	0.000	0.000	0.000	0.000	0.003	0.009
	0.015	0.026	0.046	0.148	0.344	0.244	0.102	0.038	0.015	0.005	0.002	0.001
	0.001	0.000	0.000	0.000	0.000	0.000	0.001					
2005	1	2	0	0	-53	0.000	0.000	0.000	0.000	0.002	0.011	0.059
	0.100	0.057	0.022	0.037	0.139	0.273	0.182	0.078	0.024	0.009	0.003	0.002
	0.001	0.001	0.000	0.000	0.000	0.000	0.001					
2007	1	2	0	0	-70	0.000	0.000	0.004	0.013	0.065	0.145	0.127
	0.061	0.029	0.011	0.016	0.046	0.103	0.164	0.133	0.049	0.019	0.006	0.002
	0.001	0.001	0.001	0.001	0.000	0.000	0.000					
2009	1	2	0	0	-80	0.000	0.000	0.000	0.000	0.000	0.001	0.003
	0.020	0.084	0.200	0.210	0.160	0.089	0.065	0.059	0.037	0.014	0.006	0.003
	0.001	0.001	0.000	0.000	0.000	0.000	0.000					

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

38 # N_ageerror_definitions

0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5				
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	

43 # 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=7)

1995	1	2	0	0	23	-1	-1	68	0	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	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	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	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	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	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	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	

Aggregate catch-weighted marginal fishery ages (N=36)

1975	1	1	0	0	3	-1	-1	13	0.046	0.338	0.074	0.012
	0.254	0.055	0.08	0.105	0.01	0.006	0.009	0.005	0	0.005	0	
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	0.084	0.037	0.275
	0.036	0.091	0.227	0.076	0.065	0.04	0.036	0.023	0.006	0.003	0.001	
1978	1	1	0	0	6	-1	-1	341	0.004	0.011	0.066	0.063
	0.265	0.061	0.088	0.215	0.098	0.047	0.045	0.024	0.005	0.004	0.003	

1979	1	1	0	0	7	-1	-1	116	0	0.062	0.106	0.093
	0.059	0.182	0.104	0.179	0.122	0.04	0.023	0.01	0.015	0	0.005	
1980	1	1	0	0	8	-1	-1	221	0.002	0.004	0.35	0.019
	0.048	0.1	0.116	0.051	0.089	0.096	0.065	0.023	0.02	0.008	0.008	
1981	1	1	0	0	9	-1	-1	154	0.218	0.03	0.014	0.282
	0.046	0.063	0.025	0.147	0.035	0.032	0.071	0.024	0.006	0.002	0.006	
1982	1	1	0	0	10	-1	-1	170	0	0.326	0.035	0.004
	0.269	0.015	0.035	0.039	0.119	0.032	0.036	0.076	0.003	0.003	0.007	
1983	1	1	0	0	11	-1	-1	117	0	0	0.341	0.04
	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	0	0.015	0.613
	0.036	0.039	0.169	0.031	0.015	0.012	0.035	0.009	0.005	0.015	0.006	
1985	1	1	0	0	13	-1	-1	56	0.011	0.002	0.004	0.077
	0.705	0.074	0.043	0.056	0.015	0.006	0.005	0.002	0	0	0	
1986	1	1	0	0	14	-1	-1	120	0	0.199	0.07	0.004
	0.011	0.377	0.058	0.07	0.088	0.022	0.028	0.017	0.04	0.007	0.009	
1987	1	1	0	0	15	-1	-1	56	0	0	0.306	0.03
	0.001	0.01	0.516	0.003	0.013	0.073	0	0.008	0.021	0.019	0	
1988	1	1	0	0	16	-1	-1	81	0	0.009	0	0.379
	0.01	0.015	0.001	0.395	0.009	0.005	0.113	0.009	0	0	0.054	
1989	1	1	0	0	17	-1	-1	77	0	0.073	0.032	0.003
	0.502	0.016	0.003	0.001	0.322	0.023	0.001	0.023	0.001	0	0	
1990	1	1	0	0	18	-1	-1	163	0	0.073	0.24	0.013
	0.008	0.254	0.003	0.003	0	0.317	0.001	0.001	0.076	0	0.012	
1991	1	1	0	0	19	-1	-1	160	0	0.044	0.253	0.224
	0.025	0.009	0.222	0.013	0.002	0.002	0.149	0.005	0	0.043	0.009	
1992	1	1	0	0	20	-1	-1	243	0.006	0.045	0.056	0.145
	0.185	0.02	0.01	0.305	0.008	0.001	0.005	0.178	0.005	0	0.032	
1993	1	1	0	0	21	-1	-1	175	0	0.011	0.285	0.036
	0.138	0.154	0.014	0.009	0.24	0.009	0.002	0.001	0.093	0	0.009	
1994	1	1	0	0	22	-1	-1	234	0	0.001	0.039	0.257
	0.012	0.129	0.204	0.009	0.003	0.256	0.001	0.003	0	0.079	0.008	
1995	1	1	0	0	23	-1	-1	147	0.002	0.021	0.004	0.06
	0.318	0.014	0.071	0.197	0.019	0.004	0.191	0.02	0.005	0.001	0.073	
1996	1	1	0	0	24	-1	-1	186	0	0.186	0.163	0.01
	0.085	0.196	0.006	0.046	0.107	0.002	0.003	0.157	0	0.001	0.037	
1997	1	1	0	0	25	-1	-1	222	0	0.007	0.342	0.275
	0.005	0.054	0.126	0.009	0.032	0.06	0.004	0.002	0.06	0.002	0.023	
1998	1	1	0	0	26	-1	-1	243	0	0.038	0.217	0.206
	0.282	0.035	0.043	0.092	0.009	0.007	0.037	0.003	0.001	0.024	0.006	
1999	1	1	0	0	27	-1	-1	514	0	0.111	0.223	0.192
	0.188	0.126	0.031	0.032	0.035	0.007	0.012	0.022	0.001	0.002	0.017	
2000	1	1	0	0	28	-1	-1	529	0.013	0.052	0.113	0.154
	0.131	0.201	0.14	0.062	0.04	0.027	0.019	0.02	0.009	0.005	0.015	
2001	1	1	0	0	29	-1	-1	541	0	0.245	0.188	0.132
	0.172	0.091	0.066	0.046	0.012	0.013	0.011	0.006	0.006	0.004	0.009	
2002	1	1	0	0	30	-1	-1	450	0	0	0.588	0.152
	0.073	0.05	0.035	0.039	0.028	0.008	0.007	0.007	0.002	0.003	0.007	
2003	1	1	0	0	31	-1	-1	457	0	0.001	0.013	0.782
	0.102	0.019	0.029	0.018	0.016	0.009	0.006	0.002	0.002	0.001	0.001	
2004	1	1	0	0	32	-1	-1	501	0	0	0.073	0.097
	0.688	0.058	0.015	0.028	0.021	0.006	0.007	0.001	0.003	0	0.002	
2005	1	1	0	0	33	-1	-1	613	0	0.011	0.006	0.085
	0.061	0.693	0.07	0.022	0.021	0.014	0.007	0.008	0.002	0	0.001	
2006	1	1	0	0	34	-1	-1	720	0.003	0.017	0.143	0.021
	0.098	0.052	0.582	0.041	0.011	0.014	0.007	0.004	0.003	0.001	0.001	
2007	1	1	0	0	35	-1	-1	629	0.014	0.156	0.039	0.164
	0.016	0.073	0.045	0.406	0.043	0.017	0.013	0.008	0.002	0.001	0.002	
2008	1	1	0	0	36	-1	-1	783	0.006	0.092	0.383	0.026
	0.137	0.01	0.036	0.033	0.241	0.018	0.006	0.006	0.001	0.002	0.001	
2009	1	1	0	0	37	-1	-1	677	0.014	0.007	0.323	0.334
	0.028	0.09	0.009	0.021	0.013	0.135	0.016	0.003	0.005	0.002	0.001	
2010	1	1	0	0	38	-1	-1	800	0	0.289	0.014	0.404
	0.211	0.015	0.019	0.002	0.003	0.006	0.03	0.004	0	0.001	0	

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
# 2011 hake Empirical age model weight-at-age file

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

120  # Number of lines of weight-at-age input to be read

20 # Maximum age
# if yr=-yr, then fill remaining years for that seas, growpattern, sex, fleet
# fleet 0 contains begin season pop WT
# fleet -1 contains mid season pop WT
# fleet -2 contains maturity*fecundity

# Maturity x fecundity vector from fixed externally estimated growth and maturity at length
#Yr	seas	sex	GP	bseas	fleet	a0	a1	a2	a3	a4	a5	a6
	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18
	a19	a20	Note
-1940	1	1	1	1	-2	0.0000	0.0000	0.1003	0.2535	0.3992	0.5180	0.6131
	0.6895	0.7511	0.8007	0.8406	0.8724	0.8979	0.9181	0.9342	0.9469	0.9569	0.9649	0.9711
	0.9761	0.9830

#Yr	seas	sex	GP	bseas	fleet	a0	a1	a2	a3	a4	a5	a6
	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18
	a19	a20	Note
# Mid-season (N=37)
-1940	1	1	1	1	-1	0.0300	0.0912	0.2575	0.3940	0.4928	0.5445	0.5906
	0.6620	0.7210	0.7907	0.8625	0.9312	0.9680	1.0779	1.0022	1.0213	1.0213	1.0213	1.0213
	1.0213	1.0213
1975	1	1	1	1	-1	0.0550	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	2.7445	2.7445	2.7445
	2.7445	2.7445
1976	1	1	1	1	-1	0.0550	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	2.7445	2.7445	2.7445
	2.7445	2.7445
1977	1	1	1	1	-1	0.0550	0.1006	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	2.2094	2.2094	2.2094
	2.2094	2.2094
1978	1	1	1	1	-1	0.0539	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	2.3379	2.3379	2.3379
	2.3379	2.3379
1979	1	1	1	1	-1	0.0528	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	1.9817	1.9817	1.9817
	1.9817	1.9817
1980	1	1	1	1	-1	0.0517	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	1.3961	1.3961	1.3961
	1.3961	1.3961
1981	1	1	1	1	-1	0.0506	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	1.2128	1.2128	1.2128
	1.2128	1.2128
1982	1	1	1	1	-1	0.0494	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	1.1693	1.1693	1.1693
	1.1693	1.1693
1983	1	1	1	1	-1	0.0483	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	1.4823	1.4823	1.4823
	1.4823	1.4823
1984	1	1	1	1	-1	0.0472	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	1.8800	1.8800	1.8800
	1.8800	1.8800
1985	1	1	1	1	-1	0.0461	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	1.1217	1.1217	1.1217
	1.1217	1.1217
```

1986	1	1	1	1	-1	0.0450	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	1.6142	1.6142	1.6142
	1.6142	1.6142										
1987	1	1	1	1	-1	0.0439	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	1.4157	1.4157	1.4157
	1.4157	1.4157										
1988	1	1	1	1	-1	0.0428	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	1.4537	1.4537	1.4537
	1.4537	1.4537										
1989	1	1	1	1	-1	0.0417	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	1.1264	1.1264	1.1264
	1.1264	1.1264										
1990	1	1	1	1	-1	0.0406	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	1.3258	1.4668	1.4668	1.4668	1.4668
	1.4668	1.4668										
1991	1	1	1	1	-1	0.0394	0.1367	0.2754	0.3697	0.4598	0.5138	0.5437
	0.5907	0.7210	0.8497	1.0997	0.7185	0.6403	0.9227	1.2051	2.3828	2.3828	2.3828	2.3828
	2.3828	2.3828										
1992	1	1	1	1	-1	0.0383	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	1.0272	1.0272	1.0272
	1.0272	1.0272										
1993	1	1	1	1	-1	0.0372	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	0.6850	0.6850	0.6850
	0.6850	0.6850										
1994	1	1	1	1	-1	0.0361	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	0.7455	0.7455	0.7455
	0.7455	0.7455										
1995	1	1	1	1	-1	0.0350	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	0.8008	0.8008	0.8008
	0.8008	0.8008										
1996	1	1	1	1	-1	0.0339	0.1007	0.2876	0.3982	0.4674	0.5317	0.5651
	0.6509	0.5957	0.6362	0.6049	0.7500	0.6756	1.0804	1.4853	0.7509	0.7509	0.7509	0.7509
	0.7509	0.7509										
1997	1	1	1	1	-1	0.0328	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	0.8693	0.8693	0.8693
	0.8693	0.8693										
1998	1	1	1	1	-1	0.0317	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	0.7714	0.7714	0.7714
	0.7714	0.7714										
1999	1	1	1	1	-1	0.0306	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	0.8187	0.8187	0.8187
	0.8187	0.8187										
2000	1	1	1	1	-1	0.0294	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	0.9336	0.9336	0.9336
	0.9336	0.9336										
2001	1	1	1	1	-1	0.0283	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	0.9768	0.9768	0.9768
	0.9768	0.9768										
2002	1	1	1	1	-1	0.0272	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	1.0573	1.0573	1.0573
	1.0573	1.0573										
2003	1	1	1	1	-1	0.0261	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	0.9965	0.9965	0.9965
	0.9965	0.9965										
2004	1	1	1	1	-1	0.0250	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	0.8959	0.8959	0.8959
	0.8959	0.8959										
2005	1	1	1	1	-1	0.0239	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	0.9678	0.9678	0.9678
	0.9678	0.9678										
2006	1	1	1	1	-1	0.0228	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	0.9550	0.9550	0.9550
	0.9550	0.9550										
2007	1	1	1	1	-1	0.0217	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	0.8698	0.8698	0.8698
	0.8698	0.8698										

2008 1 1 1 1 -1 0.0217 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 0.8332 0.8332 0.8332
0.8332 0.8332
2009 1 1 1 1 -1 0.0217 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 1.0334 1.0334 1.0334
1.0334 1.0334
2010 1 1 1 1 -1 0.0217 0.0667 0.2231 0.3365 0.4205 0.5297 0.6615
0.8603 0.9986 1.0276 0.9480 0.8981 0.9024 1.1253 0.7350 0.9045 0.9045 0.9045 0.9045
0.9045 0.9045
Begin season (N=37)
-1940 1 1 1 1 0 0.0300 0.0912 0.2575 0.3940 0.4928 0.5445 0.5906
0.6620 0.7210 0.7907 0.8625 0.9312 0.9680 1.0779 1.0022 1.0213 1.0213 1.0213 1.0213
1.0213 1.0213
1975 1 1 1 1 0 0.0550 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 2.7445 2.7445 2.7445
2.7445 2.7445
1976 1 1 1 1 0 0.0550 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 2.7445 2.7445 2.7445
2.7445 2.7445
1977 1 1 1 1 0 0.0550 0.1006 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 2.2094 2.2094 2.2094
2.2094 2.2094
1978 1 1 1 1 0 0.0539 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 2.3379 2.3379 2.3379
2.3379 2.3379
1979 1 1 1 1 0 0.0528 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 1.9817 1.9817 1.9817
1.9817 1.9817
1980 1 1 1 1 0 0.0517 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 1.3961 1.3961 1.3961
1.3961 1.3961
1981 1 1 1 1 0 0.0506 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 1.2128 1.2128 1.2128
1.2128 1.2128
1982 1 1 1 1 0 0.0494 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 1.1693 1.1693 1.1693
1.1693 1.1693
1983 1 1 1 1 0 0.0483 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 1.4823 1.4823 1.4823
1.4823 1.4823
1984 1 1 1 1 0 0.0472 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 1.8800 1.8800 1.8800
1.8800 1.8800
1985 1 1 1 1 0 0.0461 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 1.1217 1.1217 1.1217
1.1217 1.1217
1986 1 1 1 1 0 0.0450 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 1.6142 1.6142 1.6142
1.6142 1.6142
1987 1 1 1 1 0 0.0439 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 1.4157 1.4157 1.4157
1.4157 1.4157
1988 1 1 1 1 0 0.0428 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 1.4537 1.4537 1.4537
1.4537 1.4537
1989 1 1 1 1 0 0.0417 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 1.1264 1.1264 1.1264
1.1264 1.1264
1990 1 1 1 1 0 0.0406 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 1.3258 1.4668 1.4668 1.4668 1.4668
1.4668 1.4668
1991 1 1 1 1 0 0.0394 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437
0.5907 0.7210 0.8497 1.0997 0.7185 0.6403 0.9227 1.2051 2.3828 2.3828 2.3828 2.3828
2.3828 2.3828
1992 1 1 1 1 0 0.0383 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 1.0272 1.0272 1.0272
1.0272 1.0272

1993	1	1	1	1	0	0.0372	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	0.6850	0.6850	0.6850
	0.6850	0.6850										
1994	1	1	1	1	0	0.0361	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	0.7455	0.7455	0.7455
	0.7455	0.7455										
1995	1	1	1	1	0	0.0350	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	0.8008	0.8008	0.8008
	0.8008	0.8008										
1996	1	1	1	1	0	0.0339	0.1007	0.2876	0.3982	0.4674	0.5317	0.5651
	0.6509	0.5957	0.6362	0.6049	0.7500	0.6756	1.0804	1.4853	0.7509	0.7509	0.7509	0.7509
	0.7509	0.7509										
1997	1	1	1	1	0	0.0328	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	0.8693	0.8693	0.8693
	0.8693	0.8693										
1998	1	1	1	1	0	0.0317	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	0.7714	0.7714	0.7714
	0.7714	0.7714										
1999	1	1	1	1	0	0.0306	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	0.8187	0.8187	0.8187
	0.8187	0.8187										
2000	1	1	1	1	0	0.0294	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	0.9336	0.9336	0.9336
	0.9336	0.9336										
2001	1	1	1	1	0	0.0283	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	0.9768	0.9768	0.9768
	0.9768	0.9768										
2002	1	1	1	1	0	0.0272	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	1.0573	1.0573	1.0573
	1.0573	1.0573										
2003	1	1	1	1	0	0.0261	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	0.9965	0.9965	0.9965
	0.9965	0.9965										
2004	1	1	1	1	0	0.0250	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	0.8959	0.8959	0.8959
	0.8959	0.8959										
2005	1	1	1	1	0	0.0239	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	0.9678	0.9678	0.9678
	0.9678	0.9678										
2006	1	1	1	1	0	0.0228	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	0.9550	0.9550	0.9550
	0.9550	0.9550										
2007	1	1	1	1	0	0.0217	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	0.8698	0.8698	0.8698
	0.8698	0.8698										
2008	1	1	1	1	0	0.0217	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	0.8332	0.8332	0.8332
	0.8332	0.8332										
2009	1	1	1	1	0	0.0217	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	1.0334	1.0334	1.0334
	1.0334	1.0334										
2010	1	1	1	1	0	0.0217	0.0667	0.2231	0.3365	0.4205	0.5297	0.6615
	0.8603	0.9986	1.0276	0.9480	0.8981	0.9024	1.1253	0.7350	0.9045	0.9045	0.9045	0.9045
	0.9045	0.9045										
# Fishery (N=37)												
-1940	1	1	1	1	1	0.0300	0.0912	0.2575	0.3940	0.4928	0.5445	0.5906
	0.6620	0.7210	0.7907	0.8625	0.9312	0.9680	1.0779	1.0022	1.0213	1.0213	1.0213	1.0213
	1.0213	1.0213										
1975	1	1	1	1	1	0.0550	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	2.7445	2.7445	2.7445
	2.7445	2.7445										
1976	1	1	1	1	1	0.0550	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	2.7445	2.7445	2.7445
	2.7445	2.7445										
1977	1	1	1	1	1	0.0550	0.1006	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	2.2094	2.2094	2.2094
	2.2094	2.2094										

1978	1	1	1	1	1	0.0539	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	2.3379	2.3379	2.3379
	2.3379	2.3379										
1979	1	1	1	1	1	0.0528	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	1.9817	1.9817	1.9817
	1.9817	1.9817										
1980	1	1	1	1	1	0.0517	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	1.3961	1.3961	1.3961
	1.3961	1.3961										
1981	1	1	1	1	1	0.0506	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	1.2128	1.2128	1.2128
	1.2128	1.2128										
1982	1	1	1	1	1	0.0494	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	1.1693	1.1693	1.1693
	1.1693	1.1693										
1983	1	1	1	1	1	0.0483	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	1.4823	1.4823	1.4823
	1.4823	1.4823										
1984	1	1	1	1	1	0.0472	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	1.8800	1.8800	1.8800
	1.8800	1.8800										
1985	1	1	1	1	1	0.0461	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	1.1217	1.1217	1.1217
	1.1217	1.1217										
1986	1	1	1	1	1	0.0450	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	1.6142	1.6142	1.6142
	1.6142	1.6142										
1987	1	1	1	1	1	0.0439	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	1.4157	1.4157	1.4157
	1.4157	1.4157										
1988	1	1	1	1	1	0.0428	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	1.4537	1.4537	1.4537
	1.4537	1.4537										
1989	1	1	1	1	1	0.0417	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	1.1264	1.1264	1.1264
	1.1264	1.1264										
1990	1	1	1	1	1	0.0406	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	1.3258	1.4668	1.4668	1.4668	1.4668
	1.4668	1.4668										
1991	1	1	1	1	1	0.0394	0.1367	0.2754	0.3697	0.4598	0.5138	0.5437
	0.5907	0.7210	0.8497	1.0997	0.7185	0.6403	0.9227	1.2051	2.3828	2.3828	2.3828	2.3828
	2.3828	2.3828										
1992	1	1	1	1	1	0.0383	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	1.0272	1.0272	1.0272
	1.0272	1.0272										
1993	1	1	1	1	1	0.0372	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	0.6850	0.6850	0.6850
	0.6850	0.6850										
1994	1	1	1	1	1	0.0361	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	0.7455	0.7455	0.7455
	0.7455	0.7455										
1995	1	1	1	1	1	0.0350	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	0.8008	0.8008	0.8008
	0.8008	0.8008										
1996	1	1	1	1	1	0.0339	0.1007	0.2876	0.3982	0.4674	0.5317	0.5651
	0.6509	0.5957	0.6362	0.6049	0.7500	0.6756	1.0804	1.4853	0.7509	0.7509	0.7509	0.7509
	0.7509	0.7509										
1997	1	1	1	1	1	0.0328	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	0.8693	0.8693	0.8693
	0.8693	0.8693										
1998	1	1	1	1	1	0.0317	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	0.7714	0.7714	0.7714
	0.7714	0.7714										
1999	1	1	1	1	1	0.0306	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	0.8187	0.8187	0.8187
	0.8187	0.8187										

2000	1	1	1	1	1	0.0294	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	0.9336	0.9336	0.9336
	0.9336	0.9336										
2001	1	1	1	1	1	0.0283	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	0.9768	0.9768	0.9768
	0.9768	0.9768										
2002	1	1	1	1	1	0.0272	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	1.0573	1.0573	1.0573
	1.0573	1.0573										
2003	1	1	1	1	1	0.0261	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	0.9965	0.9965	0.9965
	0.9965	0.9965										
2004	1	1	1	1	1	0.0250	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	0.8959	0.8959	0.8959
	0.8959	0.8959										
2005	1	1	1	1	1	0.0239	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	0.9678	0.9678	0.9678
	0.9678	0.9678										
2006	1	1	1	1	1	0.0228	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	0.9550	0.9550	0.9550
	0.9550	0.9550										
2007	1	1	1	1	1	0.0217	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	0.8698	0.8698	0.8698
	0.8698	0.8698										
2008	1	1	1	1	1	0.0217	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	0.8332	0.8332	0.8332
	0.8332	0.8332										
2009	1	1	1	1	1	0.0217	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	1.0334	1.0334	1.0334
	1.0334	1.0334										
2010	1	1	1	1	1	0.0217	0.0667	0.2231	0.3365	0.4205	0.5297	0.6615
	0.8603	0.9986	1.0276	0.9480	0.8981	0.9024	1.1253	0.7350	0.9045	0.9045	0.9045	0.9045
	0.9045	0.9045										
# Survey (N=8)												
-1940	1	1	1	1	2	0.030	0.091	0.257	0.394	0.493	0.544	0.591
	0.662	0.721	0.791	0.863	0.931	0.968	1.078	1.002	1.021	1.021	1.021	1.021
	1.021	1.021										
-1995	1	1	1	1	2	0.035	0.111	0.268	0.342	0.488	0.537	0.651
	0.625	0.660	0.756	0.667	0.744	0.800	0.910	0.680	0.801	0.801	0.801	0.801
	0.801	0.801										
-1998	1	1	1	1	2	0.032	0.081	0.209	0.354	0.504	0.517	0.542
	0.641	0.610	0.677	0.808	0.717	0.810	0.773	0.751	0.771	0.771	0.771	0.771
	0.771	0.771										
-2001	1	1	1	1	2	0.028	0.051	0.287	0.484	0.653	0.665	0.747
	0.863	0.855	0.880	0.963	0.979	1.005	1.049	0.993	0.977	0.977	0.977	0.977
	0.977	0.977										
-2003	1	1	1	1	2	0.026	0.100	0.255	0.436	0.522	0.588	0.757
	0.691	0.747	0.825	0.769	0.889	0.927	0.789	0.841	0.996	0.996	0.996	0.996
	0.996	0.996										
-2005	1	1	1	1	2	0.024	0.116	0.260	0.431	0.509	0.539	0.568
	0.634	0.655	0.703	0.796	0.810	0.811	0.760	1.145	0.968	0.968	0.968	0.968
	0.968	0.968										
-2007	1	1	1	1	2	0.022	0.046	0.227	0.378	0.535	0.553	0.607
	0.633	0.647	0.705	0.772	0.763	0.814	0.870	0.801	0.870	0.870	0.870	0.870
	0.870	0.870										
-2009	1	1	1	1	2	0.022	0.067	0.245	0.343	0.471	0.637	0.670
	0.694	0.746	0.823	0.767	0.812	1.015	0.850	0.958	1.033	1.033	1.033	1.033
	1.033	1.033										

End of file

2011 hake Empirical Age model 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 # bnd	Hi bnd	Init value	Prior mean	Prior type	Prior SD	Param phase	Env var	Use dev	Dev minyr	Dev maxyr	Dev SD	Block design	block 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														
-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 # bnd	Hi bnd	Init value	Prior mean	Prior type	Prior SD	Param phase	
13	18	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     1.3     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
0.85    # 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       1       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 - nonparametric age-based selectivity
 -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
 -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
 0.10 0.89 # 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
```

12. Appendix E. TINSS model input files

```
#Data file for 2010 Assessment of Pacific Hake - TINSS
#Model Dimensions
1966	2010	15

#Observed catch megatons (1e6Kg) 1966-2009
#Entire series updated January 7 2011 - aggregate data supplied by Ian Stewart  #
137700	214370	122180	180130	234590	154620	117540	162640	211260	221350	237520	132690	103637
	137110	89930	139158	107741	113931	138492	110399	210616	234148	248840	298079	261365
	320985	302309	199337	363134	250462	307529	326275	322583	314150	229707	229113	182345
	206717	340793	365072	363174	291865	326155	182181	217850

#n_yt - number of acoustic survey yearws
7
#Acoustic survey data year, yt, relwt,suvey_index
#THESE ARE NEW ESTIMATES GENERATED BY CHU (KRIGING) -- Jan 2011
#Relative weights are based on Chu's CVs, where all are scaled to the lowest CV (1998)
 1995	1.518	1.356	1
 1998	1.343	1.000	1
 2001	0.919	1.675	1
 2003	2.521	1.443	1
 2005	1.755	1.726	1
 2007	1.123	1.530	1
 2009	1.612	2.808	1

## Number of ages, and a list of those ages
# numages
14
# ages
2 3 4 5 6 7 8 9 10 11 12 13 14 15
#Extracted from the SS base input file marginals
0.324964	0.043475	0.012039	0.212541	0.009810	0.032765	0.148871	0.002177	0.000000	0.158452	0.000354	0.006429	0.000000
	0.048122
0.168351	0.187074	0.157169	0.195749	0.014026	0.055093	0.087607	0.010731	0.015903	0.048868	0.003121	0.001999	0.042448
	0.011861
0.709921	0.089531	0.052761	0.056572	0.026180	0.026069	0.014190	0.008255	0.005804	0.002446	0.002162	0.004212	0.000400
	0.001496
0.029781	0.025334	0.640666	0.109500	0.027623	0.060058	0.039723	0.021949	0.022287	0.007181	0.004232	0.004367	0.003083
	0.004214
0.239916	0.024324	0.072095	0.051813	0.482518	0.052666	0.017966	0.024352	0.013884	0.011229	0.004744	0.002436	0.000323
	0.001734
0.428146	0.024375	0.101876	0.011527	0.041221	0.026044	0.289941	0.030229	0.013473	0.013191	0.007185	0.006086	0.002778
	0.003928
0.001881	0.229516	0.423131	0.024861	0.091878	0.007856	0.018074	0.024434	0.128613	0.029027	0.009417	0.005566	0.005402
	0.000343

#Age proportions (from number at age calcs_revised)
1975
2010
#Obtained from Ian Stewart, NMFS, January 10 2011
0.3546695 0.0776495 0.0125918 0.2665268 0.0577125 0.0839454 0.1101784 0.0104932 0.0062959 0.0094439 0.0052466 0.0000000 0.0052466
	0.0000000
0.0130000 0.1450000 0.0670000 0.0410000 0.2460000 0.0980000 0.0890000 0.1210000 0.0540000 0.0430000 0.0410000 0.0110000 0.0240000
	0.0070000
0.0840000 0.0370000 0.2750000 0.0360000 0.0910000 0.2270000 0.0760000 0.0650000 0.0400000 0.0360000 0.0230000 0.0060000 0.0030000
	0.0010000
0.0110553 0.0663317 0.0633166 0.2663317 0.0613065 0.0884422 0.2160804 0.0984925 0.0472362 0.0452261 0.0241206 0.0050251 0.0040201
	0.0030151
0.0620000 0.1060000 0.0930000 0.0590000 0.1820000 0.1040000 0.1790000 0.1220000 0.0400000 0.0230000 0.0100000 0.0150000 0.0000000
	0.0050000
0.0040120 0.3510532 0.0190572 0.0481444 0.1003009 0.1163490 0.0511535 0.0892678 0.0962889 0.0651956 0.0230692 0.0200602 0.0080241
	0.0080241
0.0383142 0.0178799 0.3601533 0.0587484 0.0804598 0.0319285 0.1877395 0.0446999 0.0408685 0.0906769 0.0306513 0.0076628 0.0025543
	0.0076628
```

0.3263263 0.0350350 0.0040040 0.2692693 0.0150150 0.0350350 0.0390390 0.1191191 0.0320320 0.0360360 0.0760761 0.0030030 0.0030030 0.0070070
0.0000000 0.3413413 0.0400400 0.0180180 0.2352352 0.0510511 0.0560561 0.0530531 0.0940941 0.0390390 0.0310310 0.0230230 0.0110110 0.0070070
0.0000000 0.0150000 0.6130000 0.0360000 0.0390000 0.1690000 0.0310000 0.0150000 0.0120000 0.0350000 0.0090000 0.0050000 0.0150000 0.0060000
0.0020222 0.0040445 0.0778564 0.7128413 0.0748231 0.0434783 0.0566229 0.0151668 0.0060667 0.0050556 0.0020222 0.0000000 0.0000000 0.0000000
0.1990000 0.0700000 0.0040000 0.0110000 0.3770000 0.0580000 0.0700000 0.0880000 0.0220000 0.0280000 0.0170000 0.0400000 0.0070000 0.0090000
0.0000000 0.3060000 0.0300000 0.0010000 0.0100000 0.5160000 0.0030000 0.0130000 0.0730000 0.0000000 0.0080000 0.0210000 0.0190000 0.0000000
0.0090090 0.0000000 0.3793794 0.0100100 0.0150150 0.0010010 0.3953954 0.0090090 0.0050050 0.1131131 0.0090090 0.0000000 0.0000000 0.0540541
0.0730000 0.0320000 0.0030000 0.5020000 0.0160000 0.0030000 0.0010000 0.3220000 0.0230000 0.0010000 0.0230000 0.0010000 0.0000000 0.0000000
0.0729271 0.2397602 0.0129870 0.0079920 0.2537463 0.0029970 0.0029970 0.0000000 0.3166833 0.0009990 0.0009990 0.0759241 0.0000000 0.0119880
0.0440000 0.2530000 0.2240000 0.0250000 0.0090000 0.2220000 0.0130000 0.0020000 0.0020000 0.1490000 0.0050000 0.0000000 0.0430000 0.0090000
0.0452261 0.0562814 0.1457286 0.1859296 0.0201005 0.0100503 0.3065327 0.0080402 0.0010050 0.0050251 0.1788945 0.0050251 0.0000000 0.0321608
0.0109890 0.2847153 0.0359640 0.1378621 0.1538462 0.0139860 0.0089910 0.2397602 0.0089910 0.0019980 0.0009990 0.0929071 0.0000000 0.0089910
0.0009990 0.0389610 0.2567433 0.0119880 0.1288711 0.2037962 0.0089910 0.0029970 0.2557443 0.0009990 0.0029970 0.0000000 0.0789211 0.0079920
0.0210421 0.0040080 0.0601202 0.3186373 0.0140281 0.0711423 0.1973948 0.0190381 0.0040080 0.1913828 0.0200401 0.0050100 0.0010020 0.0731463
0.1861862 0.1631632 0.0100100 0.0850851 0.1961962 0.0060060 0.0460460 0.1071071 0.0020020 0.0030030 0.1571572 0.0000000 0.0010010 0.0370370
0.0069930 0.3416583 0.2747253 0.0049950 0.0539461 0.1258741 0.0089910 0.0319680 0.0599401 0.0039960 0.0019980 0.0599401 0.0019980 0.0229770
0.0380000 0.2170000 0.2060000 0.2820000 0.0350000 0.0430000 0.0920000 0.0090000 0.0070000 0.0370000 0.0030000 0.0010000 0.0240000 0.0060000
0.1111111 0.2232232 0.1921922 0.1881882 0.1261261 0.0310310 0.0320320 0.0350350 0.0070070 0.0120120 0.0220220 0.0010010 0.0020020 0.0170170
0.0526316 0.1143725 0.1558704 0.1325911 0.2034413 0.1417004 0.0627530 0.0404858 0.0273279 0.0192308 0.0202429 0.0091093 0.0050607 0.0151822
0.2447552 0.1878122 0.1318681 0.1718282 0.0909091 0.0659341 0.0459540 0.0119880 0.0129870 0.0109890 0.0059940 0.0059940 0.0039960 0.0089910
0.0000000 0.5885886 0.1521522 0.0730731 0.0500501 0.0350350 0.0390390 0.0280280 0.0080080 0.0070070 0.0070070 0.0020020 0.0030030 0.0070070
0.0009990 0.0129870 0.7812188 0.1018981 0.0189810 0.0289710 0.0179820 0.0159840 0.0089910 0.0059940 0.0019980 0.0019980 0.0009990 0.0009990
0.0000000 0.0730731 0.0970971 0.6886887 0.0580581 0.0150150 0.0280280 0.0210210 0.0060060 0.0070070 0.0010010 0.0030030 0.0000000 0.0020020
0.0109890 0.0059940 0.0849151 0.0609391 0.6923077 0.0699301 0.0219780 0.0209790 0.0139860 0.0069930 0.0079920 0.0019980 0.0000000 0.0009990
0.0170854 0.1437186 0.0211055 0.0984925 0.0522613 0.5849246 0.0412060 0.0110553 0.0140704 0.0070352 0.0040201 0.0030151 0.0010050 0.0010050
0.1583756 0.0395939 0.1664975 0.0162437 0.0741117 0.0456853 0.4121827 0.0436548 0.0172589 0.0131980 0.0081218 0.0020305 0.0010152 0.0020305
0.0927419 0.3860887 0.0262097 0.1381048 0.0100806 0.0362903 0.0332661 0.2429435 0.0181452 0.0060484 0.0060484 0.0010081 0.0020161 0.0010081
0.0070922 0.3272543 0.3383992 0.0283688 0.0911854 0.0091185 0.0212766 0.0131712 0.1367781 0.0162107 0.0030395 0.0050659 0.0020263 0.0010132
0.2895792 0.0140281 0.4048096 0.2114228 0.0150301 0.0190381 0.0020040 0.0030060 0.0060120 0.0300601 0.0040080 0.0000000 0.0010020 0.0000000

###Entire series revised January 2011
#Catch Weight at age (1966-2010) #2 3 4 5 6 7 8 9 10 11 12 13 14 15
#NB 1966-1974 average of new series. NEW SERIES FROM 1975-2010
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441 0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895 1.002178301 1.021286413

0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.257481216 0.39400288 0.492793898 0.544458326 0.590642252 0.661987441
0.720983453 0.79070932 0.862534484 0.931223433 0.968035893 1.077946895
1.002178301 1.021286413
0.29870000 0.36583333 0.61428571 0.63059322 0.78733333 0.87384615
0.96782609 0.90750000 0.97000000 1.69333333 1.50000000 1.90000000
1.95548387 2.74454545
0.23588889 0.49731523 0.51880342 0.69356436 0.80412664 0.91658683
1.20970944 1.33748756 1.44977419 1.65323077 1.80664286 1.85882353
1.95548387 2.74454545
0.40213918 0.48697761 0.59020032 0.66503049 0.74929883 0.82669643
0.97808418 1.10521739 1.23491667 1.31484375 1.40583893 1.75114286
2.03666667 2.20941176
0.13600000 0.46988067 0.53004975 0.60265116 0.63924603 0.73948998
0.83905125 0.97746606 1.09707641 1.23493333 1.30279279 1.48142857
1.74185185 2.33785714
0.24099415 0.25866906 0.58212219 0.68675000 0.76767988 0.89092827
0.91282353 1.03686316 1.19870504 1.24818182 1.53263158 1.55200000
1.79500000 1.98166667
0.22363610 0.45294532 0.39223388 0.49043111 0.51659017 0.65542640
0.71254258 0.87403290 1.06156239 1.16230511 1.28982398 1.30013998
1.26990338 1.39611787
0.21369204 0.34218451 0.52643683 0.39328076 0.52537284 0.54624801
0.74643154 0.72040710 0.82312746 1.04129930 1.09886254 1.34494905
1.49264179 1.21278224
0.24653481 0.33362180 0.30971104 0.54961219 0.39556275 0.52747468
0.56285031 0.76057432 0.68371073 0.85390604 1.06698709 0.87927747
1.01864626 1.16933755
0.13566524 0.34096417 0.36941340 0.32767627 0.51997252 0.50275519
0.61789214 0.70601496 0.88001394 0.92990138 1.03557547 1.03102479
1.32166478 1.48232826
0.16424805 0.24928139 0.43851121 0.41132567 0.43515119 0.58722506
0.58020098 0.67577693 0.70095627 0.95125625 1.13644080 1.02578701
1.28072686 1.88000000
0.22966052 0.26787099 0.44142516 0.54966722 0.54740107 0.60141968
0.74523402 0.69334233 0.72311980 0.85840481 0.86975845 0.94581146
0.67585208 1.12169523
0.27707890 0.29092716 0.30241291 0.37345020 0.54245831 0.57173262
0.64206578 0.82090752 0.94031880 1.18604258 1.18996338 1.38637838
1.68002863 1.61417195
0.13877080 0.37904309 0.27861241 0.28701524 0.36205024 0.57750167
0.59746377 0.63692487 0.76375750 0.98200000 0.92500000 1.24065847
1.20305556 1.41571429
0.18702917 0.31886271 0.47112526 0.36894266 0.37305932 0.51633089
0.64737340 0.68510514 0.71830474 0.91669355 1.09239800 1.02250000
1.45000000 1.45368421

0.27366376 0.30472737 0.29306066 0.51337112 0.43863520 0.40636682
0.51666161 0.62633661 0.66114451 0.60267921 0.87576137 0.66862495
0.82817339 1.12644152
0.24351955 0.35059305 0.39063291 0.51111111 0.54621590 0.60764706
0.66777778 0.53000000 0.76908504 0.83125000 2.20000000 1.18473958
1.32576979 1.46680000
0.27538646 0.36969094 0.45981049 0.51378883 0.54372501 0.59067830
0.72099231 0.84972731 1.09974500 0.71847703 0.64032616 0.92271811
1.20511007 2.38284268
0.23163526 0.34726390 0.47433367 0.53340285 0.58166290 0.62102838
0.64059633 0.65301308 0.63295238 0.72168750 0.73543574 0.85010388
0.97500000 1.02718798
0.24863477 0.33838638 0.39601559 0.45391162 0.49348435 0.50167127
0.48802061 0.54908173 0.50996778 1.26297848 1.02500000 0.61348267
0.59947560 0.68500683
0.30000000 0.36256819 0.44694443 0.44731209 0.52615739 0.57003303
0.62183271 0.55976868 0.63408591 0.48500000 0.64907053 0.73000000
0.70129383 0.74551903
0.26821941 0.34178356 0.48761090 0.53672651 0.65060574 0.62494533
0.65973460 0.75598834 0.66704600 0.74419008 0.79982070 0.91005329
0.68038800 0.80081935
0.28760477 0.39815937 0.46742091 0.53166497 0.56512213 0.65089275
0.59572554 0.63617054 0.60485893 0.75000000 0.67557066 1.08043189
1.48529312 0.75087280
0.35546668 0.43216342 0.49307190 0.54763825 0.54526919 0.58332152
0.58545411 0.60707999 0.63153126 0.86333333 0.59459533 0.71183323
0.66184450 0.86930057
0.20908259 0.35390632 0.50414352 0.51720322 0.54201367 0.64121672
0.60988953 0.67689398 0.80784095 0.71742604 0.80997222 0.77333679
0.75102382 0.77137444
0.25017474 0.34549509 0.42508452 0.52652152 0.55687307 0.57268168
0.61174441 0.70304254 0.66503020 0.79886551 0.75544156 0.87871807
0.73484377 0.81867906
0.32163706 0.47293400 0.57656707 0.65978248 0.71760699 0.72792653
0.75387583 0.83776017 0.81593982 0.88135650 0.85538032 0.93913350
0.87444513 0.93364097
0.28667013 0.48433345 0.65267299 0.66450168 0.74692172 0.86287378
0.85545556 0.88015276 0.96298011 0.97903170 1.00540360 1.04944391
0.99269319 0.97676624
0.35833768 0.45750803 0.60578654 0.81598945 0.75814483 0.84878395
0.97707839 0.93223037 0.91759764 0.99743645 0.98895030 0.92363636
1.12500786 1.05731574
0.25506658 0.43552760 0.52245840 0.58790967 0.75685516 0.69148433
0.74693619 0.82461197 0.76915859 0.88871563 0.92659886 0.78943743
0.84142105 0.99645447
0.25767880 0.43602338 0.48066852 0.53192394 0.64778325 0.70683173
0.65792953 0.70943498 0.80501139 0.85807677 0.77148793 0.97044112
0.86305714 0.89590979
0.26029102 0.43114615 0.50856231 0.53934367 0.56823418 0.63362898
0.65497943 0.70273466 0.79622012 0.81040001 0.81086008 0.76020813
1.14485228 0.96784213
0.38310324 0.45748259 0.53407862 0.57398092 0.59098940 0.59786461
0.65600380 0.69965612 0.72589389 0.72199927 0.77530848 0.65800684
0.63991740 0.95502880
0.22721310 0.37755780 0.53521799 0.55297335 0.60730849 0.63275570
0.64746281 0.70549432 0.77226548 0.76269225 0.81368488 0.87023922
0.80084133 0.86975166
0.24446516 0.40805706 0.56301528 0.63705509 0.68653507 0.68177596
0.70842585 0.72103335 0.74883032 0.80726107 0.84833938 0.77547025
0.88341564 0.83322320
0.24484950 0.34309938 0.47116844 0.63707054 0.67019360 0.69422922
0.74626057 0.82258945 0.76719860 0.81152735 1.01474456 0.85034884
0.95815532 1.03337456
0.22310125 0.33650576 0.42050916 0.52965997 0.66149447 0.86025314
0.99855978 1.02761276 0.94798173 0.89814715 0.90243485 1.12533293
0.73500000 0.90446245

```
#Aging error std for constructing a classification matrix.
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

#eof
999

#Control file for Tinss.exe with modifications by Robyn Forrest
#logmsy - switch for estimating log of msy 1=log(msy) 0=msy CHANGE FIRST LINE OF THETA BELOW (FIRST LINE IF LOGS)
0
#verbose (0=false, 1=true)
0
#Retro years
0
#steepmap
0
#meanbet -- mean of SS3 beta distribution for steepness
0.777
#meansd -- sd of SS3 beta distribution for steepness
0.113

# eqm Switch to determine whether model is initialised at equilibrium
0

# Priors

# Fmsy mean
#0.35
0.35
# Fmsy sd
0.4

# Msy mean
0.2
# Msy sd
0.5

# M mean
0.2
# M sd
0.1

# rhoAlpha
3
# rhoBeta
12

# ____________________________________________________________________________
#          POPULATION PARAMETERS  (theta)
# ____________________________________________________________________________
#np
9
# ival        lb          ub          phz               #parameter
# ____________________________________________________________________________
 0.2          0.01     3.0         1                 #msy
 0.35         0.01        3.0         1                 #fmsy
 0.2          0.05        0.9         1                       #m
 3.5          0.00        14.0        1                 #ahat - age at 50% first harvest FISHERY
 0.45         0.05        5.0         1                       #ghat - standard eviation in selectivity
FISHERY
 2.5          2.00        14.0        1                 #abar - logistic survey selectivity (base =2.0)
 0.45         0.05        5.0         1                       #gbar      - logistic survey selectivity (base
=0.45)
 0.15         0.01        0.999    3                    #rho
 1.25         0.01     150.0       2                    #varphi
# ____________________________________________________________________________
#
```

```
#
#______________________________________________________________________________#
#          LIFE-HISTORY_PARAMETERS                                                       #
#______________________________________________________________________________#
#nphi
9
#ival          lb          ub          phz                #parameter
#______________________________________________________________________________#
25.15          20.00       40.0        -2        #l1
52.948    41.00       80.0        -2        #l2
0.334          0.01        0.9         -2        #rho_vbk
6.5359e-6  0.00        1.0         -1        #a
2.98684        0.00        4.0         -1        #b
2.7                        0.10        15.0      -1        #lam1
0.37                  0.00        2.5         -1        #lam2
2.721                 0.00        5.0         -1        #adot  maturity (Dorn 1997): age at 50% maturity
0.488                 0.00        1.0         -1        #gdot  maturity: sd maturity
#______________________________________________________________________________#
999
```

13. Appendix F. TINSS model description and documentation

Appendix F. TINSS Model description and documentation

The stock assessment model used herein consists of 4 major components:

1. A component for initializing the model based on steady-state conditions,
2. A component for updating the state variables,
3. A component that relates the state variables to observations on relative abundance and composition information, and
4. A statistical criterion for evaluating how likely these data are for a given set of model parameters.

We have broken the description of the assessment model into these four components and use a series of tables to document model equations. Symbols and their definitions are defined in Table 1; furthermore, we have divided the estimated parameter set into life-history parameters Φ and population parameters Θ for clarity.

We have adopted a management oriented approach tho the parameterization of the age-structured model where the leading parameters that define population scale and productivity correspond to MSY and F_{msy}. The basic idea here is to change the question to how likely are the data given MSY and F_{msy} and derive the corresponding B_o and slope of the stock recruitment relationship rather than the traditional approach of estimating these values directly. There are a few statistical advantages of using this approach (i.e., reduced confounding between the leading parameters Schnute and Richards, 1998 [3]), but perhaps the biggest advantage is to increase the transparency by which the application of informative priors influence model results Martell et al., 2008 [4]).

Model initialization

To initialize the model, we must first derive B_o and κ from MSY and F_{msy} as well as other life-history parameters Φ and the vulnerability schedule. In other words, first we must transform the management parameters MSY and F_{msy} into population parameters B_o and κ. This transformation starts with the equilibrium yield equation (e.g. Fig 1a), differentiating this function with respect to F_e, setting this equation equal to 0 and solving for κ (for the full derivation see Martell et al., 2008 [4]). Next substitute κ back into the equilibrium recruitment equation to obtain estimates of the unfished biomass B_o.

An alternative way to envision this transformation is to think about it graphically. For any given model (e.g., a simple production model or a complex age-structure model) we can derive a system of equations that results in the equilibrium yield for any specified equilibrium fishing mortality rate. This same system of equations can also be used to derived equilibrium values of recruitment (e.g., Fig 1b), equilibrium biomass (e.g., Fig 1c) and the spawners per recruit

Table 1: Description of symbols and indices used in TINSS

Symbol	Description
Indices	
i, j, k, l	index for age,year, fleet, and size interval
Estimated population parameters (Θ)	
F_{msy}	Optimal fishing mortality rate
MSY	Maximum sustainable yield
M	Instantaneous natural mortality rate
a_{h_k}	Age at 50% selectivity
γ_k	Standard deviation in selectivity
Estimated life-history parameters (Φ)	
l_∞	mean asymptotic length
k	growth coefficient
t_o	age at 0 length
a, b	parameters for length-weight relationship
λ_1, λ_2	parameters for standard deviation in length-at-age
Derived variables	
B_o	unfished steady-state biomass
κ	recruitment compensation ratio (Goodyear, 1980 [1])
R_e	equilibrium age-1 recruitment
$\iota_i, \hat{\iota}_i$	survivorship to age i, unfished and fished
ϕ_E, ϕ_e	eggs per recruit, unfished and fished
ϕ_B, ϕ_b	vulnerable biomass per recruit, unfished and fished
ϕ_q	vulnerable biomass available to the fishery

(Fig. 1d). The traditional approach would then differentiate the catch equation with respect to F_e, solve this expression for F_e to determine the corresponding value of F_{msy}, then substitute the corresponding F_{msy} into the catch equation and calculate MSY conditional on estimates of B_o and κ. What differs in the management oriented approach is that we estimate MSY and F_{msy} directly and then derive B_o and κ conditional on the estimates of MSY and F_{msy}.

The system of equation used to derive B_o and κ are laid out in Table (2). The purpose of laying out the equations in a tabular format is two fold, 1) documentation of the model structure and 2) to provide an algorithm or pseudo code in which to implement the model. First given initial estimates of the life-history parameters Φ (7), calculate the corresponding age-schedule information (8)–(11). Note that this does not assume that growth or maturity is constant over time, only that some average, or steady state, growth occurred for the cohorts that are used to initialize the numbers-at-age. Next, calculate the survivorship (12) of an individual recruit based on the instantaneous natural mortality rate M. These survivorship functions (12) and (13) are used to calculate the per recruit incidence functions for unfished and fished conditions, respectively. An incidence function is the sum of age-specific schedules that express the population units on a per recruit basis. For example the total biomass

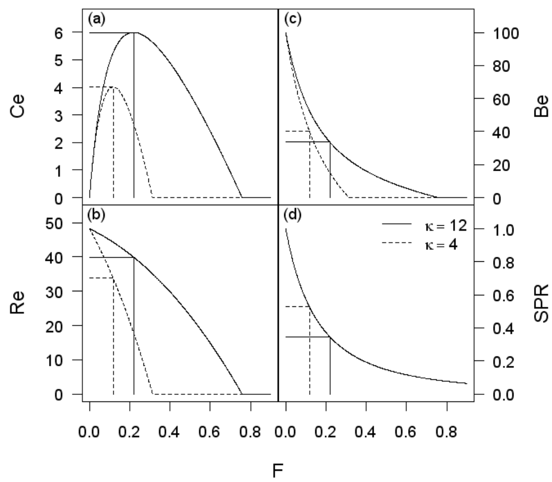


Figure 1: Relationship between equilibrium values for yield (a), recruitment (b), biomass (c) and spawners per recruit (d) versus instantaneous fishing mortality rate for a hypothetical stock with high ($\kappa = 12$) and low ($\kappa = 4$) recruitment compensation parameters.

per recruit is given by (15) and the total unfished biomass is the product $R_o\phi_E$. For notational purposes the prefix ϕ denotes an incidence function and the corresponding subscript denotes the type of incidence function (see Table (1) for definitions); we also use upper and lower case subscripts to denote unfished and fished conditions, respectively.

The eggs per recruit for unfished and fished conditions are defined by (14), the biomass per recruit by (15), and the vulnerable biomass per recruit available to the fishery is defined by (16). Note that we assume both natural and fishing mortality operate simultaneously and ϕ_q represents the Barnov catch equation. To derive κ, we differentiate

$$C_e = F_e R_e \phi_q \tag{1}$$

with respect to F_e and solve this equation for κ. Using the chain rule, the derivative of (1) is

$$\frac{\partial C_e}{\partial F_e} = R_e\phi_q + F_e\phi_q\frac{\partial R_e}{\partial F_e} + F_e R_e\frac{\partial \phi_q}{\partial F_e} \tag{2}$$

To derive the recruitment compensation parameter (17) it is necessary to substitute (16) and (18) into (2), set the corresponding expression equal to zero and then solve for κ. The partial derivatives for (17) are defined in Table (3). Equation (18) is the equilibrium recruits that corresponds to the equilibrium fishing mortality rate F_e and (19) corresponds to the unfished biomass.

Initialization with multiple fleets

Although the catch data are aggregated into a single fleet for this assessment, the following describes an algorithm for implementing the management oriented approach for multiple fleets that have different age-specific fishing mortality rates. In essence, the algorithm derives F-multipliers for each fleet.

The catch equation (1) considers a single fishery with a unique vulnerability-at-age curve. In the case of multiple fisheries with different vulnerability-at-age curves, it is necessary to allocate the proportion of the total fishing mortality (F_{msy}) to each fleet such that the sum of catches from each fleet is equal to MSY. For example, consider two separate fishing fleets A and B and assume that fleet A harvest younger fish that fleet B and that the allocation of MSY is assigned equally to each fleet. In this case a higher proportion of F_{msy} would be assigned to fleet B because this fleet harvest fewer, older fish, in comparison to fleet A which harvest more abundant younger fish. Thus, if some sort of allocation agreement exists between two or more fleets, a multiplier on the fishing mortality rate must be used to allocate the total catch among these fleets. For a given allocation arrangement (e.g., where the fraction of MSY assigned to fleet k is denoted as Λ_k), the equilibrium catch of fleet k can be represented as:

$$\Lambda_k MSY = \tau_k F_{msy} R_e \phi_q^{(k)} \tag{3}$$

where τ_k is the fleet specific multiplier on F_{msy}, R_e is defined in (18), and $\phi_q^{(k)}$ is the fleet specific vulnerable biomass per recruit which is defined as

$$\begin{aligned} \phi_q^{(k)} &= \sum_i \frac{\hat{\iota}_i w_i v_{i,k}}{Z_i} \left(1 - e^{-Z_i}\right), \\ \text{where} \quad Z_i &= M + F_{msy} \sum_k \tau_k v_{i,k}, \\ \hat{\iota}_i &= \begin{cases} 1 & i = 1 \\ \hat{\iota}_{i-1} e^{-Z_{i-1}} & i > 1. \end{cases} \end{aligned} \tag{4}$$

Note that τ_k appears multiple times in (4) in the Z_i and $\hat{\iota}_i$ terms, as well as the derivation of R_e (see eq. (18)), and there is no analytical solution for τ_k (at least that we could find using symbolic math languages). Therefore, τ_k must be solved for iteratively. Solving (3) for τ_k results in an update of τ_k:

$$\tau_k = \frac{\Lambda_k MSY}{R_e F_{msy} \phi_q^{(k)}} \tag{5}$$

A simple algorithm to numerically calculate τ_k proceeds as follows

1. set initial values of the fishing multiplier equal to the allocation proportion: $\tau_k = \Lambda_k$ (Note that if the vulnerability-at-age curves are the same for each fleet, then τ_k is exactly equal to Λ_k, i.e., the vulnerable biomass per recruit is the same for all fleets).

2. calculate the age-specific total mortality rates for all fleets combined

$$Z_i = M + F_{msy} \sum_k \tau_k v_{i,k}.$$

3. calculate survivorship ($\hat{\iota}_i$), and per-recruit incidence functions that lead to R_e (eqs. (13)–(18)) based on the age-specific total mortality rate in step 2.

4. for each fleet k, calculate the vulnerable biomass per-recruit ($\phi_q^{(k)}$) using (4).

5. update τ_k using (5), and repeat steps 2-5 until estimates of τ_k converge (Note this take 6-20 iterations depending on how different the vulnerability-at-age curves are for each fleet.

6. Check that the sum catches for each fleet equal MSY.

The algorithm outline above is based on the allocation arrangement among the various fleets (Λ_k) and is not intended to optimize the allocation arrangement based on differences in vulnerability among the various fishing fleets. This is an entirely different policy issue that is not addressed here. If there is no formal allocation arrangement, then historical catch proportions to each fleet could be used as a starting point for values of Λ_k. Recall, that the approach adopted here is to simple express the population parameters B_o and κ as analytical functions of management parameters MSY and F_{msy}.

Updating state variables

Equations used to update the state variables are defined in Table (4). We aggregate the catch data from the CAN and US fisheries into a single catch time series (26) and treat both fisheries as a single fishery with the same selectivity pattern over time. This data simplification reduces the number of estimated parameters but further assumes that the relative mortalities imposed by the two different fisheries has been constant over time. We also aggregate the catch-age samples from the commercial fisheries ($A_{i,j}$) into a single catch age matrix. Catch-age data for the US portion of the fishery are available back to 1976, and age-composition information for the CAN portion of the fishery are available back to 1988. The age-compositions were combined from 1988 to 2006 using a weighted average, where the weights are the proportions landed by each nation.

Process errors are represented as a vector of annual recruitment deviations ω_j which are assumed to be lognormal with an estimated variance τ^2. These annual deviations are estimated parameters and included in the objective function calculation with a bias correction term for the log-normal distribution (40).

The relative abundance data (I_j) corresponds to the abundance index derived from the acoustic surveys, and here we assume these indices are proportional to abundance and use the conditional maximum likelihood estimate of the scaling parameter in the calculation of the residuals (38). We assume that observation errors in the acoustic survey data are lognormal and the likelihood function for acoustic survey data are given by (41).

Residuals between the observed proportions and predicted proportions-at-age for each fleet (the joint US and CAN fleet and the fisheries independent surveys) were assumed to come from a multivariate logistic distribution. Age composition information are generally thought to arise from a multinomial distribution where the probability of sampling a fish of a given age is conditioned on the product of proportions-at-age in the population and the probability of sampling a fish age-i given the sampling gear. However, the multinomial likelihood kernel generally results in errors that are unrealistically small due to the large samples taken for ageing Schnute and Richards, 1995 [2]. The advantage of the multivariate logistic distribution is that the likelihood kernel can be weighted by the conditional maximum likelihood estimate of the variance; this is given by the mean squared error of the residual terms $\eta_{i,j,k}$ for each fleet k. The likelihood of the age composition information for both fleets k (commercial and acoustic survey) is given by (42).

References

[1] Goodyear, C.P., *Compensation in fish populations*, Biological Monitoring of Fish, Lexington Books, D.C. Heath Co., Lexington, MA, 1980.

[2] Schnute, J.T., Richards, L.J., *The Influence of Error on Population Estimates from Catch-Age Models*, Canadian Journal of Fisheries and Aquatic Sciences, 52(10):2063-2077, 1995.

[3] Richards, L.J., Schnute, J.T., *Model Complexity and Catch-Age Analysis*, Canadian Journal of Fisheries and Aquatic Sciences, 55:949-957, 1998.

[4] Martell, S.J.D., *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, 2008.

Table 2: Steady-state age-structured model assuming unequal vulnerability-at-age, age-specific natural mortality, age-specific fecundity and Beverton-Holt type recruitment.

Parameters

$$ \tag{6} $$

$$\Phi = (l_\infty, k, t_o, a, b, \dot{a}, \dot{\gamma}) \tag{7}$$

Age-schedule information

$$l_i = l_\infty(1 - \exp(-k(a - t_o))) \tag{8}$$

$$w_i = a(l_i)^b \tag{9}$$

$$v_i = (1 + \exp((\hat{a} - a)/\hat{\gamma}))^{-1} \tag{10}$$

$$f_i = w_i(1 + \exp((\dot{a} - a)/\dot{\gamma}))^{-1} \tag{11}$$

Survivorship

$$\iota_i = \begin{cases} 1, & i = 1 \\ \iota_{i-1}e^{-M}, & i > 1 \\ \dfrac{\iota_{i-1}}{1 - e^{-M}}, & i = A \end{cases} \tag{12}$$

$$\hat{\iota}_i = \begin{cases} 1, & i = 1 \\ \hat{\iota}_{i-1}e^{-M - F_{msy}v_{i-1}}, & i > 1 \\ \dfrac{\hat{\iota}_{i-1}}{1 - e^{-M - F_{msy}v_i}}, & i = A \end{cases} \tag{13}$$

Incidence functions

$$\phi_E = \sum_{i=1}^{\infty} \iota_i f_i, \quad \phi_e = \sum_{i=1}^{\infty} \hat{\iota}_i f_i \tag{14}$$

$$\phi_B = \sum_{i=1}^{\infty} \iota_i w_i, \quad \phi_b = \sum_{i=1}^{\infty} \hat{\iota}_i w_i v_i \tag{15}$$

$$\phi_q = \sum_{i=1}^{\infty} \frac{\hat{\iota}_i w_i v_i}{M + F_{msy}v_i} \left(1 - e^{(-M - F_{msy}v_i)}\right) \tag{16}$$

Derived variables

$$\kappa = \frac{\phi_E}{\phi_e} - \frac{F_{msy}\phi_q \dfrac{\phi_E}{\phi_e^2} \dfrac{\partial \phi_e}{\partial F_{msy}}}{\phi_q + F_{msy} \dfrac{\partial \phi_q}{\partial F_{msy}}} \tag{17}$$

$$R_e = \frac{MSY}{F_{msy}\phi_q} \tag{18}$$

$$B_o = \phi_B \frac{R_e(\kappa - 1)}{\kappa - \phi_E/\phi_e} \tag{19}$$

Table 3: Partial derivatives, based on components in Table (2), required for the derivation of κ and B_o using the Beverton-Holt recruitment model.

Mortality & Survival

$$Z_i = M + F_{msy} v_i \tag{20}$$

$$S_i = 1 - e^{-Z_i} \tag{21}$$

Partial for survivorship

$$\frac{\partial \hat{\iota}_i}{\partial F_{msy}} = \begin{cases} 0, & i = 1 \\ e^{-Z_{i-1}} \left(\frac{\partial \hat{\iota}_{i-1}}{\partial F_{msy}} - \hat{\iota}_{i-1} v_{i-1} \right), & i > 1 \\ \frac{e^{-Z_{i-1}}}{1 - e^{-Z_i}} \left(\frac{\partial \hat{\iota}_{i-1}}{\partial F_{msy}} - \hat{\iota}_{i-1} v_{i-1} \right) - \hat{\iota}_{i-1} e^{-Z_{i-1}} v_i e^{-Z_i}, & i = A \end{cases} \tag{22}$$

Partials for incidence functions

$$\frac{\partial \phi_e}{\partial F_{msy}} = \sum_{i=1}^{\infty} f_i \frac{\partial \hat{\iota}_i}{\partial F_{msy}} \tag{23}$$

$$\frac{\partial \phi_q}{\partial F_{msy}} = \sum_{i=1}^{\infty} \frac{w_i v_i S_i}{Z_i} \frac{\partial \hat{\iota}_i}{\partial F_{msy}} + \frac{\hat{\iota}_i w_i v_i^2}{Z_i} \left(e^{-Z_i} - \frac{S_i}{Z_i} \right) \tag{24}$$

Partial for recruitment

$$\frac{\partial R_e}{\partial F_{msy}} = \frac{R_o}{\kappa - 1} \frac{\phi_E}{\phi_e^2} \frac{\partial \phi_e}{\partial F_{msy}} \tag{25}$$

Table 4: Statistical catch-age model using the Baranov catch equation and MSY and F_{msy} as leading parameters.

Data

$$C_j = C_j^{\text{US}} + C_j^{\text{CA}} \tag{26}$$

$$I_j, A_{i,j,k} \tag{27}$$

Parameters

$$\Theta = (\text{MSY,F}_{msy}\text{,M,,,,,}\{\omega_j\}_{j=1}^{J-1}, \rho, \vartheta^2) \tag{28}$$

$$\sigma^2 = \rho\vartheta^2, \quad \tau^2 = (1-\rho)\vartheta^2, \quad \sum_t \omega_t = 0 \tag{29}$$

Unobserved states

$$N_{i,j}, B_j, E_j, F_j \tag{30}$$

Initial states (t=1)

$$N_{i,j} = B_o/\phi_B \iota_i \tag{31}$$

State dynamics (t>1)

$$E_j = \sum_i N_{i,j} f_i \tag{32}$$

$$Z_{i,j} = M + F_j v_i \tag{33}$$

$$\hat{C}_j = \sum_i \frac{N_{i,j} w_i F_j v_i \left(1 - e^{-Z_{i,j}}\right)}{Z_{i,j}} \tag{34}$$

$$F_{j_{i+1}} = \; F_{j_i} - \frac{\hat{C}_j - C_j}{\hat{C}'_j} \tag{35}$$

$$N_{i,j} = \begin{cases} \dfrac{s_o E_{j-1}}{1+\beta E_{j-1}} \exp(\omega_j - 0.5\tau^2) & i = 1 \\ \\ N_{i-1,j-1} \exp(-Z_{i-1,j-1}) & i > 1 \end{cases} \tag{36}$$

$$B_j = \sum_i N_{i,j} w_i v_i \tag{37}$$

Residuals

$$\epsilon_j = \ln\left(\frac{I_j}{B_j}\right) - \frac{1}{n} \sum_{j \in I_j} \ln\left(\frac{I_j}{B_j}\right) \tag{38}$$

$$\eta_{i,j,k} = \ln(p_{i,j,k}) - \ln(\bar{p}_{i,j,k}) - \frac{1}{I-1} \sum_{i=2}^{I} [\ln(p_{i,j,k}) - \ln(\bar{p}_{i,j,k})] \tag{39}$$

Table 5: Likelihoods and priors used in the statistical estimation of Θ from Table (4).

Negative log-likelihoods

$$\ell(\Theta)_1 = \sum_{j=1}^{J-1} \left[\ln(\tau) + \frac{(\omega_j + 0.5\tau^2)^2}{2\tau^2} \right] \tag{40}$$

$$\ell(\Theta)_2 = \sum_{j \in I_j} \left[\ln(\sigma) + \frac{\epsilon_j^2}{2\sigma^2} \right] \tag{41}$$

$$\ell(\Theta)_3 = \sum_{k} \left\{ (I-2) J_{j \in k} \ln \left(\frac{1}{(J_{j \in k} - 2) I} \sum_{j=1}^{J_{j \in k}} \sum_{i=2}^{I} \eta_{i,j,k}^2 \right) \right\} \tag{42}$$

$$\ell(\Theta) = \sum_{i=1}^{3} \ell(\Theta)_i \tag{43}$$

Constraints

$$\kappa > 1.0 \tag{44}$$

Posterior distribution

$$P(\Theta) \propto \exp[-\ell(\Theta)] p(\mathrm{MSY}) p(\mathrm{F}_{msy}) \mathrm{p}(\mathrm{M}) \mathrm{p}(\rho) p(\vartheta^2) \tag{45}$$

Pacific Whiting

Joint U.S.-Canada STAR Panel Report

Pacific Fishery Management Council
Hotel Deca
Seattle, Washington
February 7-11, 2011

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Overview

During 7-11 February 2011, a Joint Canada-U.S. Pacific hake / whiting Stock Assessment Review (STAR) Panel met in Seattle, Washington, to review a draft stock assessment document that had been prepared by the Joint Canada-US stock assessment team. The Panel operated under the U.S. Pacific Fishery Management Council's Terms of Reference for the Groundfish Stock Assessment and Review Process for 2011-2012 (PFMC 2010). As in previous years, the Panel attempted to adhere to the spirit of the Canada-U.S. Treaty on Pacific hake / whiting (Bush 2004). The revised stock assessment and the STAR Panel Report will be forwarded to the Pacific Fishery Management Council (PFMC) and its advisory groups, and to the Canadian Department of Fisheries and Oceans (DFO) managers and the Groundfish Sub-committee of PSARC (Pacific Scientific Advice Review Committee).

The Panel convened at 9AM Monday, February 7, 2011 with a welcome from Tom Jagielo (Panel Chair) and a round of introductions. Mr. Jagielo then gave a brief overview of the STAR process and reviewed the terms of reference (PFMC 2010). The agenda was subsequently reviewed and adopted for the STAR Panel.

Presentations began with Dr. Ian Stewart giving an overview of the acoustic survey. Past concerns were identified and actions taken in 2010 to rectify them were discussed. The primary questions were: 1) what is the survey biomass variance, 2) how sensitive are the survey results to the analysis methods, 3) what are the implications of sparse haul sampling, and 4) is post-stratification of the haul sampling appropriate. Dr. Stewart summarized progress made in 2010, including: 1) the raw acoustic data were re-analyzed, 2) biomass estimates and characterization of uncertainty were improved using the method of kriging, 3) uncertainty in the 2009 estimate due to the presence of squid in 2009 was evaluated, 4) new sampling failed to reveal a systematic bias in trawl samples, and 5) the analysis results were robust to post stratification. A major difference in the 2011 assessment is that the survey data prior to 1995 are not included due to limited spatial and bathymetric coverage.

Dr. Dezhang Chu followed up with a more detailed presentation of the acoustic survey design and historical database and a discussion of the data explorations done since last year (Chu and Thomas 2011). Questions from the STAR Panel focused on the companion trawl survey and the selectivity of the gear used to verify the species composition of the acoustic backscatter and to obtain biological samples. It was noted that there was a change in the mid-water trawl on the U.S. survey vessel after 2001; although no comparative tows were made, it was indicated that selectivities of the two gears were probably similar. The STAR Panel questioned the use of the Traynor (1996) target strength relationship; given more recent research results are available (Henderson and Horne 2007). The Acoustics Team indicated that although there was uncertainty in both relationships, it continued to use the Traynor relationship as it was more consistent with other available information. The Acoustics Team noted the importance of continued target strength research and the STAR Panel endorsed this as an important recommendation.

Next, Dr. Chu gave a presentation on the reprocessing of historical acoustic survey data and kriging (Chu 2011). Data re-processing focused on the years from 1995 forward, due to problems with incomplete data and lack of full spatial and depth coverage into Canada in the earlier years. Reprocessing with the new EchoPro software resulted in estimates which showed minor discrepancies when compared to the previous values; in part this resulted from improved treatment of the bottom algorithm. The technique of kriging was used to derive estimates of total biomass from the transect data. Kriging is a geo-spatial analysis method that has been used extensively in the mining industry. Kriging estimates are consistently larger than original estimates because this method includes area beyond the transect extent. One set of semi-variograms (along and across isobaths) is produced for each survey year over the entire survey area, and semi-variograms were shown to be similar between surveys. It was pointed out that one set of coastwide semi-variograms per year assumes the same spatial structure throughout, yet age structure is known to vary by latitude. The STAR Panel discussed the possibility of using a regression model to assist characterization of the spatial structure, considering the large area covered and the lack of homogeneity over the range. Dr. Chu pointed out that the method they employed strived to minimize subjectivity, which can be a factor when employing regression methods. It was agreed that this would be a good area for future research in a sensitivity analysis. Previous STAR panels have asked for an analysis of the factors affecting the spatial distribution of the stock, and it was noted that Melissa Haltuch is currently preparing a report on this subject that is not yet ready for distribution.

Dr. Rebecca Thomas followed with a presentation on the re-analysis of the 2009 acoustic survey data and the challenges of dealing with the unusually large numbers of Humboldt squid seen in the survey in that year. Approximately 39% of the estimated 2009 hake biomass came from "challenging transects" where squid occurred with hake. Stratification by depth of the two species was observed in the survey, with squid often found above hake in the water column. Bootstrapping analyses were conducted to evaluate the sensitivity of the survey results to assumptions including: 1) choice of depth threshold, 2) species composition in trawl sets, and 3) expert opinion in identifying squid. Re-analysis of the 2009 survey left the point estimate of hake biomass unchanged, but resulted in higher uncertainty. The highest uncertainty (species composition in trawl sets) was added to survey uncertainty.

Dr. Thomas continued with a presentation on haul representativeness in the acoustic survey. Trawl sampling experiments were conducted in 2010 in U.S. and Canadian waters to begin to evaluate the variability of repeated hauls on fish aggregations. The survey team had difficulty in finding suitable schools of hake in 2010 for the evaluation. Sample sizes were small and variability was high among hauls (especially in the US zone), with no clear patterns evident. Statistical analysis of post-stratification indicates model results are insensitive to post-stratification of survey data. The acoustic survey team emphasized that more work of this kind in the future will help to validate haul representativeness for the survey.

Presentations were given on the 2010 fishery in Canada by Chris Grandin and in the US by Ian Stewart. A relatively large number of age 2 fish (2008 year class) were observed in U.S. and Canadian waters in 2010. Industry participants at the meeting noted that behavior of the fishery (particularly in U.S. waters) may have been influenced by the active avoidance of the 2008 year class in 2010.

Summary of data and assessment models

Dr. Stewart gave a presentation on the data sources evaluated and those ultimately used in the current stock assessment (JHTWG 2011). Improved collaboration occurred between the Canada and the US members of the Joint Technical team in 2010. All data inputs were reviewed and revised from raw data and a single set of input data was used for the first time in both assessment models. Fishery data were dis-aggregated and looked at for the first time by season for the individual fishery sectors. Fishery-dependent data include catch data back to 1966 and age data back to 1975. U.S. and Canada catches were modeled in one fleet rather than as separate fleets as was done in the past.

Explorations of age-at-length data showed a dramatic shift in growth rates between more recent data and the historical data prior to 1991. Growth rates are faster now but maximum length is smaller. It is unclear whether there is a fishery effect as the target fisheries developed in the 1990s or whether there was an environmental shift influencing those observations.

Ageing precision was addressed in the new assessment with an exploration of the "cohort effect" where the age of dominant cohorts tend to be assigned more frequently. Pooled samples that had been previously read (2003-2009) were read again and compared to past age assignments. As expected, fewer age assignments were made to dominant cohorts when pooled samples were re-read.

Maturity schedules have not been updated for many years. The existing maturity schedule is based on visual examination of gonads from samples collected from 1990-1992 (Dorn and Saunders 1997) and these data have not been revisited since 2006. The Joint STAT recommended collection and re-analysis of maturity data as a high research priority.

Sensitivity analyses of disaggregated fishery landings and composition data (seven fishery sectors with seasonal strata) indicated within-season growth for dominant cohorts with differences in growth trajectories evident among the dominant cohorts. Modeling of this complexity was problematic; however, it was found from a sensitivity analysis (where a seasonal time step was modeled in SS) that stratification did not make a significant difference to the model result. This analysis provided some assurance that the current assessment results are not sensitive to the observed recent shift to later season fishing.

On day two of the meeting, the Joint STAT team gave presentations describing the TINSS and SS model structures. Dr. Stewart pointed out that this is the first year in which close collaboration in data preparation resulted in both models using the same fishery and survey data inputs. Specifically, the SS and TINSS models share the same: 1) annual catch, 2) weight-at-age, 3) acoustic survey biomass index time series, and 4) acoustic survey age frequency distributions. Structurally, the models both: 1) model combined genders, 2) use an annual time step, 3) take population weight-at-age data directly from the data (growth is not parametric), 4) estimate M using the same informative prior, 5) use the same acoustic sampling variance component, 6) model time-invariant asymptotic selectivity, and 7) do not assume equilibrium conditions at the beginning of the modeled era.

Dr. Stewart noted that in SS: 1) age frequency data are modeled with a multinomial likelihood, 2) age composition data sample sizes are derived from the haul/trip data and are iteratively re-weighted, 3) fishery and survey selectivity estimates are age specific and are held constant for ages 5+, 4) the acoustic survey is modeled with a log-normal likelihood, 5) recruitment deviations are modeled with a penalty based on sigma R, and 6) the prior on steepness in SS is somewhat higher than the implied prior on steepness in TINSS.

Dr. Robyn Forrest reported that an error in coding of the Baranov catch equation influenced the results originally distributed in the draft stock assessment document prior to the STAR Panel meeting. The problem was corrected and the revised TINSS and SS base models agreed more closely with respect to key outputs. The TINSS base model: 1) employs a log of mean recruitment parameter, 2) uses a multivariate logistic function to model the age compositions, 3) weights the acoustic survey index scaled relative to the 1998 value, 4) bins age composition data for small sample sizes, 5) assumes logistic and fishery survey selectivity (holding the parameters fixed for the survey), and 6) uses the same prior for MSY but a somewhat broader prior for F_{msy} compared to the 2010 model. Dr. Forrest reported that, for the current TINSS base model: 1) some poorly characterized year classes (e.g., 1984/1985 and 2006/2007) appeared to be the result of the binning structure, 2) auto-correlation was evident in the MCMC chain results, and 3) sensitivity was evident to selectivity parameters and the choice of priors on the MSY and F_{msy} parameters.

The Panel discussed key differences between the current TINSS and SS base models, and discussed how best to proceed with the review. It was decided that the next step would be to identify ways the two models could be standardized (if possible) with regard to basic assumptions and inputs, with the notion that this could assist in guiding the direction for formulating alternative model runs and sensitivity requests for the Joint STAT. To this end, the Panel requested that the Joint STAT provide a list of priors, key assumptions, and critical differences in model structures between the TINSS and SS models (see Request No. 1, below).

The Joint STAT responded by providing a table with the requested information (Appendix 1, attached). Items identified as potentially important included differences between the models with respect to: 1) likelihoods used for the age composition data, 2) weighting among years for age composition data, 3) the binning of small age frequency observations in TINSS, and 4) informative priors used in the estimation of various parameters; in particular: steepness, F_{msy}, MSY, acoustic q, total precision (observation error and recruitment variability), and the ratio of observation error to recruitment variability. Structurally, the models also differed in that fishery selectivity was estimated using a logistic function in TINSS, with the logistic parameter values fixed at the 2010 values for the acoustic survey. Following review and discussion of the identified model differences, the Panel made a set of additional requests of the Joint STAT (see requests No. 2-8, below); these focused on: 1) some items that appeared to be relatively straightforward to standardize (i.e., housekeeping issues), and 2) other items that could potentially help to better understand the differences in the model outputs.

The Joint STAT response to the additional requests resulted in a closer agreement between model outputs (due to changes made in the TINSS model). The new TINSS base model included: 1) correction of an error discovered in the age composition likelihood computation, 2) removal of the age binning structure, 3) estimation of the survey selectivity parameters that were previously fixed, 4) timing of acoustic survey aligned with SS (to middle of year), and 5) weight--at-age in forecast set to the average of the most recent six years (to align with SS). The Joint

STAT reported that the fit to the age composition was good and characterization of the 1984, 1985, 2006, 2007, and 2008 year classes was substantially improved.

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, 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 although uncertainty remained large for both models. Though estimates of B_0 were still quite different, those differences were likely driven by prior selection and structural differences including: 1) priors on leading parameters, and 2) other differences between the two models including differences in modeling the age composition error structure, how the age composition data were weighted, how selectivity of the fishery and acoustic trawl survey were modeled, and parameterization of the initial age structure of the models.

The Joint STAT and the STAR Panel discussed whether the current configurations of the TINSS and SS models represented the best base-case models for development of management advice. The general consensus was “yes”. The group recognized, however, that uncertainty in the strength of the 2008 year class is 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. It was decided that: 1) outputs from both the TINSS and SS base models would form the basis of a revised set of decision tables (with the strength of the 2008 year class as the primary axis of uncertainty), and 2) uncertainty in the true state of nature would be further (but not fully) characterized by an updated set of sensitivity model runs.

Requests by the STAR Panel and Responses by the Joint STAT February 8, 2011

Request No. 1:
The Panel requested that the Joint STAT provide a list of priors, key assumptions, and critical differences in model structures between the TINSS and SS models.
Rationale: This will guide the decision for formulating alternative model runs and sensitivity requests for the Joint STAT.
Joint STAT Response: A detailed table was provided (see Appendix I).

Request No. 2:
Change the survey and fishery age composition binning in TINSS to try to resolve “problem” year class estimations (such as 2007). Also look at selectivity and catchability. Plot selectivities against SS values for direct comparison of the two models.
Rationale: Basic housekeeping.

Joint STAT Response: The binning structure was removed from TINSS and characterization of the problematic year classes was much improved. A plot was also prepared comparing selectivity estimates from the two models. Closer agreement in survey and fishery selectivity was evident, with the TINSS curves to the right of the SS estimates of selectivity at age.

Request No. 3:
Standardize the weight-at-age assumption in the stock forecast and estimation of MSY for both models.
Rationale: Basic housekeeping.
Joint STAT Response: This was done in stock forecast but not in estimation of MSY due to fundamental differences in the SS and TINSS model parameterizations.

Request No. 4:
Standardize the treatment of survey timing for both models.
Rationale: Basic housekeeping.
Joint STAT Response: Done.

Request No. 5:
Look at what model components affect differences in B_0 between models, i.e., produce numbers at age (at B_0) for the two models.
Rationale: Try to better understand reasons for differences in model outputs.
Joint STAT Response: Done. The vectors were similar and differed mainly in scale. It was noted that looking at the 1966 vectors may provide additional insight into differences between the models.

Request No. 6:
Decide if ageing error and selectivity should be handled the same way in both models. If so, standardize for both models.
Rationale: Try to better understand reasons for differences in model outputs.
Joint STAT Response: The Joint STAT reported that some differences exist in this area with regard to modeling philosophy. There was not time to fully evaluate the differences during this meeting.

Request No. 7:
Decide if model age composition weights should be handled the same way for both models. If so, standardize for both models.
Rationale: Try to better understand reasons for differences in model outputs.
Joint STAT Response: There was not enough time to do this at this meeting. Further exploration of age composition likelihood functions should form a research recommendation.

Request No. 8:
Examine sensitivity to selection of maturity schedules for both models.
Rationale: Try to better understand reasons for differences in model outputs.
Joint STAT Response: The Joint STAT found that it was not easy to align these at this time, and noted that this should be revisited when the maturity data are updated. Updating the maturity schedules should form a research recommendation.

February 9, 2011

Request No. 9:
Update the set of sensitivity runs for TINSS. Provide tables and figures for the Panel to review.
Rationale: The TINSS model has changed since the original draft report.
Joint STAT Response: Done. The updated results were presented by Dr. Forrest and will be included in the final stock assessment document.

Request No. 10:
Update the decision tables. Provide tables for the Panel to review.
Rationale: The TINSS model has changed since the original draft report.
Joint STAT Response: Done. The updated results were presented by the Joint STAT and will be included in the final stock assessment document.

Request No. 11:
Update the stock assessment document Executive Summary section and distribute.
Rationale: The results have changed since the original draft report.
Joint STAT Response: Done. The updated results were presented by the Joint STAT and will be included in the final stock assessment document.

Description of the base model and alternative models used to bracket uncertainty

This is discussed above under the "Summary of data and assessment models" section, and given in detail in the updated stock assessment document. The final decision tables employed the updated TINSS and SS base models and used the strength of the 2008 year class as the primary axis of uncertainty.

Technical merits

Improved collaboration by the Joint STAT resulted in the sharing of the same input dataset by TINSS and SS for the first time. The collaboration resulted in greatly improved joint stock assessment modeling overall. Efficiency was improved and one collaborative document was presented to the STAR Panel for review. Both models are informative and offer unique perspectives.

Technical deficiencies

No obvious pathologies were evident. Structurally, the base models do not address time-varying selectivity. Some feel this is an improvement from the perspective of parsimony; others feel that this overlooks an important property of the data.

Areas of disagreement regarding STAR Panel recommendations

Among STAR Panel members (including GAP and GMT representatives): None.
Between the STAR Panel and Joint STAT Team: None.

Management, data, or fishery issues raised by the GMT or GAP representatives during the STAR Panel Meeting

The PFMC management representative (Mr. John DeVore) noted that deciding the acceptable biological catch (ABC) would be aided if the two models could be aligned with respect to assumptions of the value of stock recruitment steepness. He asked if using the SS model would be the better model for deciding the ABC with respect to the default $F_{40\%}$ proxy. Panel discussion followed on this issue. The DFO Panel Advisor (Mr. Greg Workman) pointed out that uncertainty of the strength of the 2008 year class is large and is not necessarily fully characterized in the decision tables; for example, time-varying fishery selectivity remains an uncertainty.

Managers, the Joint STAT, and others present at the meeting pointed out that stock assessment authors need more time to obtain the needed data following the fishery, and more time to fully analyze the data to ensure adequate time prior to reviews to adequately prepare the assessment and report the results.

Unresolved problems and major uncertainties

A key source of uncertainty in the determination of current stock status is the absolute magnitude of the 2008 year class. At present, there is information only from the age composition of the 2010 fishery, since there was no acoustic survey in 2010. The strength of the 2008 year class will be better known subsequent to the 2011 acoustic survey and fishery.

It is noteworthy that the acoustic survey is the only fishery independent index, and while the new treatment of the data included an accounting of uncertainty based upon survey design and other sources, additional uncertainty is likely present due to factors such as survey timing, target strength, and depth distribution.

The biological data indicate dramatic changes in growth in the early 1990s and the effects this change may have had on maturity have not been evaluated.

Basic ecosystem information is lacking on hake as predators or prey, and the resulting impact this may have on modeling the stock is unknown. Work is underway that could contribute new information in the future.

Recommendations for future research and data collection (not prioritized)

The Panel reviewed and endorses the full set of research recommendations presented by the Joint STAT (JHTWG 2011). The following list includes items specifically brought up at the meeting.

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.

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.

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.

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.
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.

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

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

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

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

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.

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

Acknowledgements

The STAR Panel thanks Dr. Jim Hastie and Ms. Stacey Miller of the NWFSC for logistical support for the meeting. The Panel also commends the Joint STAT members for demonstrating a productive collaborative relationship in the preparation of the 2011 stock assessment and for their excellent performance at the meeting.

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Appendix I

STAR Panel request #1:

The panel discussed key differences between the TINSS and SS models.
The panel requested that the STAT provide a list of priors, key assumptions,
and critical differences in model structures between the TINSS and SS models.
This will guide the decision for formulating alternative model runs and sensitivity request for the STAT.

STAT Response

	TINSS	SS	Relative Potential Importance
Data use			
Likelihood for age-composition data	Multivariate logistic	Multinomial (0.001 added to obs. and exp.)	1
Weighting of composition likelihood	Automatic	Iterative	0
Weighting heterogeneity among years for compositional data	Uniform	Reflects sample size	1
Additional variance component for acoustic survey index	Variance, multiplicative	log-SE, additive	0
Aggregation of small age-frequencies	<=1.5%	None	1
Fit to age 1 in fishery age compositions	No	Yes	0
Maturity	Logistic by age	Age from logistic by length x growth	0
Priors			
Steepness (*h*)	NA	Informative Beta	1
FMSY	Informative log-Normal	NA	1
MSY	Informative log-Normal	NA	1
Acoustic catchability (*q*)	Informative log-Normal	Analytical solution	1
Total precision (observation error and recruitment variability)	Informative Gamma	NA	1
Ratio of observation error to recruitment variability	Informative Beta	NA	1
Sigma R	Function of variance ratio and precision	Iterated	1
Dynamics			
Leading parameters estimated	MSY, FMSY	Steepness, log-R0	0

Ageing error	None	Base plus cohort	0
Age-based fishery selectivity	Logistic (estimated)	Non-parametric (non informative priors to age 5)	1
Age-based survey selectivity	Logistic fixed	Non-parametric (non informative priors to age 5)	1
Catch removal	Baranov catch equation	Pope's approximation	0
Timing of acoustic survey	Beginning of year	Middle of year	0
Weight-at-age for forecast	Terminal year	Average of most recent 6 years	0
Weight-at-age for *MSY*	Average over time series	Average of most recent 6 years	0

Agenda Item H.3.a
Supplemental Attachment 3
March 2011

THE 2011 PACIFIC WHITING OFL, DEPLETION RATE, AND REVISED DECISION TABLES AS RECOMMENDED BY THE SCIENTIFIC AND STATISTICAL COMMITTEE

At the request of the Scientific and Statistical Committee (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. These quantities, as well as the revised decision tables below also include small corrections made to the TINSS model subsequent to the assessment document provided in the briefing book.

Post-SSC Supplement 1 Management Quantities

	12.5th percentile	Median	87.5th percentile
2011 Depletion	69%	126%	231%
2011 OFL (mt)	530,115	973,727	1,726,125

Post-SSC Supplement 2. Decision table with three year projections of posterior distributions for Pacific hake female **spawning biomass** (millions mt, at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	50,000	1.238	2.180	3.801	1.605	2.711	4.427
	2013	50,000	1.309	2.308	3.912	1.629	2.732	4.449
b	2011	100,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	100,000	1.215	2.157	3.777	1.581	2.686	4.403
	2013	100,000	1.262	2.261	3.866	1.584	2.685	4.403
c	2011	150,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	150,000	1.191	2.133	3.754	1.557	2.662	4.379
	2013	150,000	1.215	2.215	3.821	1.538	2.643	4.356
d	2011	262,500	1.053	1.873	3.232	1.358	2.174	3.534
	2012	262,500	1.138	2.081	3.701	1.503	2.608	4.325
	2013	262,500	1.110	2.110	3.718	1.439	2.539	4.252
e	2011	300,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	300,000	1.120	2.063	3.683	1.485	2.589	4.306
	2013	300,000	1.075	2.075	3.684	1.404	2.504	4.217
f	2011	400,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	400,000	1.073	2.016	3.636	1.437	2.541	4.258
	2013	400,000	0.982	1.982	3.593	1.313	2.409	4.124
g	2011	500,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	500,000	1.025	1.969	3.589	1.388	2.494	4.209
	2013	500,000	0.889	1.890	3.500	1.221	2.314	4.034
h	2011	704,600	1.053	1.873	3.232	1.358	2.174	3.534
	2012	781,000	0.928	1.879	3.493	1.292	2.398	4.107
	2013	784,200	0.662	1.671	3.280	0.998	2.083	3.820
i	2011	840,000	1.053	1.873	3.232	1.355	2.174	3.534
	2012	886,000	0.864	1.809	3.429	1.225	2.335	4.040
	2013	782,000	0.558	1.559	3.166	0.890	1.971	3.712
j	2011	1,120,000	1.053	1.873	3.232	1.358	2.174	3.534
	2012	1,107,000	0.734	1.683	3.297	1.080	2.201	3.900
	2013	1,007,000	0.369	1.333	2.943	0.450	1.742	3.485

Post-SSC Supplement 3. Decision table with three year projections of posterior distributions for Pacific hake relative **depletion** (at the beginning of the year before fishing takes place). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model	SS			TINSS		
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
	2011	50,000	0.549	0.909	1.493	1.144	1.749	2.704
a	2012	50,000	0.649	1.066	1.740	1.412	2.155	3.327
	2013	50,000	0.693	1.116	1.782	1.437	2.213	3.292
	2011	100,000	0.549	0.909	1.493	1.144	1.749	2.704
b	2012	100,000	0.633	1.055	1.729	1.389	2.142	3.307
	2013	100,000	0.669	1.095	1.760	1.397	2.173	3.252
	2011	150,000	0.549	0.909	1.493	1.144	1.749	2.704
c	2012	150,000	0.618	1.042	1.719	1.367	2.125	3.289
	2013	150,000	0.645	1.074	1.740	1.360	2.134	3.217
	2011	262,500	0.549	0.909	1.493	1.144	1.749	2.704
d	2012	262,500	0.589	1.014	1.698	1.320	2.087	3.260
	2013	262,500	0.591	1.023	1.693	1.269	2.049	3.138
	2011	300,000	0.549	0.909	1.493	1.144	1.749	2.704
e	2012	300,000	0.580	1.006	1.691	1.302	2.071	3.251
	2013	300,000	0.572	1.007	1.680	1.235	2.018	3.106
	2011	400,000	0.549	0.909	1.493	1.144	1.749	2.704
f	2012	400,000	0.556	0.984	1.670	1.264	2.022	3.214
	2013	400,000	0.519	0.963	1.642	1.147	1.939	3.019
	2011	500,000	0.549	0.909	1.493	1.144	1.749	2.704
g	2012	500,000	0.533	0.961	1.648	1.221	1.979	3.175
	2013	500,000	0.474	0.918	1.602	1.058	1.864	2.950
	2011	704,600	0.549	0.909	1.493	1.144	1.749	2.704
h	2012	781,000	0.484	0.913	1.604	1.145	1.900	3.114
	2013	784,200	0.357	0.809	1.496	0.852	1.677	2.763
	2011	840,000	0.549	0.909	1.493	1.140	1.749	2.704
i	2012	886,000	0.451	0.878	1.569	1.088	1.847	3.072
	2013	782,000	0.298	0.753	1.437	0.741	1.572	2.685
	2011	1,120,000	0.549	0.909	1.493	1.144	1.749	2.704
j	2012	1,107,000	0.387	0.816	1.505	0.916	1.733	2.930
	2013	1,007,000	0.202	0.643	1.329	0.359	1.383	2.510

Post-SSC Supplement 4. Decision table with three year projections of posterior distributions for Pacific hake relative **spawning potential ratio** (1-SPR/1-SPRTarget=0.4; values greater than 1.0 denote overfishing). Catch alternatives are based on: 1) arbitrary constant catch levels of 50,000, 100,000, 150,000, 300,000, 400,000 and 500,000 mt (rows a-c, and e-g), 2) the status quo OY from 2010 (row d), and 3) the OY implied by the estimated F_{MSY} from the TINSS model (row h), and the values estimated via the 40:10 harvest control rule and the F40% overfishing limit/target for the base case SS (row i) and TINSS models (row j).

			States of nature					
		Model		SS			TINSS	
		Within model probability	25%	50%	25%	25%	50%	25%
		Description	Low 2008 cohort	Modal density	High 2008 cohort	Low 2008 cohort	Modal density	High 2008 cohort
Management Action								
	Year	Catch (mt)						
a	2011	50,000	0.225	0.129	0.075	0.174	0.122	0.080
	2012	50,000	0.181	0.103	0.058	0.145	0.097	0.062
	2013	50,000	0.167	0.095	0.055	0.131	0.084	0.053
b	2011	100,000	0.399	0.241	0.145	0.311	0.225	0.152
	2012	100,000	0.334	0.197	0.113	0.266	0.184	0.120
	2013	100,000	0.316	0.184	0.107	0.247	0.162	0.103
c	2011	150,000	0.538	0.340	0.209	0.421	0.313	0.216
	2012	150,000	0.465	0.283	0.166	0.370	0.262	0.173
	2013	150,000	0.448	0.267	0.158	0.352	0.234	0.151
d	2011	262,500	0.766	0.519	0.337	0.608	0.470	0.338
	2012	262,500	0.699	0.451	0.274	0.560	0.411	0.282
	2013	262,500	0.699	0.437	0.266	0.551	0.379	0.250
e	2011	300,000	0.823	0.569	0.374	0.657	0.513	0.373
	2012	300,000	0.762	0.501	0.308	0.614	0.454	0.314
	2013	300,000	0.769	0.488	0.300	0.609	0.422	0.281
f	2011	400,000	0.946	0.685	0.466	0.764	0.613	0.457
	2012	400,000	0.905	0.620	0.392	0.740	0.557	0.395
	2013	400,000	0.933	0.615	0.387	0.748	0.529	0.359
g	2011	500,000	1.038	0.780	0.546	0.851	0.695	0.529
	2012	500,000	1.016	0.723	0.470	0.845	0.646	0.468
	2013	500,000	1.067	0.727	0.468	0.869	0.626	0.429
h	2011	704,600	1.166	0.926	0.682	0.986	0.824	0.648
	2012	781,000	1.214	0.932	0.650	1.055	0.835	0.631
	2013	784,200	1.307	0.973	0.664	1.139	0.843	0.599
i	2011	840,000	1.226	1.000	0.755	1.056	0.891	0.712
	2012	886,000	1.280	1.002	0.710	1.131	0.896	0.685
	2013	782,000	1.340	1.003	0.679	1.192	0.867	0.611
j	2011	1,120,000	1.308	1.110	0.878	1.166	1.004	0.820
	2012	1,107,000	1.359	1.118	0.822	1.325	1.014	0.786
	2013	1,007,000	1.378	1.116	0.815	1.664	1.027	0.733

GROUNDFISH ADVISORY SUBPANEL REPORT ON PACIFIC WHITING HARVEST SPECIFICATIONS FOR 2011

The Groundfish Advisory Subpanel (GAP) received a presentation from Dr. Ian Stewart and Dr. Robyn Forrest about the Pacific whiting stock assessment models that were reviewed and adopted by the Stock Assessment Review (STAR) Panel. The GAP greatly appreciates the tremendous amount of work accomplished by the stock assessment authors, Department of Fisheries and Oceans, and Northwest Fisheries Science Center during 2010. We believe that their comprehensive review of the model and input data, including re-analysis of the acoustic survey data, vastly improved the stock assessment because it addressed many of the critical questions raised during past STAR Panels.

The GAP also reviewed *The 2011 Pacific Whiting OFL, Depletion Rate, and Revised Decision Tables as Recommended by the SSC* (Exhibit H.3.a, Supplemental Attachment 3). The GAP supports the Scientific and Statistical Committee (SSC) recommendation to adopt both assessment models with equal weight. The GAP also supports the SSC's recommended 2011 Overfishing Level (OFL) value of 973,727 mt. The combined assessments estimate 2011 depletion at 126 percent of unfished biomass, which is well above the 40 percent management target.

Mr. John Devore informed the GAP about the range of optimum yields (OYs) analyzed in the 2011-2012 biennial specifications and the Draft Environmental Impact Statement (DEIS). Apparently, the DEIS constrains the upper range of the 2011 U.S. OY to 290,903 mt, which corresponds to a 2011 coastwide (i.e., U.S. and Canada) OY of 393,751 mt.

The GAP discussed the strength of the 2008 year class, which is identified as the key uncertainty in the stock assessments because its effect in the model is primarily informed by one year (2010) of fishery data. While we accept that there is uncertainty about the strength of the 2008 year class as presented in the assessment model, the GAP notes that the model appears to confirm anecdotal information from both the shrimp and whiting fisheries about a very large biomass of young whiting. We also note that 7 out of 8 times a very large year class has shown up as two-year-olds in the fishery data, the fishery data was correct and there was a very large year class. In other words, historically, fishery data has been a very strong indicator of large year class strength.

The GAP recommends a 2011 coastwide OY of 393,751 mt. Our recommendation is premised, in part, on our understanding that under current NMFS procedural constraints, our recommended OY is at the upper limit of the available range. Importantly, the recommendation also accounts for the uncertainty underlying the strength of the 2008 year class. This harvest level recommendation provides a buffer of 579,977 mt below the SSC-recommended OFL, which, to our knowledge, is the largest buffer in the history of the fishery.

PFMC
03/07/11

GROUNDFISH MANAGEMENT TEAM REPORT ON PACIFIC WHITING HARVEST SPECIFICATIONS FOR 2011

The Groundfish Management Team (GMT) reviewed the 2011 Pacific Hake/Whiting Stock Assessment (Agenda Item H.3.a, Supplemental Attachment 1) and the Stock Assessment Review (STAR) Panel (Agenda Item H.3.a, Supplemental Attachment 2) report and offers the following considerations to the Council in setting harvest specifications for the 2011 season. The GMT also thanks representatives from the joint Stock Assessment Team (STAT) for providing us an opportunity to discuss their results at this meeting.

Harvest Specifications

The draft 2011 assessment (Agenda Item H.3.a, Supplemental Attachment 1) shows that the stock biomass is trending upward and is nearly at or above B_0, depending on the model. The main axes of uncertainty as reflected in the decision tables in the assessment are: 1) the size of the 2008 cohort and, 2) the different estimates of stock size produced by the two different models forwarded for management advice. The U.S. (SS) and the Canadian (TINSS) models have different parameterization and assumptions driving abundance estimation from available data sources, but, due largely to collaboration prior to the STAR Panel by the joint STAT, their results are in very close agreement. The GMT understands that the SSC will recommend a combination model (i.e. blending the two) for purposes of determining an overfishing level (OFL), which was traditionally defined as acceptable biological catch (ABC) for whiting.

Application of Amendment 23, which reflects the new National Standard 1 (NS1) guidelines, for setting harvest specifications is not necessary since this species falls under the international exemption. The U.S.-Canada treaty does provide instruction on the setting of the annual harvest. Article III of the treaty says that, "the default harvest rate shall be F-40 percent with a 40/10 adjustment." The treaty does give the parties discretion to depart from the $F_{40\%}$ harvest rate "if the scientific evidence demonstrates that a different rate is necessary to sustain the offshore hake/whiting resource." Article II also instructs the scientific bodies created by the treaty to "provide scientific advice on the annual potential yield of the offshore hake/whiting resource that may be caught for that fishing year, taking into account uncertainties in stock assessment and stock productivity parameters and evaluating the risk of errors in parameter estimates produced in the assessment."[1] The scientific uncertainty that is described in the decision tables used by the Council seems consistent with this language in the Treaty.

For the sake of consistency in terminology, the GMT recommends the maximum sustainable yield harvest level be designated as OFL while the total catch harvest level is designated as annual catch limit (ACL). The GMT notes that if the ACL were set equal to the OFL with no accounting for scientific uncertainty, the blended model recommended by the SSC gives a median $F_{40\%}$ value of 973,727 mt. (Agenda Item H.3.a, Supplemental Attachment 3.) Again, the Council applied the international exception to this stock with Amendment 23 and did not

[1] The treaty defines "Potential yield" to mean "the range of results obtained from applying the harvest rate established pursuant to paragraph 1 +of Article III [i.e., the $F_{40\%}$ with 40/10 adjustment] to a range of forecasted biomass estimates."

contemplate using the P* ABC control rule. Just for comparison purposes, the GMT notes that the percentiles are analogous to the P* approach the Council is using for other groundfish stocks. In other words, the 12.5^{th} percentile quantity of 530,115 mt would be roughly equivalent to a P* choice of 0.125.

The Council may still want to set harvest for this species at a more risk-averse level given its importance to west coast groundfish fisheries and historical harvest context. The GMT notes that, in the last 10 years, the coastwide annual harvest level (OY) for whiting has only been over 300,000 mt five times (see Table G in the Executive Summary of the assessment, Agenda Item H.3.a, Supplemental Attachment 1). Also, the highest U.S. harvest level analyzed during the 2011-2012 biennial specifications and management measures process was 290,903 mt (150 percent of the 2010 OY). This translates to 393,751 mt coastwide (i.e. the U.S. OY is 73.88 percent of the coastwide OY). In recent years one aspect considered when documenting the environmental effects of setting the whiting harvest level has been looking at the magnitude of incidental catch of overfished groundfish species that could be associated with a certain harvest level of whiting. The GMT notes that a wide range of impacts to overfished species from groundfish target opportunities were considered in the 2011-2012 specifications and management measures Environmental Impact Statement (EIS), and that the impacts to overfished species by vessels targeting whiting under the rationalized fishery are limited by the available set-asides and other allocations, and that these allocations of overfished species are not directly affected by the setting of the whiting harvest level. If we were asked to analyze the impact of a higher ACL, it is unclear to the GMT what further analysis would be required in addition to what was analyzed in the 2011-2012 Final EIS.

Furthermore, given the uncertainty of the 2008 cohort, we anticipated that the Council may wish to take a more measured approach to increasing the harvest level until the size of that year class can be verified by the acoustic survey. There are many rationales for taking such an approach. If the expectation of higher biomass is verified in 2012, more of the 2008 cohort will be of marketable size (i.e. more desirable to industry) at that time as well. Even under low 2008 cohort scenarios the SS model predicts that overfishing will not occur under the low 2008 cohort scenario at harvest levels less than around 400,000 mt. The TINSS model predicts that overfishing will not occur below about 704,600 mt under this scenario.

<u>Tribal Allocation</u>
Prior to calculating the whiting sector allocations, the tribal allocation and set-asides for whiting removals in other fisheries and research must be accounted. Last year the National Marine Fisheries Service (NMFS) based the tribal allocation on a formula reflecting the estimates of need from the two tribes planning to participate in the fishery. That formula was 17.5 percent of the U.S. OY requested by Makah plus 16,000 mt based on Quileute's estimate of an amount of fish that would be economically feasible for two boats. While that allocation was not intended to be the basis for future allocations, the Council may want to comment on whether that is an appropriate formula for 2011 (i.e. based on estimated tribal participation for the coming year).

<u>Set Asides</u>
Catch or anticipated catches from 2005 through 2011 are presented in **Table 1** below. The Northwest Region anticipates at least 1,200 mt will be needed for research in 2011 because of

new bycatch reduction research for midwater gears that target whiting that the Northwest Fisheries Science Center (NWFSC) will be conducting. Because of the variability in catches of whiting in the pink shrimp fishery and the time lag in receiving the final impacts from these fisheries, the GMT recommends that 4,008 mt, which is the maximum level of removals or anticipated catch from 2005 to 2011 (2,808 from the pink shrimp fishery in 2007 plus 1,200 from research in 2011), be deducted in 2011 prior to determining the non-tribal sector allocations. However the GMT notes that the estimate of whiting needed for new bycatch research is a point estimate based on expected average performance, so the Council may want to increase the set aside to account for potentially higher impacts.

Table 1. Allocations, Catches or Estimates of Potential Catch of Pacific whiting that come off-the-top, e.g. deducted from the ACL (mt).

	2011	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**
Tribal (deducted first from ACL) 1/	TBD	49,939	50,000	32,500	32,500	35,000	--
Research 2/	**1,200**	28	35	12	49	16	42
Incidental Catch in the Pink Shrimp Fishery 3/	--	--	1,937	684	**2,808**	--	--

1/ Tribal values in this row represent the allocation or set-aside for tribal fisheries that were initially done during setting of the annual whiting harvest specifications. Year-end values may differ due to re-apportionments that occurred during the year.
2/ Research estimates for 2011 and 2010 are based on correspondence with the Science Centers and on limited catch reporting from 2010 research projects. Research estimates from 2009-2005 are those reported in the total mortality reports from those years.
3/ Reported catch from non-whiting fisheries (i.e. pink shrimp) are from the total mortality reports (2009-2007). 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.

GMT Recommendations:

- Adopt a coastwide OFL based on the combined model recommended by the SSC.
- Adopt a coastwide ACL that is less than or equal to the OFL based on risk and any other considerations.
- Make a recommendation to NMFS on any considerations for the 2011 tribal allocation.
- Adopt a set aside of 4,008 mt for research and other incidental mortality to determine the sector allocations under the fishery harvest guideline.

PFMC
03/07/11

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON PACIFIC WHITING ASSESSMENT AND HARVEST SPECIFICATIONS FOR 2011

The Scientific and Statistical Committee (SSC) was briefed on the hake assessment conducted using the Stock Synthesis (SS) model by Dr. Ian Stewart and the TINSS model by Dr. Robyn Forrest. Mr. Tom Jagielo presented the report of the Stock Assessment Review (STAR) Panel. There was increased collaboration between the Canadian and U.S. members of the Joint Technical Working Team (Team) prior to this year's assessment, and both models used a common data set. This data set was checked and revised for the 2011 assessment. A major difference between the data sets on which the 2010 and 2011 assessments were based was that the acoustic survey data prior to 1995 were not included in the 2011 assessment owing to limited spatial and bathymetric coverage. The acoustic data from 1995 to 2009 were comprehensively re-analysed, and account was taken of the impact of the presence of Humboldt squid on the results of the 2009 survey.

The SSC commends the Team for the analyses undertaken and the level of collaboration. This made the process of reviewing the two models more straightforward than was the case in 2010 when the two models were based on vastly different assumptions and data sets. The SSC noted that several differences between two models remain. However, there is no compelling reason to prefer one model over the other. As such, the SSC agrees that the outcome of two models from the STAR Panel represents best available science, and that management decisions should be based on the combined results of both models.

The SSC was informed that a minor error was discovered in the specification of the TINSS model after the STAR Panel. The differences in results between the corrected version of the model and those in the Draft Stock Assessment (Supplemental Attachment 2) are small, and the SSC recommends that the corrected model be used for decision making. The assessment report should be updated with the results for the corrected model before the Stock Assessment and Fishery Evaluation (SAFE) report is published. The numbers in this statement are based on the outcomes of the corrected model.

The SSC notes that the results from the 2011 assessment differ from those of 2010 assessment. There are a number of reasons for this, including a reformulation of the SS model, correction of errors to the implementation of the TINSS model, and changes to data streams. The inclusion of the 2010 fishery age data had a particularly large impact on the estimates of abundance for recent years.

Pacific hake is an exempt species under the U.S.-Canada hake treaty. As such, although an overfishing level (OFL) needs to be set, there is no requirement for the SSC to recommend an acceptable biological catch (ABC). The SSC agreed to base the OFL for Pacific hake on pooling the results from the SS and the corrected TINSS models under the assumption that these two models are equally likely. The resulting OFL from this approach is 973,700 mt and the SSC endorses this value. There is a 75 percent probability that OFL lies between 530,000 mt and 1,726,000 mt. The full results of this pooling process should be provided by the Team to the Groundfish Management Team because it reflects a distribution for the OFL, and hence captures the uncertainty due to model choice and the uncertainty due to the fit of the model to the data. This information, in addition to the decision tables for each model, could be used by the Council if it wishes to compute a buffer to account for scientific uncertainty.

The SSC agrees with the Joint Technical Team and the STAR Panel that a key uncertainty in the stock assessment is associated with the estimate of the size of the 2008 year-class, which is currently based entirely on the 2010 fishery age data. Inferences about the strength of this year-class rely on the assumption that the selectivity for age-2 animals in the fishery is unchanging over time even though this may not be the case. In particular, the SSC notes that although a large number of age-2 fish in the fishery catches is generally indicative of strong year-class, this is not always the case.

PFMC
03/06/11

Agenda Item H.4
Situation Summary
March 2011

CONSIDERATION OF INSEASON ADJUSTMENTS – PART I

Management measures for the groundfish seasons are set by the Council with the general understanding these measures will likely need to be adjusted within the biennial management period to attain, but not exceed, the total catch optimum yield levels. This agenda item will consider inseason adjustments to ongoing 2011 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. Changes to the total optimum yield levels will not be considered.

The Groundfish Management Team and the Groundfish Advisory Subpanel will meet prior to this agenda item to discuss and recommend inseason adjustments to 2011 groundfish fisheries. The Council will consider this agenda item on Tuesday, March 8, 2011, and make recommendations as necessary. If further consideration of inseason adjustments is warranted, Agenda Item H.6, Consideration of Inseason Adjustments – Part II, is scheduled for Thursday, March 10, 2011.

Council Action:

1. **Consider information on the status of 2011 fisheries and adopt preliminary or final (if possible) inseason adjustments as necessary.**

Reference Materials:

1. Agenda Item H.4.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 2011 Groundfish Fisheries (Part II on Thursday if necessary)

PFMC
2/9/11

GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS – PART 1

The Groundfish Advisory Subpanel (GAP) met with the Groundfish Management Team (GMT) to discuss inseason adjustments and has the following comments and recommendations.

Limited Entry Sablefish Daily-Trip-Limit Fishery North of 36° N. Latitude

Landings for the limited entry (LE) sablefish daily-trip-limit (DTL) fishery are traditionally tracked using PacFIN data and reports. Mr. Dan Erickson and Dr. Sean Matson of the GMT explained to the GAP that due to programming issues within the PacFIN system, reported catches in the LE sablefish DTL fishery from PacFIN have been much lower than the actual catches. The GMT's catch projection model was developed using this PacFIN data and landings for any given trip limit may therefore be higher than estimated by the model. The Pacific States Marine Fisheries Commission has been made aware of the PacFIN problem and is attempting to fix the catch reporting program. However, corrected catch numbers are not currently available and may not be available until June. The GMT estimates that catches may have been under-reported by a minimum of 33 percent and possibly 50 percent of the final total mortalities reported by National Marine Fisheries Service in annual total mortality reports.

The GMT has provided alternative DTL limits for Council consideration that provide for the fishery while not exceeding the 282 mt LE sablefish DTL allocation. The GAP discussed these options and recommends the following:

Option 2: 7,000 lbs/2 months in periods 1-3;
6,500 lbs/2 months in periods 4-6;
Maintain the 2,000 lb weekly limit.

The GAP prefers these precautionary DTL limits for a couple of reasons. We note that the sablefish market is very strong and LE DTL effort is at a maximum. Option 2 should allow time to gather updated catch information that can be considered at the June Council meeting. If the corrected catch information in PacFIN confirms that DTL catch has been underestimated, DTL limits can be increased in June for later in the season.

Modifying the Trawl Rockfish Conservation Area North of 40°10' N. Latitude

The GAP discussed modifying the seaward and shoreward boundaries of the trawl Rockfish Conservation Area (RCA) under rationalization. The GAP is concerned that the current RCA configuration is too restrictive for many fishermen north of 40°10' N. latitude to effectively prosecute their intended fishing strategies. The GAP understands the concern that a few disaster tows, if large enough, could risk exceeding a sector allocation for a limited species. However, the GAP believes the behavior of individual trawl fishermen under rationalization will ensure risk-averse fishing since no fishermen wants to risk exceeding their individual quota for any individual fishing quota species. Trawl fishermen know the areas where they can fish sustainably and those areas where fishing risks too high a bycatch of species of concern.

With these considerations in mind the GAP recommends modifying the trawl RCA boundaries north of 40°10’ N. latitude as follows:

> **Adopt the modified 200 fm seaward boundary in the north in period 2.**
> **Adopt the 100 fm shoreward boundary in the north for the rest of the year.**

PFMC
03/08/11

GMT Summary: H4

Agenda Item H.4.b
Supplemental GMT PowerPoint
March 2011

- Recreational
  - *Washington and Oregon*: open; low effort
  - *California*: South 36 ° opened March 1st; north of 36° opens May 1st at earliest.
  - **No updates to overfished species scorecard.**

- IFQ fishery RCA request
  - Recommendations from industry to liberalize the trawl RCA boundaries
  - SPEX analysis shows this would impact overfished species; No new data available
  - **GMT recommends no changes to trawl RCA.**

GMT Summary: H4

- IFQ yelloweye
  - Trawl allocation of 0.3 mt too small for the IFQ fishery?
  - Council & NMFS trawl allocation = 0.6mt

- IFQ/trawl - darkblotched rockfish
  - No changes recommended in 2011
  - "Real-time" catch accounting under IFQ = low discard and low uncertainty
  - New WCGOP data:
    - high IFQ retention **2011** (99.6%, *Period 1*)
    - low retention **2010** (20.1%, *Period 1*)
  - Continued monitoring throughout 2011 needed

GMT Summary: H4

- Fixed gear sablefish
  - Miscalculation in PacFIN affects QSM and GMT projection models
  - May lead to LE DTL north of 40°10' reductions
  - Does not affect LE FG sablefish total, only assignment to primary versus non-primary (DTL)
  - **GMT offer multiple trip limit options, but no recommendations for implementation**
  - OA fishery: **GMT does not recommend action**

- Longnose skate
  - Longnose skate exceeded the OY by 8% in 2009
  - The GMT requests refined discard data to inform management measures

GMT Summary: H4

- Nearshore and non-nearshore bycatch projections
  - Updated bycatch ratios in both models
  - Landings/observer coverage increased significantly 2008-2009
  - Yelloweye rockfish:
    - Nearshore: bycatch ratios decreased for both states in 2009
    - Non-nearshore: impacts unchanged
  - Canary rockfish: nearshore bycatch ratios increased in OR & CA
  - Bocaccio: bycatch ratios increased in CA

- Scorecard
  - Updated to reflect the most recent projection of overfished species impacts
  - Yelloweye rockfish impacts remained the same (1.1 mt)
  - **GMT proposes no changes**.

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

This initial GMT report is intended to give the Council, the Groundfish Advisory Subpanel (GAP) and public, advanced notice on certain issues that we foresee arising during this first inseason agenda item of 2011 as a result of the most recent information from the Pacific Fisheries Information Network (PacFIN), the West Coast Groundfish Observer Program (WCGOP), and the status of ongoing fisheries. The GMT will provide additional considerations and specific recommendations for 2011 in a supplemental report.

COMMERCIAL

Shoreside Individual Fishing Quota (IFQ) Fishery

IFQ landings summary

As of Wednesday, March 2, 2011, there were 124 landings (receipts) recorded over 40 landing days (49 possible fishing days), counted against 31 vessel accounts at 8 ports in all three states, since the fishery began January 11, 2011. Landings have been made for 25 of the 29 IFQ species categories (species or species groups), and 2.4 percent of total available IFQ quota pounds have been landed (Table 1). Species with the highest landings (4 to 18 percent of their allocations) have been mainly Dover sole , thornyhead, and trawl-caught sablefish (DTS) complex species and petrale sole(Figure 1, Table 1). As of Wednesday, March 2, 2011, there was no WCGOP discard data available.

As a quick comparison, 18.4 percent (158 mt /860 mt) of the petrale sole allocation has been landed from January 11 through March 1 of 2011, compared with approximately 25.1 percent (286 mt /1140 mt) in all of January and February combined of 2010. The current average catch per day of petrale sole in 2011 is approximately 3.2 mt/day versus 4.7 mt/day in 2010. Several factors (in addition to trip limit versus IFQ management) including fishery start date and difference in available harvest level should be considered for this comparison.

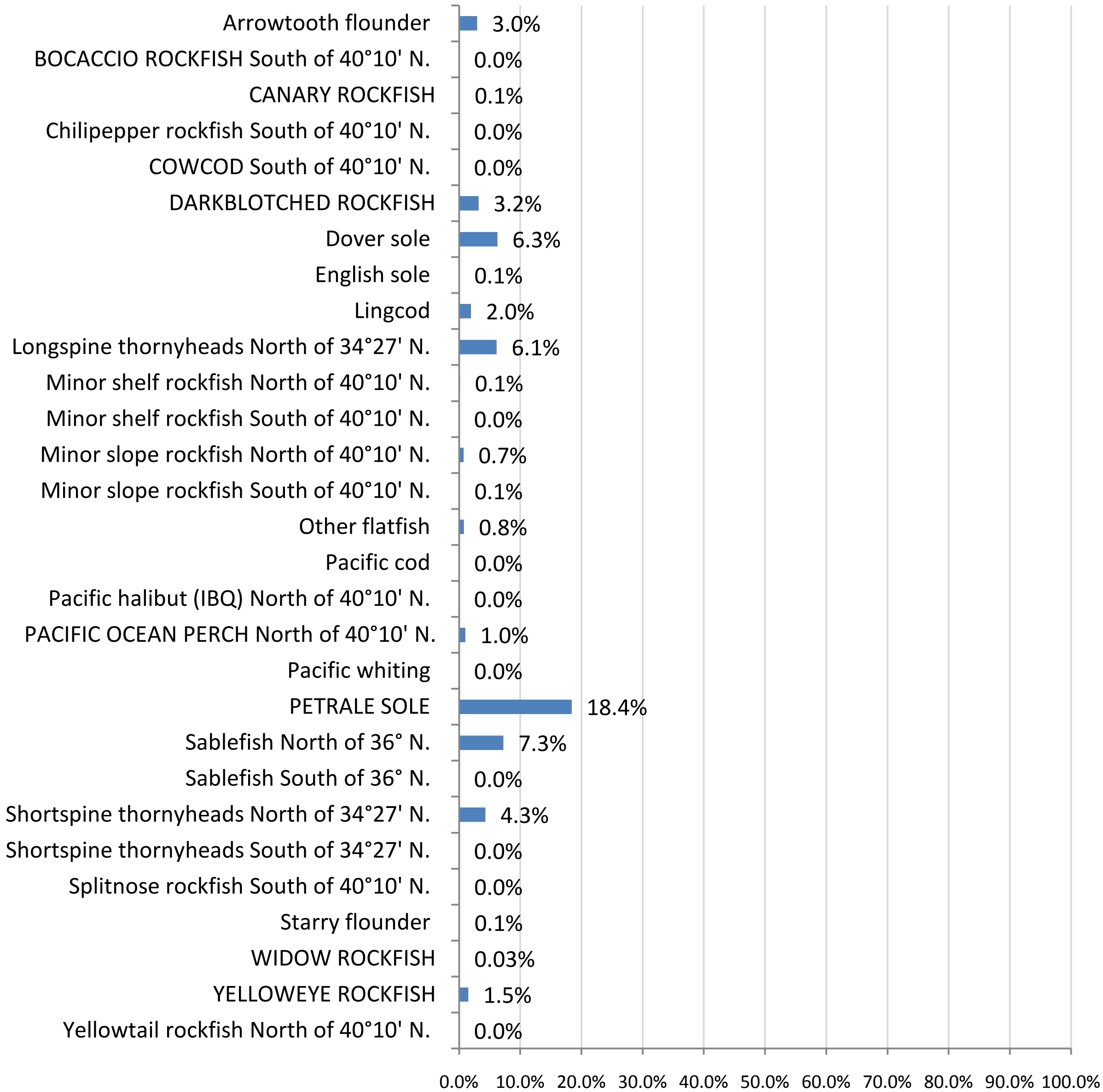

Figure 1. IFQ landings by species category and percentage of allocation, as of Wednesday, March 2, 2011.

As for other overfished species, 3.2 percent of the darkblotched rockfish allocation has been landed (7.98 mt, or 17,587 lbs.), as well as 0.1 percent of the canary rockfish allocation (65 lbs.), and 0.03 percent of the widow rockfish allocation (199 lbs.). Ten pounds of yelloweye rockfish have been landed (1.5 percent of the allocation). No bocaccio rockfish or cowcod have been landed at this time.

Seventy-four and two tenths percent of the total quota pounds debited have been landed in Oregon, followed by 15.4 percent in Washington, and 10.4 percent in California. Of the eight ports where landings have occurred so far, Astoria and Charleston (Coos Bay), Oregon have landed the largest percentage of catch.

Table 1. IFQ landings by species category, pounds, percentage of allocation, and metric tons (mt) as of March 2, 2011.

IFQ Species Category	Pounds Debited	Allocation	Percent	mt
Arrowtooth flounder	497,961	16,804,295	3.0%	225.87
BOCACCIO ROCKFISH South of 40°10' N.	0	132,277	0.0%	0.00
CANARY ROCKFISH	65	57,100	0.1%	0.03
Chilipepper rockfish South of 40°10' N.	53	3,252,370	0.0%	0.02
COWCOD South of 40°10' N.	0	2,976	0.0%	0.00
DARKBLOTCHED ROCKFISH	17,587	552,997	3.2%	7.98
Dover sole	1,952,850	31,216,354	6.3%	885.80
English sole	10,212	20,189,383	0.1%	4.63
Lingcod	80,213	4,107,873	2.0%	36.38
Longspine thornyheads North of 34°27' N.	265,777	4,334,839	6.1%	120.55
Minor shelf rockfish North of 40°10' N.	170	115,813	0.1%	0.08
Minor shelf rockfish South of 40°10' N.	1	189,958	0.0%	0.00
Minor slope rockfish North of 40°10' N.	13,164	1,828,779	0.7%	5.97
Minor slope rockfish South of 40°10' N.	465	831,958	0.1%	0.21
Other flatfish	72,913	9,253,683	0.8%	33.07
Pacific cod	837	2,502,247	0.0%	0.38
Pacific halibut (IBQ) North of 40°10' N.	14	257,524	0.0%	0.01
PACIFIC OCEAN PERCH North of 40°10' N.	5,685	563,148	1.0%	2.58
Pacific whiting	2,827	40,712,766	0.0%	1.28
PETRALE SOLE	348,622	1,896,130	18.4%	158.13
Sablefish North of 36° N.	407,031	5,613,728	7.3%	184.63
Sablefish South of 36° N.	0	1,133,352	0.0%	0.00
Shortspine thornyheads North of 34°27' N.	149,080	3,456,138	4.3%	67.62
Shortspine thornyheads South of 34°27' N.	0	110,231	0.0%	0.00
Splitnose rockfish South of 40°10' N.	320	950,854	0.0%	0.15
Starry flounder	924	1,168,450	0.1%	0.42
WIDOW ROCKFISH	199	622,916	0.03%	0.09
YELLOWEYE ROCKFISH	10	661	1.5%	0.00
Yellowtail rockfish North of 40°10' N.	317	6,821,455	0.0%	0.14
Grand Total	3,827,297	158,680,255	2.4%	1736.03

IFQ data sources

Currently, the NMFS site https://www.webapps.nwfsc.noaa.gov/ifq/ is the best available public summary for IFQ debited quota pounds; it provides a current snapshot of poundage attainment by species category, and portion of allocation remaining. Efforts are underway by Pacific States Marine Fish Commission (PSMFC) to adapt the PacFIN Quota Species Management (QSM) system for IFQ. The current QSM best estimate reports are slower than electronic ticket data for IFQ, do not specifically differentiate IFQ landings from other sectors, and adjustments to soft data are made based on last year's fishery behavior, which was under trip limit management.

Fixed gear fisheries

PacFIN Limited Entry sablefish daily-trip-limit landings data and the QSM system

It was discovered in December 2010 that there has been error in the calculation of sablefish landings data since 2004, which has affected the queries supplying data for the QSM system, and the tables that inform the limited entry (LE) sablefish daily trip limit (DTL) catch projection models north of 36° N. lat. The GMT notes that this error only affects how total LE fixed gear sablefish landings are split between the LE primary and LE DTL portions, within the LE fixed gear sablefish fishery. This error has not resulted in any miscalculation of total LE sablefish fixed gear landings.

The net result of this data error has been overestimation of primary sablefish catch, and a coinciding underestimation of LE sablefish DTL catch. Subsequently, projection models have been underestimating LE DTL landings for a given set of cumulative trip limits. PacFIN discovered the problem when updating internal tables in order to provide more detailed catch data for the GMT. The apparent outcome of this problem is shown in Table 2, where WCGOP total mortality (TM) reports calculated 62.5 mt to 152.4 mt higher sablefish catches than calculated by QSM reports for 2007 – 2009. For example, the WCGOP TM report indicated that 302.4 mt of sablefish were caught by the LE DTL fishery during 2008, which exceeded the LE DTL allocation by 26.4 mt.

Table 2. Comparison of LE sablefish DTL landings reported by the WCGOP total mortality (TM) report and the QSM Best Estimate Report (BER) for 2007 – 2009.

LE DTL Landings	2009		2008		2007
Longline	296.8		287.1		175.9
Pot	8.2		15.3		2.6
TM total	305		302.4		178.5
BER updated	205		150		116
Allocation	351		276		277
TM - Allocation Difference	-46		**26.4**		-98.5
BER - TM Difference	-100		-152.4		-62.5

Currently, LE sablefish DTL landings in the QSM are calculated incorrectly as they have been for the past seven years. This will continue until the replacement algorithm has been finished and approved by PacFIN, NWR, and the GMT. A more detailed explanation of the PacFIN LE sablefish DTL landings issue, and potential solutions will be described in a future GMT statement.

Limited Entry Fixed Gear sablefish DTL, north of 36° N. lat

The most recent data from PacFIN, through Period 5 of 2010 became available Friday, January 28. Models were updated with these data to project 2011 landings using current trip limit tables (76 FR 11381, March 2, 2011). Model-derived projections show that sablefish landings may be less than allocations north of 36° N. lat. (92 percent of the allocation; Table 3). As noted above, however, the model-derived projections shown in Table 2 were based on PacFIN data (QSM-BER reports) that have historically under-reported LE sablefish DTL landings north of 36° N. lat. (see discussion above). Table 2 shows that PacFIN-reported landings for the LE sablefish DTL fishery north of 36° N. lat. were 35, 50, and 33 percent lower than catches shown by WCGOP total mortality reports during 2007, 2008, and 2009. Adjusted projections for this DTL fishery north of 36° N. lat. suggest that landings may have actually ranged from 345 – 389 mt during 2011, which would exceed the allocation by 63 – 107 mt (Table **3**). Trip-limit reductions may therefore be considered north of 36° N. lat.

Table 3**. Projected sablefish landings (2011) for the limited entry sablefish DTL fisheries north of 36° N. lat. Model derived projected landings (mt) were based on status quo trip limits. Higher projections are also provided to adjust for the PacFIN data problems described above in Table 2.**

LE DTL sablefish fishery	2011 Allocation	Model-derived projected landings (mt)	Adjusted projections - 33% increase (mt)	Adjusted projections – 50% increase (mt)
North of 36°	282	259	345	389

PFMC
03/05/11

THE GROUNDFISH MANAGEMENT TEAM REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS

The Groundfish Management Team (GMT) considered the requests from industry representatives, the most recent information from Pacific Fisheries Information Network (PacFIN) and the West Coast Groundfish Observer Program (WCGOP) and the status of ongoing fisheries and offers the following considerations and recommendations.

SUMMARY AND BRIEF NOTES

Inseason Changes Effective March 1, 2011

NMFS implemented the Council-recommended changes, from their November 2010 meeting, to the cumulative limits for sablefish in the limited entry fixed gear daily-trip-limit (DTL) fishery, and the sablefish DTL open access fishery, as well as two changes to the recreational fishing regulations off Washington, on March 1, 2011 (76 FR 11381).

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.

IFQ fishery RCA request

Recommendations from industry came to the GMT for opening fishing grounds by modifying the trawl rockfish conservation area (RCA) boundaries, both shoreward and seaward, in order to provide more access to petrale sole and yellowtail rockfish. Analyses conducted in the 2011-2012 biennial cycle indicated the potential for increased overfished species impacts and no new information from the rationalized trawl fishery have become available to inform new analyses. The GMT recommends no changes to trawl RCA at this time.

IFQ yelloweye

Industry expressed concern that the interim yelloweye trawl allocation of 0.3 mt, which was recommended by the Council in November of 2010, as a result of the 14 mt specification carryover for yelloweye rockfish, may be too small for the IFQ fishery. This low allocation may cause barriers to forming risk pools or limit operations shoreward of the RCA. Further, the impacts to yelloweye rockfish as a result of gear switching provisions is unknown (e.g., using longline gear to harvest quota pounds). The GMT notes that both the NMFS alternative in the final SPEX EIS and the Council FPA specify a trawl allocation for yelloweye rockfish of 0.6 mt.

IFQ/trawl - darkblotched rockfish

Projected catch of overfished darkblotched rockfish in the limited entry non-tribal bottom trawl fishery was higher than anticipated in 2010 and changes to management measures were necessary at the end of 2010 to reduce impacts to darkblotched rockfish. Due to the dramatic change in management under a rationalized fishery in January 2011, where vessels will fish individual quotas, the Pacific Fishery Management Council (Council) recommended no changes to fishery management measures for 2011 at their November 2010 meeting. New data from WCGOP indicates that although the retention rate of darkblotched rockfish was very low in January and February of 2010 (20.1%), it has risen dramatically to 99.6% in January and February of 2011, under the rationalized fishery. Uncertainty in discard projection was at the crux of the 2010 issue regarding darkblotched rockfish. As described in Agenda Item H.4.b, Supplemental GMT Report 1, 3.2 percent of the darkblotched rockfish shorebased trawl allocation has been landed (7.98 mt, or 17,587 lbs.) as of March 2, 2011. NMFS, the GMT and the Council will continue to monitor catches of darkblotched throughout 2011 and can consider adjustments to fishery management measures if they are warranted later in the year.

Fixed gear sablefish

Limited entry DTL sablefish north of 40°10' may require reductions to trip limits this year, due to a miscalculation in the PacFIN database which affect the QSM and inform GMT projection models. It is important to note that this error affects how sablefish catch is divided between primary and non-primary, within the LE fixed gear sector, and does not affect the sum of the two. The GMT puts forward several options for different trip limits, but makes no recommendation for a specific option, or time of implementation. Since it is early in the year, and PacFIN is expected to have a solution in place in time for better accurately informed in the June meeting, no action at this time is also an option. The GAP recommended moderate adjustment to trip limits.

Open access sablefish models for north and south of 36° N. Latitude. project landings within the sector allocations or shares, and the GMT does not recommend any inseason action at this time. We note that the southern OA model is new, and uncertainty in this model is high.

Longnose skate

Longnose skate exceeded the OY by 8 percent in 2009, the first year that individual mortality information was available for this species, raising attention to its management. The GMT will request refined discard data from the trawl fleet in 2009 from WCGOP. This information will inform derivation of potential management measures with the goal of limiting fishing mortality to within the ACL.

Nearshore and non-nearshore bycatch projections

The bycatch ratios in the nearshore model have been updated with the most recent West Coast Groundfish Observer Program (WCGOP) data. Results from the "Data Report and Summary Analyses of the US West Coast Nearshore Fixed Gear Groundfish Fishery" indicate that neither landings nor observer coverage increased significantly from 2008 to 2009. The bycatch ratio of yelloweye rockfish decreased for both states in 2009, indicating that the 20 fm depth restriction implemented between 40°10' N. lat. and 43° N. lat. has been successful. The bycatch ratios increased for canary rockfish in Oregon and for bocaccio in California. The bycatch ratios in the non-nearshore model have also been updated with the most recent WCGOP. Projected impacts on yelloweye, the species of highest concern, were unchanged.

Scorecard
The primary scorecard that the Council should reference for inseason action under this agenda item is Attachment 1, which represents the current harvest specifications and shorebased trawl allocations in regulation (75 FR 82296), the anticipated harvest guidelines for 2011, and projected impacts for 2011 fisheries. Due to the delay in implementing the 2011-2012 regulations the only overfished species allocations currently specified in regulation are the shorebased trawl allocations. Projected impacts for the at-sea sectors are the expected allocations when the rule for final harvest specifications for 2011 is issued. For the non-trawl sectors, the values in the allocation column represent the Council's final preferred apportionment of the anticipated non-trawl allocation (i.e., the informal catch sharing within the Council's final preferred non-trawl allocation for 2011) and the Council's final preferred 2011 recreational harvest guidelines for canary and yelloweye rockfish.

For reference, the November 2010 scorecard for the 2011 fisheries (Attachment 2) and the scorecard under the Council's final preferred harvest specifications and management measures for 2011 fisheries (Attachment 3) are included.

The GMT updated the March 2011 scorecard to reflect the most recent projections of overfished species impacts. Specifically, the non-nearshore and nearshore models were updated with the latest WCGOP observer data. **The GMT proposes no changes to trip limits or depth restrictions at this time.**

COMMERCIAL

Individual Fishing Quota (IFQ) Fishery
Industry Request for Trawl RCA Boundary Modification

Industry requested that the GMT analyze opening fishing areas both seaward and shoreward of the rockfish conservation areas (RCA) north of 40°10' N. lat. The requests were for implementing a *modified* 200 fathom (fm) seaward line between 40°10' N. lat. and 48°10' N. lat. during Period 2 and a 100 fm shoreward line year round. The current schedule for RCAs can be found in Table 1. The GMT notes that the "modified" boundary lines have been traditionally used to allow access spawning aggregations of petrale sole during winter months. Part of the rationale for this industry request was to increase access to petrale sole on the seaward side of the RCA during Period 2, and to yellowtail rockfish on the shoreward side during other periods.

Table 1. Current schedule of trawl RCA boundaries for the area north of 40°10' N. lat.

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
Rockfish Conservation Area (RCA):							
1	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
2	48°10' N. lat. - 45°46' N. lat.	75 fm line - modified 200 fm line	75 fm line - 200 fm line	75 fm line - 150 fm line	100 fm line - 150 fm line	75 fm line - 200 fm line	75 fm line - modified 200 fm line
3	45°46' N. lat. - 40°10' N. lat.			75 fm line - 200 fm line	100 fm line - 200 fm line		

The Council made a decision on the structure of the trawl RCA under IFQ in June 2010, which was re-iterated in November 2010, based on analysis of the best available, and most recent scientific information. Bycatch by depth information is presented in Appendix B, Detailed Management Measure Analysis to the 11-12 FEIS (http://www.pcouncil.org/2011/03/12814/amendment-16-5-final-environmental-impact-statement-feis-available/, pages 48 and 49). Bycatch charts from the FEIS are reproduced below (Figures 1 and 2). At this time the GMT does not have any new depth-stratified bycatch information since the information that was presented to inform the decisions under the 11-12 harvest specifications and management measures. Therefore, there is no new information to inform the potential impacts of liberalizing the trawl RCA boundaries. We have only proceeded through 7 weeks of the new IFQ fishery under the new management regime. These requests would open areas to fishing where it was demonstrated in the SPEX analyses that there were high bycatch rates of overfished species, including darkblotched, canary and yelloweye (Figure 1**Error! Reference source not found.**) and widow rockfish, as well as POP (Figure 2). There are very low allocations of canary and yelloweye in the IFQ fishery.

The GMT also notes that in September 2010, the Council did not recommend an EFP application to purse a Pacific sanddab fishery inside the RCA in northern areas due to concerns about take of yelloweye and canary rockfish in these shallow areas.

Given the above-mentioned rationale, **the GMT does not recommend any changes to the trawl RCA boundaries at this time.**

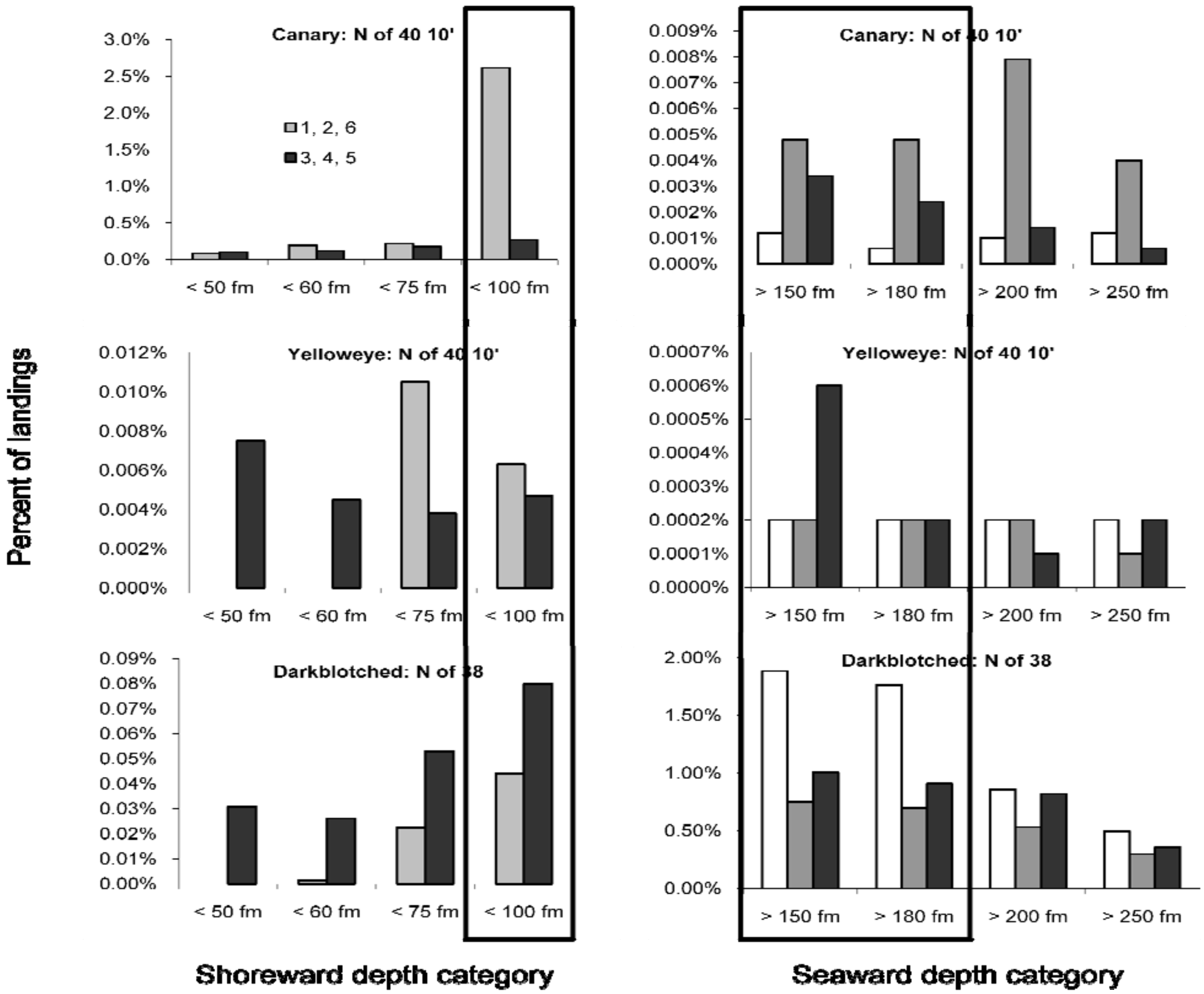

Figure 1. Bycatch rates for canary, yelloweye and darkblotched rockfish from the 2011-12 SPEX FEIS. Heavy outlined, boxed areas show the depth ranges in question for the IFQ trawl RCA.

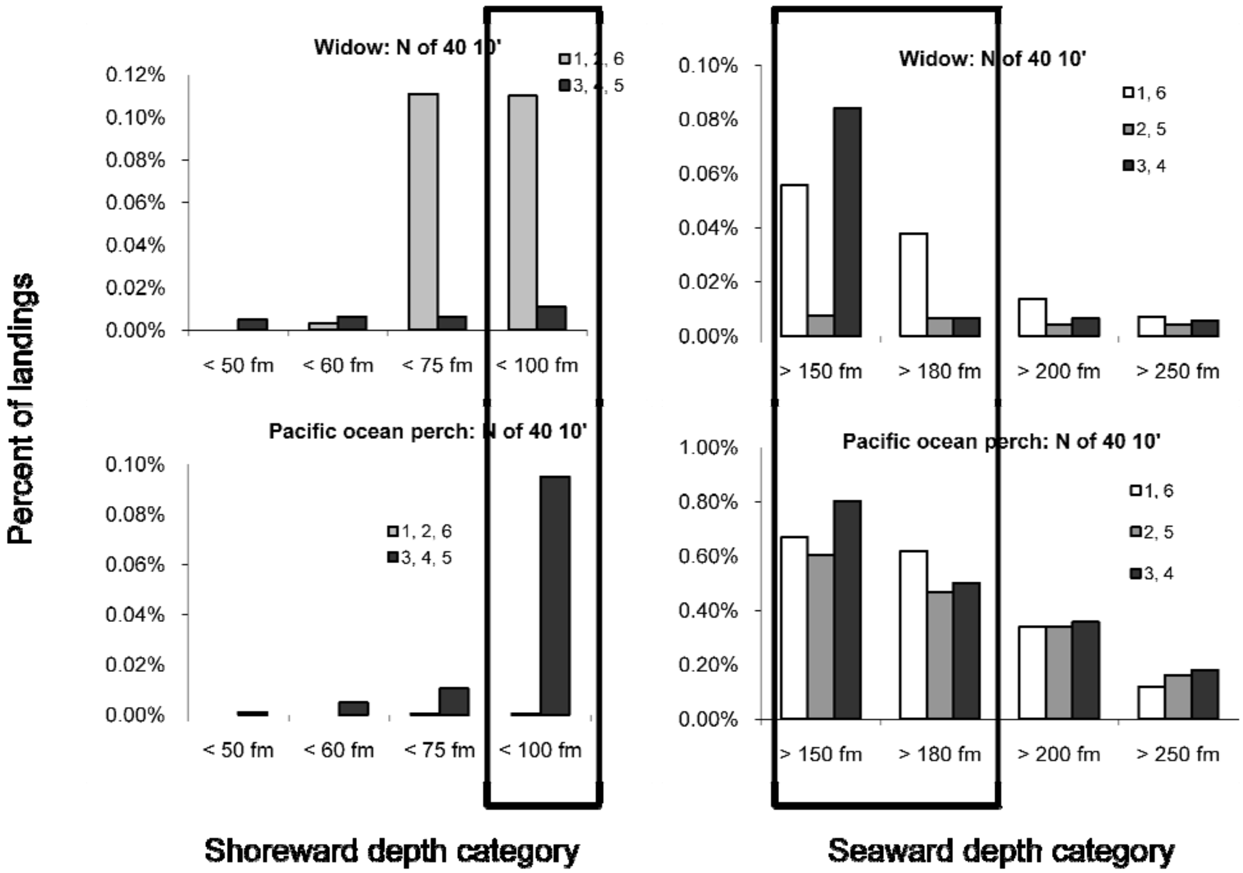

Figure 2. Bycatch rates for widow rockfish and Pacific Ocean perch, from the 2011-12 SPEX FEIS. Heavy outlined, boxed areas show the depth ranges in question for the IFQ trawl RCA.

Darkblotched rockfish

Projected catch of overfished darkblotched rockfish in the limited entry non-tribal bottom trawl fishery was higher than anticipated in 2010 and changes to management measures were necessary at the end of 2010 to reduce impacts to darkblotched rockfish. Due to the dramatic change in management with the start of a rationalized fishery in January 2011, where vessels will fish individual quotas, the Council recommended no changes to fishery management measures for 2011 at their November 2010 meeting. This is because, under a rationalized trawl fishery, vessels will be individually accountable for keeping their catch of darkblotched rockfish within their quota pounds. Individual accountability is anticipated to result in changes to the approach that vessel operators take to harvest their quota pounds. Therefore, the higher than expected projected catches during 2010 were not anticipated to continue into 2011 under a rationalized trawl fishery.

Newly available information from WCGOP indicates that although the retention rate of darkblotched rockfish was very low in January and February of 2010 (20.1 percent), it has risen dramatically to 99.6 percent in January and February of 2011, under the rationalized fishery. Retention rates of many other groundfish species have also risen substantially under IFQ, for

January and February of 2011, compared with the same months in 2010, or year averages from the 2009 Total Mortality Report (see below).

Species	2009 TM	Jan-Feb 2010	Jan-Feb 2011
Bocaccio rockfish	18.0%	NA	100.0%
Arrowtooth flounder	71.9%	80.2%	91.6%
Canary rockfish	33.7%	0.0%	100.0%
Cowcod	0.0%	NA	NA
Darkblotched rockfish	**47.4%**	**20.1%**	**99.6%**
Dover sole	93.9%	98.0%	97.0%
English sole	65.7%	90.1%	77.9%
Lingcod	48.6%	87.3%	99.9%
Other Flatfish	60.8%	83.8%	86.6%
Pacific hake	0.0%	10.2%	3.2%
Pacific Ocean perch	46.9%	92.9%	98.9%
Petrale sole	89.0%	81.7%	99.8%
Sablefish	90.4%	81.7%	99.5%
Starry flounder	88.9%	0.0%	96.7%
Widow rockfish	90.4%	0.0%	92.3%
Yelloweye rockfish	88.9%	NA	100.0%

In addition, under the rationalized fishery, discard data will be coming in near real-time, and discard poundage is debited against quotas immediately; total fishing mortality of the species is being measured daily in the IFQ fishery.

This is in stark contrast to, and a vast improvement over previous years, when models were informed using historical landings data, and averaged historical bycatch and discard rates, (which were highly variable over time, especially for darkblotched rockfish) in order to make a prediction of total mortality through the end of the year. Uncertainty in discard projection was at the crux of the 2010 issue regarding darkblotched rockfish.

As described in Agenda Item H.4.b, Supplemental GMT Report 1, 3.2 percent of the darkblotched rockfish shorebased trawl allocation has been landed (7.98 mt, or 17,587 lbs.) as of March 2, 2011. **NMFS, the GMT and the Council will continue to monitor catches of darkblotched throughout 2011 and can consider adjustments to fishery management measures if they are warranted later in the year.**

Fixed gear fisheries

The non-nearshore sector row in the scorecard has been updated with 2009 WCGOP bycatch rates. As mentioned yesterday in Agenda Item H.2, the projection of yelloweye bycatch did not change in this model despite the higher than expected 2009 catch in this sector.

The Council adjusts the seaward boundary of the non-trawl RCA to mitigate yelloweye rockfish bycatch in this sector, with the yelloweye bycatch rate decreasing as the boundary is pushed deeper.[1] As a reminder, the non-nearshore bycatch projection model is designed around four management areas, all north of 40° 10' N. lat. Within those areas, bycatch ratios are stratified at 100 fm, 125 fm, and 150 fm. The four potential management areas are:

1	2	3	4
40°10' N. lat.- Col./Eur. line (43° N. lat.)	Col./Eur. line (43° N. lat.) - Cascade Head (45° N. lat.)	Cascade Head (45° N. lat.) Pt. Chehalis (46° 53.30' N. lat.)	North of Pt. Chehalis (46° 53.30' N. lat.)

With the 2011-12 biennial implementation situation, we are looking at a hybrid of the following two scenarios:

Scenario A: Area 2 at the 125 fm line, Areas 1, 3, and 4 at the 100 fm line.
Scenario B: Areas 1-4 at the 100 fm line.

The seaward boundary in "Area 2" was pushed to 125 fm beginning in 2009 and remains in place now because of the implementation delay for 2011-12. The Council's final preferred alternative would move the line back to 100 fm. As we understand it, the RCA change will be part of the 2011-12 rule. We are recommending leaving the projected impact as is, although we would presume some precautionary buffer given that Area 2 will be at 125 fm until the rule goes into effect.

The 2009 Total Mortality Report show bycatch rates twice what we use in the model for the LE non-primary and Open Access sectors. Projected impacts did not change after the model was updated largely because of the way that bycatch ratios are pooled across years. This result led us to question the variability in the model's bycatch ratios, and in turn, the accuracy of the advice we give to the Council. To explore this variability, we requested that WCGOP report estimates of variance together with the updated bycatch information, which we received roughly two weeks prior to this meeting. We then used this information to explore error around the bycatch ratios (2002-2008) using a Monte Carlo method. Table 2 identifies the confidence limits produced from this method, which at this point, we use just to illustrate the rough magnitude of variability that this preliminary look has produced. Under the 14 mt ACL scenario, the 0.9 mt "allocated" to this sector is enough to accommodate all areas at 100 fm, yet the upper confidence limits demonstrate there is some probability that catch could exceed. The Council's final preferred alternative, with the 17 mt, has a HG of 1.3 mt (and and ACT buffer). Also precautionary, is that 125 fm line will stay in place until the proposed rule goes into effect.

[1] The model also covers the area between 36° - 40°10' N lat., yet yelloweye bycatch is negligible in this area and the seaward boundary has remained at 150 fm.

Table 2. Illustration of variation in non-nearshore bycatch (see text above)

	Point Estimate	Upper Confidence Limit (97.5%)	Lower Confidence Limit (2.5%)
Status quo	0.8	1.1	0.5
Council's FPA	0.9	1.2	0.6

<u>Limited Entry Fixed Gear Sablefish DTL, North of 36° N. lat</u>

The GMT utilizes PacFIN data to model and track landings for the Limited Entry (LE) sablefish DTL fishery. It recently came to our attention that landings shown in the PacFIN database for this fishery north of 36° N. lat. have been lower than actual catches reported by the West Coast Groundfish Observer Program (WCGOP) because of differences in the algorithm designed to differentiate landings between the sablefish DTL and sablefish primary fisheries. For example, the GMT demonstrated that PacFIN-reported landings for the LE sablefish DTL fishery north of 36° N. lat. were 33 percent to 50 percent lower than catches shown by WCGOP total mortality reports during the period 2007 – 2009 (Agenda Item H.4.b, Supplemental GMT Report 1, March 2011). The GMT catch-projection model was developed using PacFIN data, therefore, actual landings for a given trip limit may be higher than estimated by the model.

PacFIN is aware of the programming issue and is in the process of correcting it. Unfortunately, the updated program and corrected data were not available prior to this meeting and may not be available until the June Council meeting. Hence, the GMT developed a set of alternative trip limits using various adjustments to explore the sensitivity of the original GMT projection model ouputs to the PacFIN data issue.

Parameters for the GMT-projection model were updated using uncorrected PacFIN data through October 2010. Using the current trip limit tables (76 FR 11381), the GMT model projects that 259 mt of sablefish will be landed during 2011, or 92 percent of the 282 mt allocation (Table 3, Status Quo – Projection A). As described above, however, the GMT model may under project actual landings by 33 percent to 50 percent. Therefore, the GMT provides a range of three potential outcomes for each trip limit option presented in Table 1, which are projected catches for (A) no adjustment to model output (i.e., assuming no PacFIN error), (B) 33 percent adjustment to model output, and (C) 50 percent adjustment to model output.

It is important to note that of the options presented in Table 3, only Option 4 requires immediate Council Action because a reduction in current trip limits (7,000 lbs / 2 months) would be required on May 1, 2011. Immediate action may not be necessary if the Council selects Option 2 or Option 3, because implementation of associated trip limits would not be required until July 1, 2011 or November 1, 2011, respectively. Therefore, the Council may opt to wait until a later Council meeting before making any inseason adjustments for this fishery (e.g., June). There are benefits to making precautionary adjustments now and there are benefits to waiting until the June meeting before making adjustments to trip limits. A precautionary adjustment beginning May 1st (Option 4) may provide for a more stable fishery throughout the remainder of the year if this fishery harvests 33 percent to 50 percent more than base-model projections. A recommendation for Option 2 at this meeting, rather than waiting until the June meeting, would provide more time for NMFS to implement a regulation change by July 1, 2011. On the other hand, a much better informed model with corrected PacFIN data should be available to the Council at the June meeting, when the level of uncertainty will be much lower. The following information should be considered before selecting an option from Table 3:

- Annual catch-projections made early in the year are less certain than those made later in the year. In-season catch data are incorporated into annual projections as data becomes available. Currently, very little 2011 landing information is available in the PacFIN data base. We anticipate that it may be June before enough data is in the PacFIN system to better inform our models and determine whether landings are tracking high or low relative to model predictions.

- It is challenging when bimonthly trip limit increases become effective within a 2-month period, because this fishery is modeled and managed primarily with bimonthly limits. The GMT also notes that bi-monthly trip limit reductions can only go into effect at the start of the two-month cumulative limit period (e.g. May 1st).

- The GMT model projects average landings. Actual landings may be higher or lower than the model projections. On an annual basis, the average percent absolute deviation of predicted from actual is 8 percent with a minimum of 1 percent and a maximum of 18 percent. This range of error in model projections should be considered when making trip-limit decisions.

The GMT does not provide a recommendation for a specific option. The GAP may have a preferred alternative, perhaps based on a preferred strategy for setting up the bi-monthly cumulative limits for the remainder of the year. The GMT points out that weekly limits are not provided in Table 3, the Council has chosen weekly trip limits equal to approximately 25 percent of the bimonthly limit. Based on this information, GMT recommends keeping the current weekly trip limit of 2,000 lbs / week through the rest of the year, which represents 25 percent to 33 percent of the bi-monthly trip limits shown in Table 3. **The GMT recommends the Council consider setting bi-monthly limits in response to the errors that have been discovered in PacFIN, so as to keep the impacts below the limited entry fixed gear allocation.**

Table 3. Projected sablefish landings (2011) for the limited entry sablefish DTL fishery north of 36° N. lat. Projected landings relative to the 282 mt allocation are shown in parentheses (= percent of allocation).

	Bimonthly Trip Limit Structure [/a]	Period	Projection A: Model-derived projected landings (mt) with no adjustments (= base model) [/b]	Projection B: 33% adjustment (mt) [/c]	Projection C: 50% adjustment (mt) [/d]
Option 1 (status quo) [/e]	7,000 lb / 2 mo 8,000 lb / 2 mo	1 – 3 4 – 6	259 (92%)	345 (122%)	389 (138%)
Option 2	7,000 lb / 2 mo 6,500 lb / 2 mo	1 – 3 4 – 6	214 (76%)	285 (101%)	322 (114%)
Option 3	7,000 / 2 mo 6,000 / 2 mo	1 – 5 6	215 (76%)	286 (101%)	322 (114%)
Option 4	7,000 lb / 2 mo 6,000 lb / 2 mo	1 – 2 3 – 6	190 (67%)	253 (90%)	285 (101%)

/a The GMT recommends weekly trip limits of 2,000 lb/week for the remainder of the year, for all options, which represents 25% to 33% of each bi-monthly limit.
/b Projections in (A) are shown assuming no adjustments to the model-derived output to correct for PacFIN data errors.
/c Projections in (B) adjusted the model output by increasing the projection by 33%.
/d Projections in (C) adjusted the model output by increasing the projection by 50%.
/e Model-derived projected landings (mt; base model) were based on trip limits currently in regulation (76 FR 11381; Option 1).

<u>Open Access Sablefish DTL, North of 36° N. lat.</u>

Parameters for the Open Access (OA) sablefish DTL model were updated using PacFIN data through October 2010. The updated model projects landings of 453 mt ±15 percent (average annual deviation) through the end of 2011, under the trip limits in regulation as of March 1, 2011 (76 FR 11381). This projection is 97.6 percent of the 2011 open access sablefish allocation (464 mt). The GMT notes that the open access sablefish DTL landings data are unaffected by the error in the PacFIN database described earlier in this statement. **The GMT is not recommending changes to trip limits in the open access sablefish DTL fishery north of 36° N. lat. at this time.**

<u>Limited Entry and Open Access Sablefish DTL, South of 36° N. lat.</u>

At the November 2010 meeting the Council recommended reductions to the limited entry and open access fisheries south of 36° N. lat., effective January 1, 2011, based on the higher than anticipated catch of sablefish during the 2010 fishery, and to stay within the 2011 harvest levels. The recommended trip limits became effective on March 1, 2011 (76 FR 11381).

Similar to discussions above for LEFG sablefish north of 36° N. lat., the limited entry trip limit model for south of 36° N. lat. was updated with the most recent PacFIN landings through Period

5 of 2010. Model-derived projections suggest that, on average, the 2011 landings will reach 86percent of the allowable landings even with the March 1 inseason action. The GMT notes that the limited entry sector in this area is unaffected by the error in the PacFIN database described earlier in this statement because the primary sablefish fishery does not operate south of 36° N. lat. **The GMT is not recommending changes to trip limits in the limited entry sablefish fishery south of 36° N. lat.**

A new open access trip limit model for the sablefish DTL fishery south of 36° N. lat. was adopted in June 2010, but has not yet been used to inform inseason management decisions due to high uncertainty in model projections. This high uncertainty is primarily due to poor prediction of participation, and the lack of variability in historical trip limits to inform the model. The GMT has updated the model with the most recent available data, including include trip limits, landings, ex-vessel prices, and fuel prices through Period 5 of 2010. The updated model-derived projections suggest that this fishery is also tracking within its allowable landings, at 267mt (±64 percent average annual deviation), taking into account the March 1 inseason changes to trip limits. The GMT does note that this model is still highly uncertain and actual landings could be higher or lower than projections; it is not as accurate as the northern open access sablefish DTL model. **The GMT is not recommending changes to trip limits in the open access sablefish fishery south of 36° N. lat.**

<u>Limited Entry Fixed Gear and Open Access Nearshore Fishery off Oregon and California</u>

The bycatch ratios in the nearshore model have been updated with the most recent WCGOP data. Results from the "Data Report and Summary Analyses of the US West Coast Nearshore Fixed Gear Groundfish Fishery" indicate that neither landings nor observer coverage increased significantly from 2008 to 2009. The bycatch ratio of yelloweye rockfish decreased for both states in 2009, indicating that the 20 fm depth restriction implemented between 40°10' N. lat. and 43° N. lat. has been successful. The bycatch ratios increased for canary rockfish in Oregon and for bocaccio in California.

The GMT updated the scorecard to reflect the most recent projection of overfished species impacts. Yelloweye rockfish impacts remained the same (1.1 mt). **No changes to trip limits or depth restrictions are proposed at this time.**

<u>In Summary, the GMT recommends:</u>

1. **Continuing with the current trawl RCA structure north of 40^{o} 10' that is currently specified in regulation.**

2. **Considering the information on the PacFIN errors for the LE sablefish DTL north of 36° N. lat. If the Council recommends changes to the limits based on the options presented in Table 3, the GMT recommends continuing the weekly limit of 2,000 lbs/week for the remainder of the year.**

REFERENCES

Pacific Fishery Management Council. 2011. Agenda Item H.4.b, Supplemental GMT Report 1, March 2011.

PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 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. Pacific Fishery Management Council, Portland, OR. February 2011.

United States Federal Register. 2010. Fisheries Off West Coast States; Pacific Coast Groundfish Fishery Management Plan; Amendments 20 and 21; Trawl Rationalization Program; Allocations for the Start of the 2011 Fishery. Vol. 75, No. 250, Thursday, December 30, 2010. Pages 82296 - 82316.

United States Federal Register. 2011. Fisheries Off West Coast States; Pacific Coast Groundfish Fishery Management Plan; Inseason Adjustments to Fishery Management Measures. Vol. 76, No. 41, Wednesday, March 2, 2011. Pages 11381 – 11393.

Attachment 1. March 2011 Scorecard. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2011. Bolded numbers represent updates to the non-nearshore and nearshore models with the 2009 West Coast Groundfish Observer Program.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Widow		Yelloweye	
	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		20.0		0.3		18.7		65.4		12.9		60.9		3.9
EFPc/		11.0		1.3		0.2		1.5		2.0		0.1		11.0		0.1
Research d/		1.7		7.2		0.1		2.1		17.0		1.8		1.6		1.3
Incidental OA e/		0.7		2.0				15.0		1.0		0.1		3.3		0.2
Tribal f/		0.0		9.5		0.0		0.1		45.4		10.9		45.0		2.3
SB Trawl Allocations	60.0	60.0	25.9	25.9	1.4	1.4	250.8	250.8	860.1	860.1	119.4	119.4	282.6	282.6	0.3	0.3
At-Sea Trawl				8.2				14.5				17.4		147.9		
At-sea whiting MS				3.4				6.0				7.2		61.2		
At-sea whiting CP				4.8				8.5				10.2		86.7		
Non-Trawl		**55.9**		**17.1**		0.2		**5.8**		0.0		0.4		**10.0**		9.6
Non-Nearshore	57.9		2.3													
LE FG				**1.4**				**4.8**				0.3		0.1	0.8	0.8
OA FG				**0.2**				0.8				0.1		0.0	0.1	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	0.5				--		--		--		--	2.6	2.6
OR			7.0	2.4				--		--		--		1.0	2.3	2.3
CA	131.0	55.4	14.5	9.3		0.2		--		--		--		8.7	2.7	2.7
TOTAL	60.0	**129.3**	25.9	**63.0**	1.4	1.9	250.8	**289.8**	860.1	925.5	119.4	150.1	282.6	**501.4**	0.3	13.8
2011 Harvest Specification i/	288	288	105	105	4.0	4.0	330	330	1,200	1,200	200	200	509	509	14	14
Difference	228.0	158.7	79.1	42.0	2.7	2.2	79.2	40.2	339.9	274.5	80.6	49.9	226.5	7.6	13.7	0.2
Percent of OY	20.8%	44.9%	24.7%	60.0%	33.8%	46.3%	76.0%	87.8%	71.7%	77.1%	59.7%	75.0%	55.5%	98.5%	2.1%	98.6%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1 mt
	(dark)	= Fixed Values
	(light blue)	= off the top deductions

a/ Due to the delay in implementing the 11-12 regulations, the only allocations currently specified in regulation are the shorebased trawl allocations. Projected impacts for the at-sea sector are the expected allocations when the rule for final harvest specifications for 2011 fisheries is issued. For the non-trawl sectors, the values in the allocation column represent the Council's final preferred apportionment of the non-trawl allocation or harvest guidelines for the recreational fishery (canary,
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 still represent our best estimate of catch.

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).

f/ Tribal values represent the estimates derrived during the 11-12 biennial cycle, which still represent our best estimate of catch.

Attachment 2. Projected mortality impacts (mt) of overfished groundfish species for 2011 after Council action in November 2010. Bolded numbers represent the difference between the FPA in the DEIS and November action.

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	Petrale	POP	Widow	Yelloweye
Limited Entry Trawl - Non-whiting a/	60.0	20.0	1.8	240.3	871.0	107.0	235.5	**0.3**
Limited Entry Trawl - Whiting a/								
At-sea whiting motherships		3.4		6.0		7.2	61.2	0.0
At-sea whiting cat-proc		4.8		8.5		10.2	86.7	0.0
Shoreside whiting		5.9		10.5		12.6	107.1	0.0
Tribal whiting		4.3		0.1		7.2	5.0	0.0
Tribal								
Midwater Trawl		3.6		0.0		0.0	40.0	0.0
Bottom Trawl		0.8		0.0	45.4	3.7	0.0	0.0
Troll		0.5		0.0		0.0		0.0
Fixed gear		0.3		0.0		0.0	0.0	2.3
Non-nearshore c/								
LE FG	0.0	1.9		3.5		0.3	0.1	0.8
OA FG	0.0	0.3		0.8		0.1	0.0	0.1
Directed OA: Nearshore c/	0.3	3.0					0.3	1.1
Incidental OA d/	0.7	2.0		15.0	1.0	0.1	3.3	0.3
Recreational Groundfish e/								
WA		2.0						2.6
OR		7.0					1.0	**2.3**
CA	55.4	14.5	0.2				8.7	**2.7**
EFPs	11.0	1.3	0.2	1.5	2.0	0.1	11.0	0.1
Research f/	1.7	7.2	0.1	2.1	17.0	1.8	1.6	**1.3**
TOTAL	129.1	82.8	2.3	288.3	936.4	150.3	561.5	**13.9**
2011 ACL/ACT g/	263	102	4.0	298	976	157	600	**14**
Difference	133.9	19.2	1.7	9.7	39.6	6.7	38.5	0.1
Percent of OY	49.1%	81.2%	57.5%	96.7%	95.9%	95.7%	93.6%	99.3%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ Values for dkbl, POP, and widow reflect Amendment 21 allocations. Bocaccio, canary, cowcod, and yelloweye represent 11-12 allocations.

The allocation to the shoreside whiting sector is only for the Amendment 20 initial allocation. In future years only one allocation will be made to the shoreside sector (whiting and non-whiting).

b/ South of 40°10' N. lat.

c/ Values represent projected impacts under the Council's Final Preferred Alternative for 2011-2012

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

e/ Values in scorecard represent projected impacts for all species except canary and yelloweye rockfish, which are the prescribed harvest guidelines.

f/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

g/ Values for POP and yelloweye represent ACTs, which is a value less than the ACL to account for management uncertainty.

Attachment 3. Projected mortality impacts (mt) of overfished groundfish species for 2011 under the Council's Final Preferred Alternative for 2011-2012 as published in the DEIS (Table 2-66, page 146).

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	Petrale	POP	Widow	Yelloweye
Limited Entry Trawl - Non-whiting a/	60.0	20.0	1.8	240.3	871.0	107.0	235.5	0.6
Limited Entry Trawl - Whiting a/								
At-sea whiting motherships		3.4		6.0		7.2	61.2	0.0
At-sea whiting cat-proc		4.8		8.5		10.2	86.7	0.0
Shoreside whiting		5.9		10.5		12.6	107.1	0.0
Tribal whiting		4.3		0.1		7.2	5.0	0.0
Tribal								
Midwater Trawl		3.6		0.0		0.0	40.0	0.0
Bottom Trawl		0.8		0.0	45.4	3.7	0.0	0.0
Troll		0.5		0.0		0.0		0.0
Fixed gear		0.3		0.0		0.0	0.0	2.3
Non-nearshore c/								
LE FG	0.0	1.9		3.5		0.3	0.1	0.8
OA FG	0.0	0.3		0.8		0.1	0.0	0.1
Directed OA: Nearshore c/	0.3	3.0					0.3	1.1
Incidental OA d/	0.7	2.0		15.0	1.0	0.1	3.3	0.2
Recreational Groundfish e/								
WA		2.0						2.6
OR		7.0					1.0	2.4
CA	55.4	14.5	0.2				8.7	3.1
EFPs	11.0	1.3	0.2	1.5	2.0	0.1	11.0	0.1
Research f/	1.7	7.2	0.1	2.1	17.0	1.8	1.6	3.3
TOTAL	129.1	82.8	2.3	288.3	936.4	150.3	561.5	16.6
2011 ACL/ACT g/	263	102	4.0	298	976	157	600	17
Difference	133.9	19.2	1.7	9.7	39.6	6.7	38.5	0.4
Percent of OY	49.1%	81.2%	57.5%	96.7%	95.9%	95.7%	93.6%	97.6%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ Values for dkbl, POP, and widow reflect Amendment 21 allocations. Bocaccio, canary, cowcod, and yelloweye represent 11-12 allocations.

The allocation to the shoreside whiting sector is only for the Amendment 20 initial allocation. In future years only one allocation will be made to the shoreside sector (whiting and non-whiting).

b/ South of 40°10' N. lat.

c/ Values represent projected impacts under the Council's Final Preferred Alternative for 2011-2012

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

e/ Values in scorecard represent projected impacts for all species except canary and yelloweye rockfish, which are the prescribed harvest guidelines.

f/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

g/ Values for POP and yelloweye represent ACTs, which is a value less than the ACL to account for management uncertainty.

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Public Comment for the March 5-10, 2011 Council Meeting in Vancouver, WA:

I am a biologist and statistician living in Morro Bay, CA and I am concerned with preserving the California Central Coast fleet of small family owned fishing boats which contribute greatly to the economy and human ecology of my region, and to the food security of our nation. I am concerned by the possibility of small boats, in various fisheries, being displaced by larger boats which fish in a manner comparable to clearcut logging. By harvesting small spots here and there, the small boats allow for quicker recovery and open up mini territories in which nearby young fish may readily settle. Their effect is like selective logging which takes a few trees here and there, leaving the forest environment intact, complete with nearby seed trees.

This comment specifically targets ill advised regulatory actions and the quality of the data upon which such decisions are being made. For instance, consider the sablefish; according to the NOAA Fish Watch, females mature at 2.1 feet and 6.5 years of age; males mature at 1.9 feet and 5 years of age. It has a very long lifespan, potentially over 90 years, and high egg production. Although not classified as highly migratory, NOAA reports that some juveniles have been found to migrate over 2,000 miles in 6 or 7 years and that the adults are found on mud bottoms to depths of 9800 ft. This is far below where either commercial or sport gear can reach, and it is also beyond the reach of the presently used survey methods. So, a vast inaccessible part of its range adjoins the coastal fishing area and extends beyond the fishing grounds for this species and is likely to account for the majority of its biomass. Thus NOAA's and the Council's population and biomass estimates of this potentially very stable population are unsupported; the estimates are obviously much smaller than reality. Recruitment is just a swim away and this species appears to disperse.

Despite apparently limited and untimely data, last season the Council increased the sablefish quota far beyond what they have permitted before. Boats came here from far and wide within the tristate region. Now the Council is threatening to reduce it drastically below what it was before this chaos. In addition to the overall permitted take now being too small, some proposed daily limits are too small to pay for the fuel required for even our smallest boats to go out for sablefish. This fishery maintains the fishing families and boats during the off season for other fisheries. Therefore these actions threaten the survival of their small fishing businesses.

The numbers of sablefish do not fluctuate in such a manner that great increases and decreases in the allowable take make sense, as they would for salmon. Surely this confused regulatory activity was not an attempt to stimulate overfishing of this species, in our area in one season, while, all along, planning to essentially slam it closed the next. What kind of sustainable fishery regulation would that be? How can the family boats which are individual small businesses survive under such conditions?

Unfortunately sablefish is just one example of the need, across all fisheries involved, for more scientific input and less unjustifiable action against the small boat fleet. Perhaps the Council should put less effort into making so many adjustments and expend more effort on monitoring to see if and when adjustment is necessary.

The Council is neglecting to use the best available scientific information. For instance **many buyers are being allowed to submit the landing tickets long after they are legally due.** This is despite the fact that vessel operators are severely penalized for any lateness of any kind regarding paper work and reports required of them. **Timely reception and analysis of buyer's landing tickets would potentially allow the Council to have more adequate information with which to make timely regulatory decisions.**

Not enforcing the time requirement with respect to buyer's landing tickets violates the MSA mandated requirement of best available scientific information. It does so by failing to enforce the regulations and by failing to use the information that is already available, since it is required by the regulations to be available.

Finally I am concerned about the continuing use of Bayesian statistics for regulation. Fisheries involves many conflicting environmental and business interests. Sad to say, the latter are even sometimes disguised as the former. At any time when profits are to be made or when emotion is running high, as with environmental issues, it is difficult for people to avoid bias and even injustice. Analyses and models founded on Bayesian statistics invariably contain numerical values chosen by the practitioner when the needed data is not at hand. The temptation to insert guesses is even greater when the receipt and processing of data is months, if not years behind. It would be much better to use frequentist statistical analysis as much as possible, seeking further funding to achieve this.

Regards,

L.E. (Mac) MacCarter, PhD

02/02/2011

-------- Original Message --------
Subject: Recreational Rockfish Regulations for 2011 and 2012
Date: Tue, 14 Dec 2010 16:26:01 -0800
From: Tim <reelsteel@humboldt1.com>
To: pfmc.comments@noaa.gov
CC: JRSmith@co.humboldt.ca.us, Phil Glenn <celtic4@suddenlink.net>, Flatland@mcn.org, Tom & Mary Marking <tmmarking@sbcglobal.net>

Dear Sirs,   I am a charter boat operator in Eureka Ca. I am concerned that the 2011 and 2012 regulations for California will not go into effect on January 1 because the PFMC has not completed their review. The new California rockfish regulations allow for a slightly longer season in parts of Northern California. This added season length will increase the number of trips that we can make next year. I am already seeing interest from customers. Depending on weather , the longer season should help the local charter boats see a revenue increase of 15 to 20%. It is very important to us to know what our season length is so that we can book trips during the Sportsman Shows in January and February. Since we don't know what the salmon season will be like, we need to know what will be open during the season. I have hope that the longer season and relaxed restrictions on ling cod will provide increased business opportunities for recreational fishing based businesses like mine. Thank you, Tim Klassen   REEL STEEL SPORTFISHING Eureka Ca 707-499-5509

TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS

The groundfish trawl catch share program has been implemented and fishing under the program began on January 11, 2011. The catch share program was approved under Amendment 20 to the groundfish fishery management plan (FMP). Many of the trawl allocations which are managed through the catch share program were established through Amendment 21. Both of these amendments were approved by National Marine Fisheries Service (NMFS) in August 2010 and implemented for the 2011 fishery through the laudable and diligent efforts of the NMFS regional and science center staffs.

At its September 2010 meetingthe Council prioritized a number of trawl rationalization issues for immediate consideration as trailing regulatory actions or FMP amendments. For one issue of particular importance, community fishing associations, the Council held a number of hearings in October. At its November 2010 meeting, the Council provided direction for moving forward on priority issues. A tentative calendar for the Council process on these issues is provided (Agenda Item H.5.a, Attachment 1). The following is a general summary of the direction provided by the Council on these issues.

	Issue		Council Direction in November 2010	Urgency (Implementation by)
1	A-21 Supersedence of A-6		Move ahead: Highest Priority	2013 (needed for/with biennial spex)
2	Halibut Allocation		Move ahead: Alternatives provided	2012 (emergency rule expires at end of 2011)
3	Cost Recovery		Move ahead with NMFS lead. Requested transparency of cost information used to determine fees. Cost assessments should be sector specific.	2012 (stated Council objective)
4	QS/QP Control Rule Safe Harbor			
	4a	CFAs	Move ahead: general guidance on alternatives and analysis provided in Council motion.	2013 (QS trading starts)
	4b	Risk Pools	Move ahead with alternatives provided in staff document. Request NMFS/General Counsel participation and meetings with constituents regarding need for action by the Council and type of action needed. NMFS report requested for April.	Not specified
	4c	Lenders	Move ahead: Included in 4b (verbal clarification of motion)	Not specified
5	Severability of Catch History/ Endorsement From Mothership/Catcher Vessel Permit		Move ahead: Alternatives provided	2012 (stated Council objective)
6	Adaptive Management Program Quota Pound Pass Thru		Move ahead: A range of alternatives provided.	2013 (needed in lieu of other direction for using AMP pounds)

At this meeting, the Council is scheduled to identify preliminary preferred alternatives on the first three issues: (1) superseding Amendment 6 allocations with those decided under Amendment 21; (2) halibut trawl bycatch mortality allocation; and (3) severability of catch history/endorsements from the mothership catch vessel permits. The remaining five other trailing action issues are scheduled for consideration at the April Council meeting. Additionally, the Council may need to respond to any policy issues which have arisen over the course of the first months of implementation of the program. These issues may show up in a NMFS report under this agenda item or Agenda Item H.1, or as public comment. Issues that appear to warrant immediate attention may require reconsideration and reprioritization of the current schedule with public notice as to when they would be scheduled for Council action. Appropriate issues that are not urgent in requiring immediate action should be scheduled for consideration at the September 2011 Council meeting, together with issues considered in September 2010 but postponed for further action.

With respect to Amendment 21 superseding Amendment 6, the Council's Amendment 21 recommendation proposed that the Amendment 21 trawl/nontrawl allocations specifically replace the Amendment 6 (license limitation) limited entry/open access allocations in place since 1994 (Agenda Item H.5.a, Attachment 2). NMFS disapproved the Council recommendation on superseding Amendment 6 because it believed the public had not been provided adequate notice that this was a feature of the Council's Amendment 21 recommendations. The analysis on this issue was included in the Amendment 21 and 2011-2012 biennial specifications environmental impact statements. A related issue has been identified with respect to the interpretation of the Council action on set-asides and flexibility for inseason modifications. In Agenda Item H.5.a, Attachment 2, this issue is discussed and identified for possible inclusion in the alternatives. The task for the Council at this meeting is to identify a preliminary referred alternative. The final action on this issue will be an FMP amendment.

With respect to the Pacific halibut allocations, in the fall of 2010, after reviewing new information on Pacific halibut historic trawl bycatch mortality, the Council determined that the there was a substantial risk that the Amendment 21 trawl halibut allocations may have been overly restrictive. On that basis, the Council recommended an emergency action to provide a larger amount for trawl halibut bycatch mortality. That action was put into place by NMFS via emergency rule at the start of the year and will run 185 days. The action can be renewed for an additional 186 day period (covering the remainder of 2011), so long as the Council is working on a plan amendment to permanently resolve the problem. At this meeting, a draft Environmental Assessment (EA) has been provided to support the Council consideration of a preliminary preferred alternative (Agenda Item t H.5.a, Attachment 3). In order to have a revised allocation in place for the 2012 fishery, the Council needs to make a final recommendation to change the Amendment 21 halibut allocation by its June 2011 meeting. The final Council action on this issue will be an FMP amendment, currently scheduled for the June 2011 Council meeting.

With respect to the severability of the mothership whiting catcher vessel endorsement/catch history from the permit, the issue is one that was covered in the Amendment 20 Environmental Impact Statement (EIS) and an extensive analysis does not appear to be required to make a modification. The concern to be addressed is that there are some permits that were allocated very small amounts of mothership sector Pacific whiting history but are used primarily in the shoreside fishery. In order for their small amounts to be harvested, those permits would need to join a co-op. "Severability" would allow the holders of such permits to transfer the endorsements/catch history to a permit more fully engaged in the mothership whiting sector. Control limits already in place would prevent excess aggregation. A brief analysis is provided in Agenda Item H.5.a, Attachment 4. The final action on this issue will be a regulatory action, not an FMP amendment.

Council Action:

1. **Select preliminary preferred alternatives on:**
   a. **Superseding Amendment 6 Allocations with Amendment 21 Allocations.**
   b. **Trawl halibut bycatch allocation.**
   c. **Severability of catch history/endorsements from the mothership catch vessel permits.**
2. **Provide guidance on other April trailing amendment issues as may be requested or appropriate.**
3. **Respond, as appropriate, to any new implementation issues identified by NMFS and the public, as appropriate.**

Reference Materials:

1. Agenda Item H.5.a, Attachment 1: Calendar for Trailing Amendments on Catch Shares.
2. Agenda Item H.5.a, Attachment 2: Superseding Amendment 6 Allocations With Those Decided Under Amendment 21.
3. Agenda Item H.5.a, Attachment 3: Trawl Catch Shares and Intersector Allocation Amendments, Issue: Groundfish Trawl Halibut Bycatch Mortality Allocation.
4. Agenda Item H.5.a, Attachment 4: Trawl Catch Shares and Intersector Allocation Amendments, Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/ Catch History.
5. Agenda Item H.5.b, Oregon Governor's Letter.
6. Agenda Item H.5.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Adopt Appropriate Actions as needed and Preliminary Preferred Alternatives for Prioritized Trailing Issues (i.e., Amendment 21 versus Amendment 6; Pacific Halibut Bycatch Allocation; and Whiting Endorsement Severability Issues)

PFMC
02/11/11

Agenda Item H.5.a
Attachment 1
March 2011

CALENDAR FOR TRAILING AMENDMENTS/ACTIONS ON TRAWL CATCH SHARES

Table. List of trailing actions prioritized by the Council for immediate action and possible calendar for each. Shaded months indicate periods of Council activity.

		2010	2011					2012						2013		
	Topic	Nov	Mar	Apr	Jun	Sep	Nv	Jan 1	Mar	Apr	Jun	Sep	Nv	Jan 1	Lead Entity(ies)	Analytical Support
1	A-21 Supersedence of A-6	X	PPA		FPA					Impl					Council/GAP	Council Staff
2	Halibut Allocation	X	PPA		FPA			Impl							Council/GAP	Council Staff w/Contractor
3	Cost Recovery	X	X	PPA	FPA			Impl							NMFS	NMFS & Cncl Staff
4a	QS/QP Control Rule Safe Harbor CFAs	Y		Y	PPA	FPA					Impl				Council/GAP/ Staff	Council Staff w/Contractor
4b	Risk Pools	Y		Y	PPA	FPA					Impl				NMFS/ Council/GAP/ Staff	Council Staff w/Contractor
4c	Lenders	Y		Y	PPA	FPA					Impl				Council/GAP/ Staff	Council Staff
5	Severability of Catch History/ Endorsement From Mothership/ Catcher Vessel Permit	Y	PPA		FPA			Impl							Council/GAP	Council Staff w/Contractor
6	AMP Pass Thru	Y		Y	PPA	FPA					Impl				Council/GAP	Council Staff w/Contractor

PPA = Council selects preliminary preferred alternative.
FPA = Council selects final preferred alternaive. **Impl** = Target implementation date.
Y = Council activity.

Superseding Amendment 6 Allocations With Those Decided Under Amendment 21

There are three sections to this document:

Superseding Amendment 6 with Amendment 21
Set Aside Flexibility/Clarifications
Alternatives

Superseding Amendment 6 with Amendment 21

Two amendments to the FMP have considered formal allocations - Amendments 6 and 21. Amendment 6, implemented in 1994, specified allocations of groundfish stocks to limited entry and open access sectors (Table 1). Amendment 21 allocations (Table), implemented in 2011, consider allocations to trawl sectors, with the balance of the harvestable surplus allocated to non-trawl sectors (i.e., limited entry fixed gear, directed open access, and recreational sectors combined). Additionally, formal sector allocations exist for Pacific whiting and sablefish north of 36° N. latitude. While these allocations have been specified in federal regulations for many years, they are now incorporated in the FMP under Amendment 21.

Amendment 6, which established the commercial non-treaty limited entry system, also established allocation procedures for any species to be newly allocated between commercial open access (including directed and incidental open access) and limited entry sectors based on catch history for the license limitation allocation period (July 11, 1984 through August 1, 1988). These allocations worked well at the time since the fishery was not all that structurally different in the 1990s than it was in the 1984-1988 historical catch period upon which the allocations were based. However, the fishery changed significantly after passage of the Sustainable Fisheries Act (SFA) of 1996, which amended the MSA with more stringent conservation mandates, and the subsequent implementation of Amendment 11 in 1998, which codified the SFA mandates and the new National Standard 1 guidelines interpreting these mandates.

Table 1. Limited entry and open access allocations established by FMP Amendment 6.

Stock or Stock Complex	Limited Entry Share	Open Access Share
Lingcod	81%	19%
Minor Rockfish South (including Chilipepper Rockfish)	55.7%	44.3%
Minor Rockfish North (including Yellowtail Rockfish)	91.7%	8.3%
Shortspine Thornyhead (north of Conception Area)	99.73%	0.27%

A direct result of implementing the more stringent conservation mandates of Amendment 11 was the first declarations of stocks being overfished. This led to dramatically lower fishing limits, widespread fishing closures on the continental shelf (e.g., RCAs and Cowcod Conservation Areas), and a complete re-structuring of the fishery. From that time to present, Amendment 6 allocations have not been effectively attained. Because these allocations were not binding on the sectors, given other constraints needed to meeting conservation mandates, they did not directly enter into decisions on annual or biennial management measures. Beyond direct suspension of these allocations for overfished species, access to other healthy stocks in the EEZ has been constrained by the need to significantly reduce fishing mortality on overfished species. When there is little chance of attaining a harvestable surplus of a stock, the established allocation has little significance in the management system.

Amendment 21 allocations were borne of the need for allocations to the trawl fishery for species to be managed under the catch share program. While these allocations could be set during every biennial management process, for reasons of process efficiency the Council determined that it would be more efficacious to set long term allocations for stocks that are predominantly or significantly caught in trawl fisheries. The original Amendment 6 allocations for stocks that were subject to Amendment 21 allocations were superseded by the new Amendment 21 allocations. The Amendment 21 action also underscored the Amendment 6 policy to temporarily suspend any formal allocation for a stock that is declared overfished. The original FMP provision under Amendment 6 temporarily suspended any formal limited entry/open access allocation (i.e., Amendment 6 allocation) when a stock is declared overfished. Amendment 21 modified the provision to temporarily suspend any formal allocation for any stock declared overfished.

There are few, if any, stocks that are potentially subject to Amendment 6 allocation consideration in the 2011 and 2012 management cycle. Any significant harvestable surplus of shelf species that are not subject to Amendment 21 allocations, such as minor shelf rockfish, will not be accessible due to RCA restrictions. The allocation of minor nearshore rockfish species has been largely deferred to the states under the auspices of state fishing policies and/or state nearshore FMPs. The only other Amendment 6 species (i.e., lingcod, minor slope rockfish, and shortspine thornyhead north of the Conception area) are subject to Amendment 21 allocations, which the Council intended would supersede those originally specified under Amendment 6.

Table 2 details the Amendment 21 allocations of the proposed 2011 ACLs. The ACLs are reduced to account for mortality in EFPs, tribal fisheries, incidental open access fisheries, and research activities. The resulting value is the Fishery Harvest Guideline, which is the value that is used in the allocations. Under the Final Preferred Alternative, the Council specified an ACT for POP. As such, set-asides for EFPs, tribal fisheries, incidental open access fisheries, and research activities were removed from the ACT prior to calculating the allocations. Additionally, under the Final Preferred Alternative, the Council temporarily suspended the petrale sole Amendment 21 allocation and established a 2-year allocation between trawl and non-trawl sectors.

In April 2010, the Council confirmed their intent that the trawl/non-trawl allocations established under Amendment 21 would supersede the limited entry/open access allocations established under Amendment 6. NMFS disapproved that portion of the Council's Amendment 21 action because they felt that there was not adequate public notice that this was part of the Council's preferred Amendment 21 alternative. The Council is addressing this issue at their March 2011 meeting where the action to supersede Amendment 6 allocations with those established under Amendment 21 is expected to be confirmed. This action will be part of a series of trailing amendments connected to the actions taken under amendments 20 and 21.

Set Asides Flexibility/Clarifications

In addition to the issue of Amendment 21 superseding Amendment 6, it has become apparent that there may be a need for clarification of the status and adjustability of the set-aside that were specified in Amendment 21. The Council may want to include the alternatives for this plan amendment. The Groundfish Management Team addressed the Council on this issue at the June 2010 Council meeting. Under Agenda Item G.3, the GMT noted:

> Considerations for Yield Set Asides
>
> Given the sector allocations that will formally occur with implementation of Fishery Management Plan (FMP) Amendment 21 and the 2011-2012 harvest specifications and management measures, there is a need for the Council to consider setting aside some yield of overfished species . . . .

> As the fishery is managed currently (e.g., without intersector allocations) if the Council discovers that the set-asides in the scorecard are mis-specified due to changes in tribal take, research, exempted fishing permits (EFPs), or incidental open access, the scorecard is simply updated and management measures for fisheries may be adjusted up or down to attain but not exceed optimum yield (OYs). Then these changes to management measures are implemented by NMFS via routine inseason action.
>
> Under Amendment 21 and biennial specifications, formal sector allocations and set asides are specified in Federal regulations. Once the yield is compartmentalized like this, the GMT notes that it will be much more complicated to revise the estimates if changes in the set asides arise mid-bienium (i.e., much more than a scorecard update and subsequent remedy through inseason action). . . .

On this issue, the Council may wish to request inclusion in the environmental assessment the exploration of options that would provide more flexibility in the management of set asides.

Alternatives.

The following three alternatives are presented for Council consideration.

No Action Alternative (Status Quo): Amendment 21 and Amendment 6 allocations remain in place.

Alternative 1: Amendment 21 allocations supersede Amendment 6 Allocations.

Under Alternative 1, the groundfish FMP language would be changed as follows.

6.3.2.3 Limited Entry Trawl Allocations for Amendment 21 Species

. . . The remainder of the OYs/ACLs are then allocated according to the percentages in Table 6-1 [Table 6-1 provides the schedule of allocations adopted by the Council under Amendment 21, provided in this document as Table 2]. The trawl percentage is for the non-treaty trawl fishery managed under Amendment 21. The non-treaty, non-trawl percentage is for the limited entry fixed gear fishery, the open access fishery, and the recreational fishery. Amendment 6 limited entry and open access allocations are superseded by these allocation percentages.–Allocations to the directed non-trawl sectors (i.e., limited entry fixed gear, directed open access, and recreational) for the species allocated Table 6-1 are decided, if needed, in the biennial harvest specifications and management measures process

11.2.2 Allocations Between the Limited and Open Access Fisheries and Management of the Open Access Fishery

1. The division of the fleet into limited and open access participants will require that separate allocations be established for each group where management measures are required to prevent harvest in excess of annual catch limits. For those species, species groups and areas covered by the trawl/non-trawl allocations provided in Table 6-1 and for which the Council determines an allocation is necessary, open access allocations will be established as needed through the biennial specifications process.

2. For those species for which trawl/non-trawl allocations are not established in Table 6-1 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.

Alternative 2: Amendment 21 allocations supersede Amendment 6 Allocations (same as Alternative 1), plus provide flexibility for changes to be made to the set asides through routine inseason adjustments in response to new information.

Table 2. Amendment 21 allocations for 2011.

Species/Species Group/Area	2011 ACL	2011 ACT	Fishery HG b/	Trawl A21%	Non-trawl A21%	Trawl A21 mt	At-sea whiting set asides	Trawl after at-sea set asides	Non-Whiting A21 %	Whiting A21 %	Non-Whiting A21 mt	Whiting A21 mt	SS	CP	MS	Nontrawl A21 mt
Lingcod N of 42º N lat. (OR & WA)	2,330		2,059	45%	55%	927	6	921	99.7%	0.3%	918	3				1,132
Lingcod S of 42º N lat. (CA)	2,102		2,095	45%	55%	943	0	943	99.7%	0.3%	940	3				1,152
Pacific Cod	1,600		1,200	95%	5%	1,140	5	1,135	99.9%	0.1%	1,134	1				60
Sablefish S of 36º N. lat.	1,298		1,264	42%	58%	531	0	531	100.0%		531	0				733
Dover sole	25,000		23,410	95%	5%	22,240	5	22,235	100.0%		22,235	0				1,171
English sole	19,761		19,661	95%	5%	18,678	5	18,673	99.9%	0.1%	18,654	19				983
PETRALE SOLE a/	976		911			876	5	871	100.0%		871	0				35
Arrowtooth flounder	15,174		13,096	95%	5%	12,441	10	12,431	100.0%		12,431	0				655
Starry Flounder	1,352		1,345	50%	50%	673	5	668	100.0%		668	0				673
Other flatfish	4,884		4,686	90%	10%	4,217	20	4,197	99.9%	0.1%	4,193	4				469
PACIFIC OCEAN PERCH	180	157	144	95%	5%	137	0	137	The rest	17% or 30 mt	107	30	13	10	7	7
WIDOW	600		539	91%	9%	491	0	491	The rest	52.0%	235	255	107	87	61	49
Chilipepper S of 40°10' N lat.	1,882		1,867	75%	25%	1,400	0	1,400	100.0%		1,400	0				467
Splitnose S of 40°10' N lat.	1,461		1,454	95%	5%	1,381	0	1,381	100.0%		1,381	0				73
Yellowtail N of 40°10' N lat.	4,364		3,865	88%	12%	3,401	300	3,101	The rest	300	2,801	300				464
Shortspine thornyhead N of 34 27' N. lat.	1,573		1,528	95%	5%	1,452	20	1,432	99.9%	0.1%	1,430	1				76
Shortspine Thornyhead S of 34 27' N. lat.	405		363	50 mt	The Rest	50	0	50	100.0%		50	0				313
Longspine thornyhead N of 34 27' N. lat.	2,119		2,075	95%	5%	1,971	5	1,966	100.0%		1,966	0				104
DARKBLOTCHED	298		279	95%	5%	265	0	265	The rest	9% or 25 mt	240	25	11	9	6	14
Minor Slope Rockfish N of 40°10' N lat.	1,160		1,092	81%	19%	885	55	830	98.6%	1.4%	818	12				207
Minor Slope Rockfish S of 40°10' N lat.	626		599	63%	37%	377	0	377	100.0%		377	0				222

a/ Under the Final Preferred Alternative, the Council temporarily suspended the Amendment 21 allocation between trawl and non-trawl. The values in this table represent a two year allocation.

b/ The Fishery Harvest Guideline represents the amount of the ACL, after subtracting the off-the-top amounts that is available for allocations. Off-the-top amounts include total mortality estimates for scientific research, tribal fisheries, incidental open access and set asides for EFPs.

Agenda Item H.5.a
Attachment 3
March 2011

TRAWL CATCH SHARES AND INTERSECTOR ALLOCATION AMENDMENTS

ISSUE: GROUNDFISH TRAWL PACIFIC HALIBUT BYCATCH MORTALITY ALLOCATION

1st Draft of Environmental Assessment

PREPARED BY
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FEBRUARY 2011

Table of Contents

List of Tables

List of Figures

CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

This document provides background information about, and analyses for, the set aside of Pacific halibut to cover bycatch mortality in the limited entry groundfish trawl fishery. The proposed action would require an amendment to the Pacific Coast Groundfish Fishery Management Plan (FMP), which contains the policies and framework for allocating the harvestable surplus of groundfish and provides for the allocation of bycatch mortality set asides for the trawl fishery. 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

1.2.1 Issue: Halibut Bycatch Mortality Allocations

The proposed action is to amend the groundfish FMP sections to change provisions related to the amount of halibut bycatch mortality for which the trawl fishery will be managed.

1.3 Purpose and Need for the Proposed Action

1.3.1 Issue: Halibut Bycatch Mortality Allocations

Limits on halibut bycatch mortality for the limited entry groundfish trawl fishery were first established by Amendment 21 and the measures used to manage them (catch shares) were established under Amendment 20. Both of these amendments were approved by NMFS in the summer of 2010. As stated in Amendment 21, the purpose of the limit on trawl halibut bycatch mortality is as follows:

> To limit the bycatch of Pacific halibut in future LE trawl fisheries. A total catch limit of Pacific halibut, with the intent of further minimization of Pacific halibut bycatch in Area 2A trawl fisheries, is consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandate to minimize bycatch and will provide increased benefits to Area 2A fishers targeting Pacific halibut.

Amendment 21 set a limit on trawl halibut bycatch mortality that was expected to force a mortality reduction of about 50%. However, a few months after Amendment 21 approval, new information on the Pacific halibut bycatch mortality revealed that the groundfish trawl sector was taking more halibut than had previously been believed. This implied that the reductions imposed by Amendment 21 would have been more severe than intended. On that basis, following a Council recommendation NMFS implemented an emergency rule for 2011 limiting trawlers to an amount of halibut expected to attain the original target of a 50% reduction in trawl mortality. Emergency rules are effective only for 180 days and may be renewed only one time, to cover another 186 day period.[1] Absent further action by the Council and NMFS, the limits and consequent reduction in bycatch mortality originally approved in Amendment 21 will become effective at the beginning of 2012. It is believed that such a reduction would prevent trawlers from accessing healthy groundfish target species with which Pacific halibut is taken as bycatch and thereby have substantial adverse impact for the fishing industry and fishing dependent communities. The purpose of this proposed action, to modify the trawl halibut bycatch mortality limits, is to avoid this negative outcome while still limiting trawl bycatch mortality.

Action is also needed to evaluate and potentially modify other aspects of the process and formula by which the trawl bycatch mortality limits are set. For example, as currently specified, determining the amount of the limit involves a calculation using the halibut total constant exploitation yield (TCEY). A final value for TCEY is not available until after the start of each year while the calculation of the amount of halibut available to the trawl fishery must be made before the start of the year, in order to issue halibut individual bycatch quota (IBQ) pounds to the trawl fishery before fishing starts. The purpose of additional modifications to the allocation process would be to ensure that the process for determining the trawl bycatch mortality limits can be effectively and efficiently implemented.

[1] Renewal of the emergency action, for the second period, is subject to MSA (c)(3)(B): " . . .provided the public has had an opportunity to comment on the emergency regulation or interim measure, and, in the case of a Council recommendation for emergency regulations or interim measures, the Council is actively preparing a fishery management plan, plan amendment, or proposed regulations to address the emergency or overfishing on a permanent basis"

CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

2.1.1.1 Issue: Halibut Bycatch Mortality Allocations

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). A total mortality limits on trawl bycatch induced Pacific halibut mortality will be calculated as follows.

No Action Alternative -- Status quo. *Specific plan amendment language:*

> The trawl mortality limit for legal and sublegal Pacific halibut be set at 15% 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 [2015]. 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.
>
> *Note: based on the Amendment 21 analysis, status quo has been interpreted to include and expansion of the allocation from net to round weight.*

Alternative 1 – Specify the allocation as net weight legal-sized fish and make necessary expansions. Modify the No Action Alternative (Status Quo) to clearly specify that the amounts resulting from the calculations would be a total net weight of legal sized halibut which would then be expanded, converting to total round weight of legal and sublegal sized halibut. *Specific plan amendment language would be as follows.*

For 2012 through 2014, 15% of the Area 2A total constant exploitation yield (TCEY) for legal sized halibut (net weight), not to exceed 130,000 lbs will be subtracted from the TCEY to account for expected trawl bycatch mortality of legal sized halibut (net weight). Beginning in 2015, the amount to be subtracted will be capped at 100,000 lbs. The TCEY used for these calculations will be the best estimate of the TCEY available from the IPHC at the time of the calculation (most likely the preliminary TCEY). The bycatch allocation percent can be adjusted downward or upward (above or below 15%) through the biennial specifications and management measures process but the upper bound on the maximum allocations can only be changed though an FMP amendment.

The shoreside trawl rationalization program keeps the trawl sector within expectations by requiring that trawlers account for their total mortality of all halibut in round weight (legal and sublegal sized). Therefore, to determine a trawl bycatch mortality limit the amount of halibut pounds available to the trawl fleet will be determined by expanding the expected legal sized halibut mortality (net weight) into a round weight legal+sublegal sized amount. To achieve this, the following conversions will be applied.

i. Net weight to round weight conversion: multiply by the IPHC net weight to round weight conversion factor in use at the time of the calculation (for 2011 the ratio was 1/0.75=1.33).
ii. Legal to legal+sublegal sized conversion factor: multiply by the IPHC legal+sublegal to legal ratio in use at the time of the calculation (for 2011 the ratio was 1/0.62=1.61).

After these conversions, 10 mt will be subtracted to cover bycatch mortality in the at-sea whiting fishery and trawl fishery south of 40^{o} 10' N. lat, and the remainder will be issued as IBQ, to be used to cover Pacific halibut mortality by vessels operating in the shoreside trawl IFQ program. The amount of Pacific halibut set aside to accommodate incidental catch in the trawl fishery south of 40^{0}10' N latitude and in the at-sea whiting fishery can be adjusted in the biennial specifications and management measures process in future years as better information becomes available.

Alternative 2 – Set allocations biennially. Same as Alternative 1 but during the biennial specifications process set a specific amount of halibut to be subtracted from the TCEY (rather than a percentage) up to a maximum, and use the calculation described above for expanding the trawl allocation and determining the amount of IBQ quota pounds to be issued. Maximum limits to be analyzed would be 100,000 lbs and 130,000 lbs, both expressed in legal-sized, net weight. *Specific plan amendment language would be as follows.*

The same plan amendment language as Alternative 1 except replace the first paragraph of Alternative 1 with the following:

During each biennial specifications and management measures process, the Council will determine a trawl halibut bycatch mortality limit for legal sized halibut, net weight.[2] The maximum to which that limit can be set is

[2] The Council November 2010 motion stated that both Alternatives 1 and 2 should "provide for adjustment of the trawl halibut bycatch mortality limit through the biennial management process." However, for Alternative 2, since the allocation amounts would already be determined through that process, the only other aspect of the provisions that could be modified through the biennial management process would be the upper bounds. If the upper bounds could be modified through the same process and at the same time as the allocation amounts, the upper bounds would have no effect. For this reason, for Alternative 2 the specification that additional

Suboption 3a: 100,000 pounds legal-sized, net weight
Suboption 3b: 130,000 pounds legal-sized, net weight

NOTE: **If the Council continues with Alternative 2 it will need to be augmented with an explicit allocation decision for the 2012 fishery, since the fishery will occur after the current emergency rule runs out and before the Council's the next biennial management process.**

Alternative 1 and 2 were developed by the Council at its November 2010 meeting. No other alternatives were developed but eliminated from consideration.

The alternative Pacific halibut total catch limits analyzed in this EA have been applied retrospectively to the 2004 through 2010 fisheries (a hindcast) and the results are provided in Table 2-1. For each year, each total catch limit alternative was applied to the Area 2A TCEY, decided annually by the IPHC; for the no Action Alternative, the result was expended from dressed to round; and for Alternative 1 and 2 the result was expanded using the round/dressed and (legal+sublegal)/legal ratios. Under the No Action Alternative, even though there is not an expansion in the allocation from legal to legal+sublegal, the trawl sector would need to use the number of pounds allocated to it (unexpanded) to cover the mortality of all legal+sublegal fish caught.

Table 2-1. A 2004-2010 hindcast of the total pounds available to the West Coast trawl fishery to cover mortality of legal and sublegal sized Pacific halibut (round weight) under each alternative. ŧ

		Baseline Actual Mortality ŧŧ	**No Action Alternative** (Set by Formula, No Conversion)	**Alternative 1** (Set by Formula and Convert to Round Wt Legal + Sublegal)		**Alternative 2** (Determine Biennially and Convert to Round Wt Legal + Sublegal) Cap values are provided here – converted to legal + sublegal round weight Actual allocations may be lower.	
Year	TCEY (lb., legal sized net weight)	Legal and Sublegal Sized Round Wt		15% Capped at 130,000 through 2014	15 % Capped at 100,000 starting in 2015	Alternative 2a (max of 100,000 pounds legal sized net wet)	Alternative 2b (max of 130,000 pounds legal sized net wet)
2004	2,110,000	293,214	173,333	279,570	215,054	215,054	279,570
2005	1,560,000	632,726	173,333	279,570	215,054	215,054	279,570
2006	1,710,000	533,518	173,333	279,570	215,054	215,054	279,570
2007	1,580,000	460,766	173,333	279,570	215,054	215,054	279,570
2008	940,000	458,561	173,333	279,570	215,054	215,054	279,570
2009	640,000	553,360	128,000	206,452	206,452	215,054	279,570
2010	820,000	not/available	164,000	264,516	215,054	215,054	279,570

ŧ Under each alternative, to determine the amount available to the shoreside trawl IFQ fishery subtract 10 mt (22,046 pounds) from the estimated allocations.
ŧŧ Heery et. al. 2010.
* Legal sized Pacifica halibut are 32" and larger, and sublegal sized are under 32".

adjustments could be made through that biennial process has not been included in this Council review draft.

CHAPTER 3 AFFECTED ENVIRONMENT

TO BE AUGMENTED WITH ADDITIONAL BASELINE INFORMATION.

Pacific Halibut: Retention and Nonretention Fisheries

Halibut Bycatch Mortality in the Trawl Fishery

Prior to Amendment 21 allocations and the Amendment 20 catch share plan, the amount of Pacific halibut set aside for the trawl fishery each year was based on the estimated trawl Pacific halibut bycatch mortality from two years previous (the most recent data available at the time the set asides were determined). Trawl Pacific halibut bycatch mortality estimates are provided in Figure 3-1. Two bycatch estimates are provided. The first estimates (the "old method") were the estimates actually used for management during the years covered by the figure. The second estimates (the "new method") were developed and presented to the Council in the fall of 2010 (Heery, et. al., 2010). The trawl mortality amounts were determined through observer program sampling on trawl trips (generally about 20% of the trips were observed) and there were no regulations in place established specifically to reduce the amount of trawl halibut bycatch. The actual mortality and the planned mortality often varied widely from one another from one year to the next (Figure 3-1) due in part to the two year lag between the most recent estimate of trawl bycatch mortality and the year in which that estimate was used and in part because of the absence of management measures to control trawl bycatch. The Amendment 20 catch share program should increase the accuracy of the mortality estimates (due to a 100% observer coverage requirement) and reduce the differences between planned trawl mortality and the actual trawl mortality (due to the individual vessel accountability imposed through Pacific halibut individual bycatch quota included as part of the Amendment 20 catch share program).

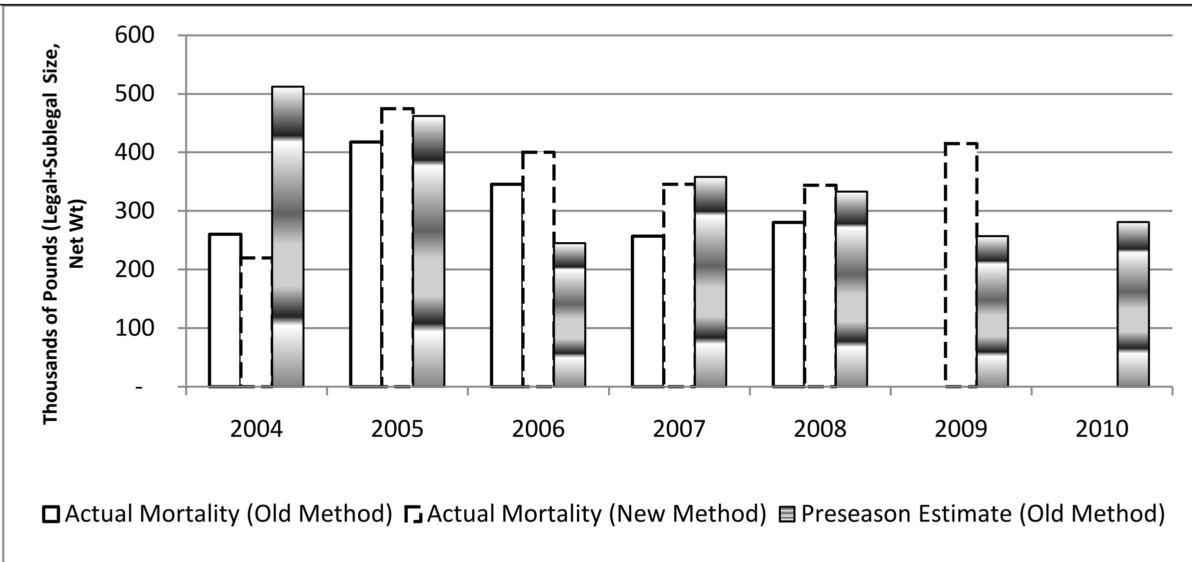

Figure 3-1. Estimates of actual trawl halibut (legal+sublegal size, net weight) bycatch mortality and preseason estimates for 2004-2010 (estimate from two years prior generally forms the basis for the preseason estimate for each year).

At-Sea Trawl Sector and Southern Fishery Bycatch Amounts

Under Amendment 21 10 mt was set aside for the southern and at-sea trawl fisheries, an amount expected to minimize the likelihood of constraining the at-sea whiting fisheries. No modifications to this aspect of the allocation formula have been proposed in the current alternatives.

Trawl sector set-asides for Pacific halibut include set-asides to account for catch in the shoreside trawl sector in areas south of 40°10' N latitude, as well as incidental catch in the at-sea sectors. Available information from the West Coast Groundfish Observer Program indicates that approximately 0.24 percent of the observed halibut has been taken in that area south of 40°10' N latitude from the 2003 to 2006 period. Over that period, the trawl bycatch estimate for areas north of 40°10' N latitude has ranged from 923,693 to 666,782 pounds, with estimated bycatch mortality equaling approximately 50 percent. This means that the observed halibut bycatch mortality estimate in areas to the south of 40°10' N latitude is estimated to be approximately 3.7 to 5.1 mt. When combined with the at-sea trawl sector take of Pacific halibut over the 1995 to 2008 period, an appropriate set-aside may be on the order of 10 mt for at-sea and shoreside trawl south of 40°10' N latitude combined (Figure 3-2).

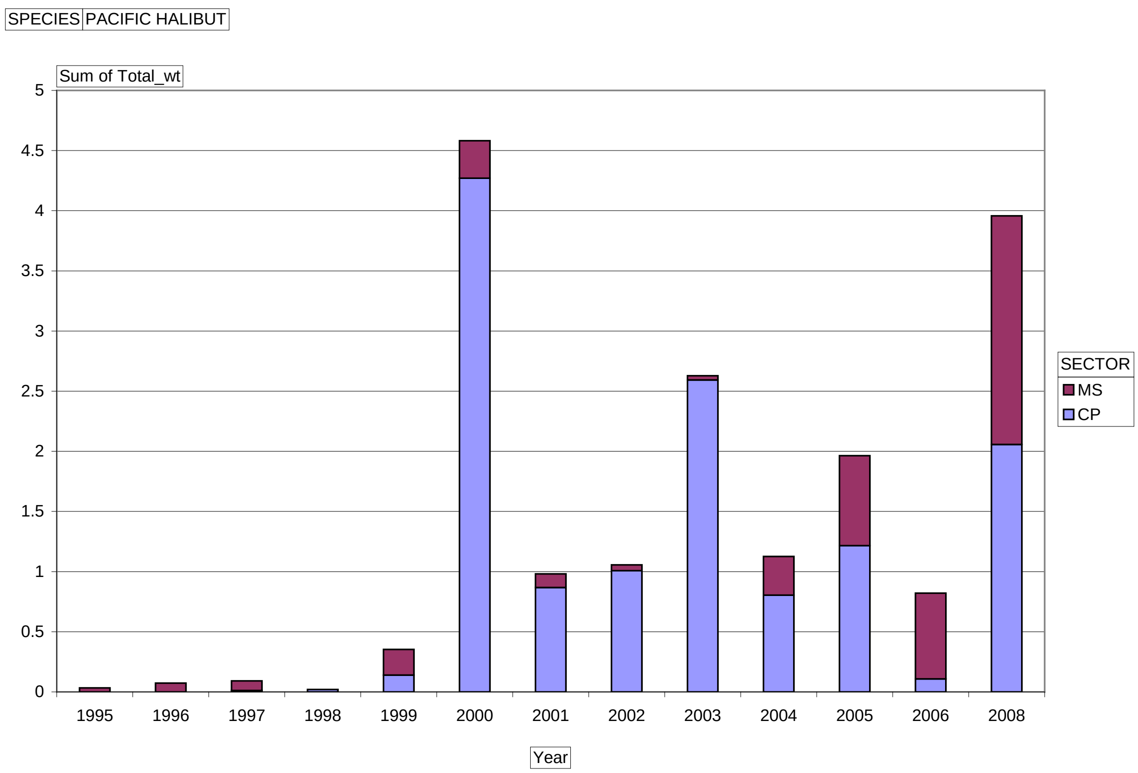

Figure 3-2. Annual bycatch (mt) of Pacific halibut by the at-sea whiting sectors, 1995-2008.

CHAPTER 4 IMPACTS ON THE AFFECTED ENVIRONMENT

4.1 Issue: Halibut Bycatch Mortality Allocations

Through 2010, trawl halibut bycatch was managed though a process under which an expected trawl bycatch was estimated and deducted from the Pacific halibut TCEY. There were no management measures designed to specifically limit the amount of trawl fishery bycatch mortality. For 2011, bycatch control measures in the form of individual bycatch quota were established as part of the Amendment 20 catch share program and a bycatch mortality limit was established through Amendment 21. However, the bycatch mortality limit specified by Amendment 21 was not implemented for 2011; a different limit was implemented through emergency action. The main action analyzed by this EA is the modification of the Pacific halibut bycatch mortality allocation formula that was developed under Amendment 21 but never implemented.

The quantitative portion of the analysis will largely rely on a hindcast of the Amendment 20 and 21 actions. The allocation implemented in lieu of the Amendment 21 allocation was implemented for this year (2011) and data on this year's fishery will not be available until after this action is complete. For these two reasons (that Amendment 21 limits were not implemented for 2011 and the unavailability of 2011 data) there is no information available to assess impacts of the fishery under status quo. The baseline used for the hindcast is 2004 through 2009, the six most recent years for which data is available[3]. The idea behind the hindcast method is to use conditions from past years to illustrate the range of conditions that might be encountered in the future and how each alternative would perform under such conditions.

The starting point for each year of the hindcast period will be the TCEYs and the amounts of quota allocated to each of the Pacific halibut retention fisheries. From there, we will examine the change in the amount of the trawl halibut bycatch mortality that would be expected given implementation of each of the alternatives. The amount of change will depend on the baseline assumptions regarding the

[3] This baseline includes both an unusually low year of trawl bycatch (2004) and an unusually high year (2005). Extending the range back to 2003 would have picked up a second unusually low year and starting the range in 2006 would have resulted in a comparable average without picking up the range of variability in fleet performance. There is only a 3% difference between the 2004-2009 average and the 2006-2009 average.

amount of trawl halibut bycatch mortality that would have been expected in each year. There are two assumptions that may be made regarding the trawl halibut bycatch mortality used for the baseline.

1. **Actual Preseason Estimates Based on Old Method:** The amount of trawl bycatch mortality that would have been expected is the preseason estimate used by the IPHC when the season was planned. In general, the amount of trawl bycatch mortality expected for a coming year was based on the most recent post season estimate available at the time the fishery was planned. For example, the post season estimate for the 2008 fishery provides the basis for planning the 2010 fishery.
2. **Hypothetical Preseason Estimates Based on New Method:** In the fall of 2010 a new estimation procedure resulted in revisions to the post season estimates going back through 2002 (Heery, et. al., 2010). For most years the estimates of legal and sublegal sized trawl caught halibut bycatch mortality resulting from this new method were higher than those based on the old method. As mentioned, the purpose of the hindcast is to use past fishery conditions to indicate the range of management situations that might be encountered under the alternatives as we move into the future. Since this new method would be used in the future and provides the best estimate of actual trawl bycatch and bycatch needs during the baseline period, it seems appropriate to use the new estimates in modeling a hindcast of the impacts of the proposed management measures.[4] However, use of the new method to develop hypothetical preseason estimates has its challenges. While IPHC based its preseason estimates on the most recent post season estimate available, in some cases the IPHC found it appropriate make modifications. It is impossible to determine how the IPHC might have modified the hypothetical preseason estimates based on the new estimates, which is why they have been termed here as “hypothetical.” Additionally, if the new bycatch information had been available this would have resulted in changes in the estimated stock biomass and amounts of TCEY made available.

Each of these methods for estimating the baseline trawl bycatch mortality has its merits and in some cases both may be used to further illustrate the range of possible outcomes.

The quantitative analysis will be based on a comparison of the following.

Hindcast Baseline – retention fishery quotas and 2004-2009 trawl Pacific halibut bycatch mortality levels. (For comparisons where complete data is available for the 2010 fishery, 2010 is included in the baseline).

No Action Alternative – Status quo, Amendment 21 trawl Pacific halibut bycatch mortality allocations, including application of expansion factor to convert from net to round weight.

Alternative 1 –Amendment 21 trawl Pacific halibut bycatch mortality allocation, with an additional expansion factor to convert from legals to legals+sublegal.

Alternative 2 – Set trawl Pacific halibut bycatch mortality allocations biennially and use same expansion factors as for Alternative 1.

Under each alternative, the hindcast assumes that the Amendment 20 catch share program would be in place to ensure that the trawl halibut bycatch mortality limits are not exceeded

[4] At the same time, it should be recognized that if the IPHC had the new estimates at the time it planned the fisheries used for the hindcast, it would have made different preseason estimates and likely would have established a different set of quotas.

There are some general impact mechanisms and impacts which form the basis of the analyses more fully developed in each subsection. These are as follows.

1. **Trade-Offs:** In general, the level of allocation of Pacific halibut bycatch mortality to the trawl fishery will not directly affect total Pacific halibut mortality since any reduction in trawl bycatch will likely result in increased quota in retention fisheries. However, on some occasions, particularly when the halibut TCEY is going through a rapid decline, the IPHC has provided for an adjustment period by allocating quota in excess of the TCEY (or in amounts that result in mortalities in excess of the TCEY when nonretention fishery discard mortality is taken into account). In such years, a reduction in the Pacific halibut needed to cover trawl mortality could go toward reducing the overall mortality and better achieving the TCEY rather than increasing the quota for retention fisheries. Assuming that quota and bycatch mortality limits are set to meet the TCEY the following are the general effects.
    - **Effect of a Trawl Bycatch Mortality Allocation In Excess of Trawl Bycatch Needs.** Any halibut allocated for trawl fishery bycatch in excess of the needs of the trawl fishery would likely represent foregone halibut opportunity for retention fisheries and total halibut mortality levels below the TCEY. The retention fishery fishing industry (including commercial harvesting, recreational charter, and processing businesses and workers), fishing communities, tribes, recreational fishers, and fish consumers would experience a reduction in benefits resulting from reduced Pacific halibut harvest. The habitat and ecosystem impacts of the retention fishery would be lower than if enough quota had been allocated to fully utilize the TCEY.
    - **Effect of a Trawl Bycatch Mortality Allocation Less than Trawl Bycatch Needs.** If the trawl fishery does not receive enough halibut to fully harvest the amount of groundfish harvest allowed by its allocations the fishing industry, fishing communities, and fish consumers would experience a reduction in benefits resulting from reduced groundish harvest; and impacts to habitat, the ecosystem, and the groundfish resource would be reduced below levels anticipated to result from the regulations analyzed and approved through the biennial specifications process.
2. **Effect on Management and Agency Resources.** The procedures established for setting the trawl allocation levels will have impacts on the management system's flexibility to respond to changing conditions and the amount of administrative effort required to make changes in the future.

4.1.1 Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem

The direct and indirect impacts of the trawl fishery to groundfish essential fish habitat (EFH) and the California current ecosystem are analyzed as part of the biennial specifications process, usually in an EIS (PFMC, 2010). The set aside to cover trawl halibut bycatch mortality will not affect the total amount of trawl activity (and hence physical impacts), except to the extent that bycatch mortality limits are not sufficient to accommodate full harvest of the amount of groundfish allocated to the trawl fishery, in which case trawl activity and impacts may be reduced below levels anticipated in the biennial specifications process.

Under normal circumstances, a reduction in the halibut set aside for the trawl fishery would likely increase the amount of quota available for tribal, sport, and non-trawl commercial halibut retention fisheries, increasing the impacts of those fisheries. The proportions by which the retention fishery activity might increase are described in the section on impacts to the fishery. An increase in activity in retention fisheries might not occur if the additional quota is instead used to better achieve conservation goals, as described in the first assumption/premise listed in Section 4.1.

The proposed action to modify the amount of Pacific halibut set aside as bycatch mortality for the trawl fishery, as well as the No Action Alternative to maintain the existing bycatch mortality set aside for the trawl fishery, do not alter the management measures by which each sector is kept within its allowable harvests. Such direct and indirect impacts are the concern of the groundfish biennial specification process and the Pacific halibut catch sharing plan, and are analyzed in separate environmental analyses that are part of those processes.

4.1.2 Direct and Indirect Impacts to the Biological Environment

Pacific Halibut

The total mortality of Pacific halibut is not expected to be directly altered by any of the action alternatives. The main effect of the alternatives is to change the amount of trawl sector halibut mortality and hence the amount left over for harvest by other sectors. The allocations for other sectors may be increased as a result of the reduction in trawl sector bycatch mortality. However, because in some recent years the IPHC has set quota levels in excess of the TCEY (Figure 4-1), it is possible that rather than increasing the harvest of other sectors, in some years the reduction in the trawl sector bycatch mortality might be used to more closely achieve the TCEY.

Groundfish, Including Overfished Species

The amount of halibut allocated to the trawl sector under the action alternatives will not increase the total mortality of groundfish to levels above those anticipated and analyzed in the impact assessments produced during the biennial specifications process. Total mortality expected mortality and amount of catch allocated to the trawl sector is determined through that biennial process. Catch accounting and 100% observer coverage in the trawl fishery assure adequate control over total mortality. A shortage of IBQ-pounds for Pacific halibut could constrain trawl harvest and prevent the sector from attaining the allocations anticipated during the biennial specifications process.

ESA Listed Salmon

No change in impacts expected. This section to be elaborated.

Other Protected Species.

No change in impacts expected. This section to be elaborated.

Other Fish Resources

No change in impacts expected. This section to be elaborated.

4.1.3 Direct and Indirect Impacts to the Socioeconomic Environment

4.1.3.1 Fishery Impacts

Approach to Analysis

Since the actions contemplated in this EA concern allocation of a set-aside to cover groundfish trawl bycatch mortality of halibut, without directly altering the total halibut mortality, the anticipated effects are largely socioeconomic. The resulting modifications of the amounts set aside to cover trawl bycatch mortality will affect the amount of halibut available for halibut retention fisheries and therefore the total tribal harvest, commercial revenue, recreational trips and associated community impacts from those fisheries. Each retention fishery will be affected differently depending on how the available halibut is split among the retention fisheries and on the management measures used to keep each sector within its allocation. These allocations and the management measures are developed annually by the Council through the catch sharing plan and recommended to the IPHC for adoption. The impacts of those specific decisions are considered through that process. Rather than speculating on the various mixes of allocations among retention fisheries, management measures, and impacts that might result, the quantitative portion of this analysis provides a baseline for the various sectors and focuses on the proportional changes in opportunities expected under each alternative. The ability to project impacts for the groundfish trawl fishery is limited by the shift of this fishery to a catch share program in 2011. The catch share program is expected to have a major impact on how this fishery is prosecuted. Key to understanding the impacts on the trawl fishery will be the halibut bycatch encounter and mortality rates. At this time, there is a great deal of uncertainty about what these rates will be under catch share management. This uncertainty will limit the quantification of the economic impacts on the groundfish trawl fishery.

Impact on the Groundfish Trawl Fishery

Since Pacific halibut bycatch retention by the trawl fishery is not allowed the halibut allocation will not directly affect total revenue. The primary issue for the trawl fishery is whether the amount set aside is sufficient to allow the sector to access its target catch and if not, the amount by which the target catch might be reduced through a halibut bycatch constraint.

There are two ways to display the trawl bycatch set asides for the purpose of assessing its impacts. One way is to show the allocations in terms of the legal sized halibut, net weight. Displays of the allocations in these units are useful first because they are the units in which most of the alternatives are denominated (e.g. upper limits of Alternatives 1 and 2 are specified in terms of legal sized net pounds); and second, because the retention fishery quotas (and consequently the changes in those quotas that might be affected by changes in the trawl allocations) are in terms of legal sized net pounds. On the other hand, the trawl sector is held accountable for the amount of halibut mortality it causes in round weight of both legal and sublegal fish. In terms of understanding the amount of quota available to the trawl fishery and the meaning of the constraints, display of the impacts on the trawl halibut in terms of legal+sublegal round weight is most useful.

One indication of the potential constraint that the Pacifica halibut allocation alternatives may impose on the groundfish trawl fishery is the amount available to cover the fishery's round weight of legal and sublegal sized halibut bycatch in comparison to the best estimate of the trawl induced actual mortality each year. On average the No Action Alternative would have been expected to reduce trawl induced mortality by 66% compared to actual observed mortality (Table 4-1). The individual accountability provided under the trawl program is expected to provide fishermen with a number of incentives and opportunities to reduce their bycatch mortality. Total bycatch may be reduced through gear modifications, changing areas of catch, and reducing tow length to allow vessels to detect whether or not they are in a high encounter rate area. Shorter tow lengths may also reduce mortality rates because the halibut are likely to be in better condition when discarded. Further fishermen will have opportunity to reduce mortality rates through more careful and rapid discard of halibut taken as bycatch. Through all of these means and others it may be possible to achieve a substantial reduction in the total halibut mortality associated with targeted trawl catch. However, if the trawlers are not able to reduce their bycatch mortality rates to the degree required, the amount of halibut IBQ-pounds available to the fishery will not be sufficient, and directed groundfish catch will be forgone resulting in a reduction in the total trawl exvessel revenue and the attendant revenues and benefits for crew members, shoreside processors, communities, and the fish consuming public.

Table 4-1 Halibut allocations under the alternatives in comparison to best estimates of bycatch mortality for each year.

Year	Postseason Bottom Trawl Halibut Bycatch Mortality Estimate ŧ Legal and Sublegal Sized (O32 + U32) (Round Wt)	Pounds Allocated to Cover Groundfish Trawl Bycatch Mortality Of Legal (O32) and Sublegal (U32) Sized Pacific Halibut (Round Wt) ŧŧ			Percent Change from Post Season Estimate		
		No Action Alternative (130,000 lb upper bound on O32 + U32 net wt)	Alternative 1 (130,000 lb upper bound on O32 net wet)	Alternative 1 (100,000 lb upper bound on O32 allocated net wt)	No Action Alternative	Alternative 1 (130,000 lb upper bound)	Alternative 1 (100,000 lb upper bound)
2004	293,214	173,333	279,570	215,054	-41%	-5%	-27%
2005	632,726	173,333	279,570	215,054	-73%	-56%	-66%
2006	533,518	173,333	279,570	215,054	-68%	-48%	-60%
2007	460,766	173,333	279,570	215,054	-62%	-39%	-53%
2008	458,561	173,333	279,570	215,054	-62%	-39%	-53%
2009	553,360	128,000	206,452	206,452	-77%	-63%	-63%
2010	n/a	164,000	264,516	215,054			
2004-2009 Avg	488,691	165,778	267,384	213,620	-66%	-45%	-56%

Notes: Since no trawl caught fish are "legal" the IPHC preferred terminology is over 32" (O32) for legal sized halibut and under 32" (U32) for sublegal sized halibut. To assist in the transition to this new terminology, the expressions are maintained side-by-side in this table.

ŧ Heery et. al. 2010 (Table 5).

ŧŧ No Action Alternative: allocation expanded from net to round weight. Alternative 1: allocation expanded from net to round weight and from O32 to O32+U32.

Alternative 1 provides 15% of the legal sized halibut TCEY to the groundfish trawl fishery, capped at 130,000 pounds for 2012 through 2014 and at 100,000 pounds starting in 2015. If Alternative 1 with the 130,000 pound cap is applied over the 2004-2009 time period, the reduction compared to actual mortalities would have been 45%. If Alternative 1 with the 130,000 pound cap is applied over the 2004-2009 time period, the reduction compared to actual mortalities would have been 56%. Because the Alternative 1 limits are greater than under the No Action Alternative, relative to the No Action Alternative there would be a lower risk that socio-economic benefits might be forgone because of the amount of halibut was insufficient to allow complete access to the trawl sectors groundfish allocation.

Under Alternative 2, every two years the Council would determine the amount of trawl halibut allocation for the coming two years. In Alternative 2, there are suboptions on the amount the trawl fishery would be allocated: Alternative 2a: 100,000 pounds and Alternative 2b, 130,000 pounds. Because the amounts under Alternative 2 are subject to biennial determinations, no estimates can be provided for the amounts the Council would allocate. These amounts would be determined and impacts analyzed during the groundfish biennial specifications process. In general, Alternative 2a might be expected to perform similarly to when Alternative 1 is operating on the 100,000 pound cap (2105 and beyond) and Alternative 2b might be expected to perform similarly to when Alternative 1 is operating on the 130,000 pound cap (2012-2014).

Some indication of the potential impacts of the Pacific halibut allocation on the shoreside trawl fishery target species retention may be derived through an examination of trawl fishery bycatch rates. These rates can be used to indicated the amount of target species forgone per pound of halibut, assuming that halibut constrains target harvest. The rates provided in Table **4-2** are for those species for which halibut bycatch rates are the highest (arrowtooth and Petrale sole). The rates are in terms of all halibut caught by the fleet in proportion to all arrowtooth and Petrale caught be the fleet for the areas and depths indicated. To the degree that halibut is taken as bycatch while targeting other groundfish species for which the bycatch rate of halibut is lower, and to the degree that halibut bycatch mortality rates can be reduced, the amount of target species (revenue and other benefits) forgone per pound of halibut will increase.

Table 4-2. Pacific halibut bycatch rates used for initial allocation (rates per pound of arrowtooth and Petrale sole, 2003 through 2006). (WORK UNDERWAY WITH THE NWFSC TO DEVELOP SOME OTHER RATES FOR CONSIDERATION IN THIS ANALYSIS.)

	Bycatch Rate (Lbs Halibut/Lb Target)		Target Catch Rate (Lbs Target/Lb Halibut)	
	Shoreward of RCA	Seaward of RCA	Shoreward of RCA	Seaward of RCA
South of 47° 30′ N. lat	0.23	0.08	4.43	11.87
40° 10′ N. lat. To 47° 20′ N. lat	0.09	0.03	11.59	29.51

Note: Lower bycatch rates (fishing for target species for which the bycatch rate is lower or otherwise reducing bycatch mortality rates) imply larger amounts of target species retained per pound of halibut and the attendant higher revenues and other impacts.

With respect to opportunities for the at-sea whiting trawl fishery and the groundfish trawl fishery south of 40° N. latitude, there is no difference between the alternatives. For all alternatives, including the No Action Alternative, 10 mt of legal and sublegal sized round weight halibut are allocated to cover bycatch.

Impact on Retention Fisheries

For the retention fisheries, of interest is the impact of the alternatives on the amounts of legal sized halibut available, net weight. For that reason, tables and figures in this section portray the allocations and effects in those units. Table **4-3** provides TCEYs, retention fishery allocations, and trawl bycatch estimates and allocations in terms of the pounds of legal sized halibut represented by each.

Table 4-3. Pacific halibut TCEYs, retention fishery quotas, actual preseason estimates, and trawl bycach mortality allocations under each alternative for a 2004-2010 hindcast (all values are pounds of legal sized halibut (O32) net weight; allocations under the alternatives have not been expanded.).

Year	TCEY	Sum of Retention Fishery Quotas	Trawl Bycach Mortality Actual Preseason Estimates (Based on Old Method)*	No Action Alternative (130,000 lb upper bound on O32 + U32 net wt)***	Alternative 1 (130,000 lb upper bound on O32 net wet)	Alternative 1 (100,000 lb upper bound on O32 net wt)
	Legal sized(O32) halibut (pounds net wt)					
2004	2,100,000	1,480,000	344,690	77,623	130,000	100,000
2005	1,560,000	1,330,001	367,000	79,677	130,000	100,000
2006	1,710,000	1,380,000	172,000	86,015	130,000	100,000
2007	1,580,000	1,340,000	228,000	67,944	130,000	100,000
2008	940,000	1,220,000	252,000	70,909	130,000	100,000
2009	640,000	950,000	128,000	53,742	96,000	96,000
2010	820,000	810,000	183,000	73,918	123,000	100,000

*The 2004 preseason estimate of the legal sized trawl halibut bycatch mortality was derived by applying the average 2005-2009 legal to legal+sublegal ratio to the preseason estimate of legal+sublegal trawl halibut bycatch mortality. All other preseason estimates in this column were provided directly by IPHC.

**Since no trawl caught fish are "legal" the IPHC preferred terminology is over 32" (O32) for legal sized halibut and under 32" (U32) for sublegal sized halibut. To assist in the transition to this new terminology, the expressions are maintained side-by-side in this table.

*** Pounds of legal sized fish derived using legal to legal+sublegal ratios from the new halibut bycatch mortality estimation method (lagged two years to account for the information that would have been available during each year's planning process had the new methodology been in place).

As discussed, the halibut bycatch mortality set aside for the trawl fishery affects the amount of the TCEY left for allocation among the retention fisheries. In (Table **4-4**), the potential reduction in the amounts set aside for the trawl fishery are displayed as a percent of the total quotas for all retention fishery over the course of a 2004-2010 base period, i.e. the proportion by which retention fishery quotas might be increased given the reduction in trawl bycatch mortality that might be imposed under each alternative. The degree of change in opportunity depends on what would have been assumed about the expected trawl bycatch mortality in the absence of a limit, which in turn depends on the model used for estimation of bycatch (the "old method" or "new method" as described earlier), and how the IPHC would have used the estimates. For the purposes of this hindcast approach, the actual quotas for each year and hypothetical preseason set asides of trawl allocation are based on the new bycatch estimates. Assuming that all of the additional legal sized halibut made available through reductions in the trawl bycatch mortality levels are used to increase the quota for the directed fisheries, the increases would have averaged 11.7% under the No Action Alternative, 7.4% under Alternative 1 with a 130,000 pound cap, and 8.4% under Alternative 1 with a 100,000 pound cap. *Note: still under discussion for the next draft of this EA is whether the best baseline to use would be the actual preseason estimates available when the IPHC planned its fishery or hypothetical estimates based on the new bycatch mortality estimation methodology.* ***Figure 4-1*** *shows graphically the actual preseason bycatch estimates use by the IPHC.*

Table 4-4. Proportions by which retention fishery quotas might increase with a decrease in the amount of halibut set aside for the trawl bycatch mortality (based on hypothetical preseason estimates that might have been used based on the new bycatch estimation methodology).

	Legal Sized Halibut (pounds (O32) net weight)			Potential Change in Total Halibut Quota Available for Retention Fishery in Moving from Baseline to Trawl Bycatch Allocation Alternative (as a percent of retention fishery quotas)		
	TCEY	Sum of Retention Fishery Quotas	Trawl Baseline (New Hypothetical Preseason Estimates Trawl Bycatch Mortality)*	No Action Alternative (Status Quo)	Alternative 1 130,000 lb upper bound	Alternative 1 100,000 lb upper bound
2004	2,100,000	1,480,000	340,614	17.8%	14.2%	16.3%
2005	1,560,000	1,330,001	125,663	3.5%	-0.3%	1.9%
2006	1,710,000	1,380,000	145,505	4.3%	1.1%	3.3%
2007	1,580,000	1,340,000	248,020	13.4%	8.8%	11.0%
2008	940,000	1,220,000	218,257	12.1%	7.2%	9.7%
2009	640,000	950,000	193,455	14.7%	10.3%	10.3%
2010	820,000	810,000	206,683	16.4%	10.3%	6.0%
'04-'10 average				11.7%	7.4%	8.4%

Note: Hypothetical preseason estimates derived from the most recent post season trawl bycatch mortality estimate that would have been available at the time the fishery was planned if the new estimation method was in place. For example, planning for the 2010 fishery occurred in 2009 at which time the most recent post season estimate available was for 2008.

While these tables indicate the amounts of halibut the alternatives might have freed up for the halibut retention fisheries, actual amounts may have varied for a variety of reasons. One of these is that the new bycatch estimation methodologies may have affected the TCEY. Another is that for some years, due to changing circumstances, the IPHC found it appropriate to set quotas in excess of the TCEY. To illustrate, Figure 4-1 shows that with the declining TCEY, starting in 2008 the IPHC allocated more quota to directed fisheries than was available under the TCEY. Under these conditions, it may be that savings from reduced halibut mortality might have gone to stock conservation rather than increases in quota for the directed fishery.

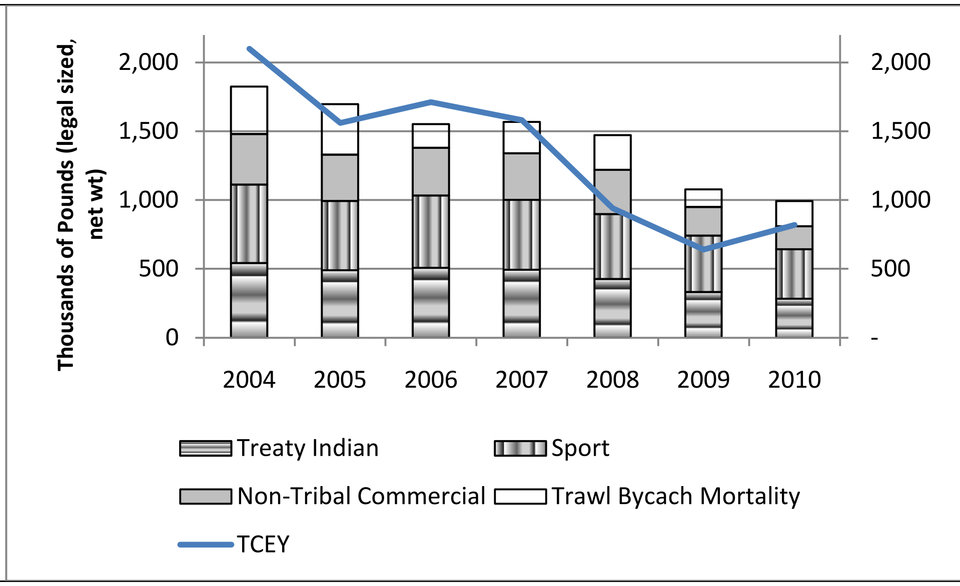

Figure 4-1. Halibut TCEYs, halibut quotas for retention fisheries, and actual preseason projections of trawl bycatch mortality, 2004 through 2010.

Additional figures provide a visual sense of the additional fishing or conservation opportunity that might have been provided under the No Action Alternative (Figure 4-2), Alternative 1 with a 130,000 pound upper limits (Figure 4-3), and Alternative 1 with a 100,000 pound upper bound (Figure 4-4). Alternative 2a also has a 100,000 pound upper bound, and Alternative 2b a 130,000 pound upper bound but the actual allocation levels are indeterminate because there is no default allocation formula (allocation would be determined entirely through the biennial specifications process).

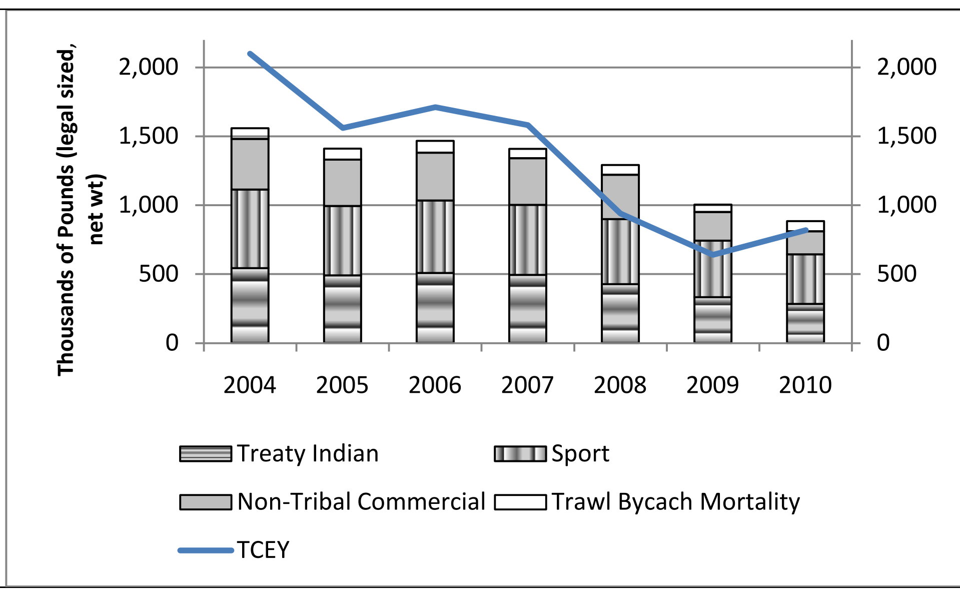

Figure 4-2. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the No Action Alternative, 2004 through 2010.

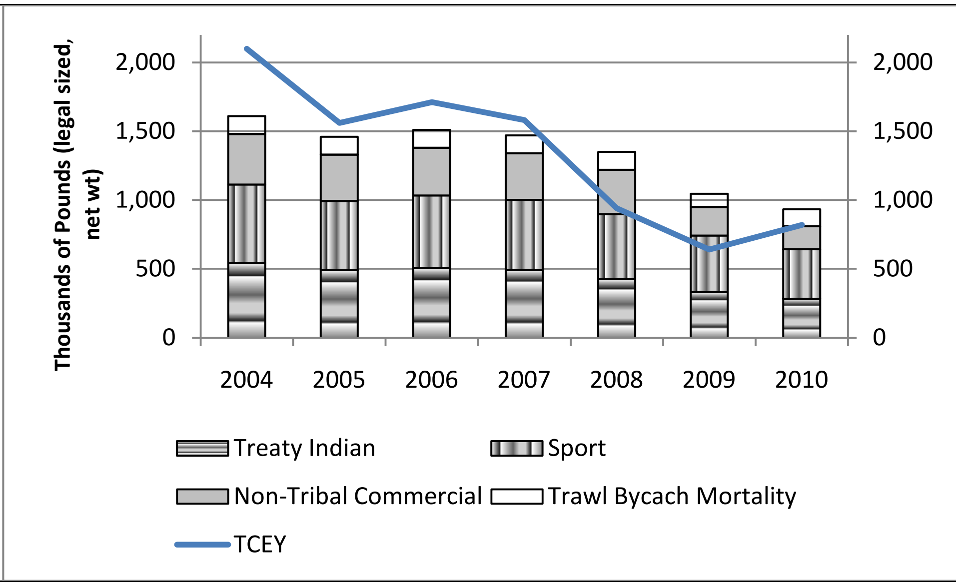

Figure 4-3. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the Alternative 1 with a 130,000 pound upper limit, 2004 through 2010.

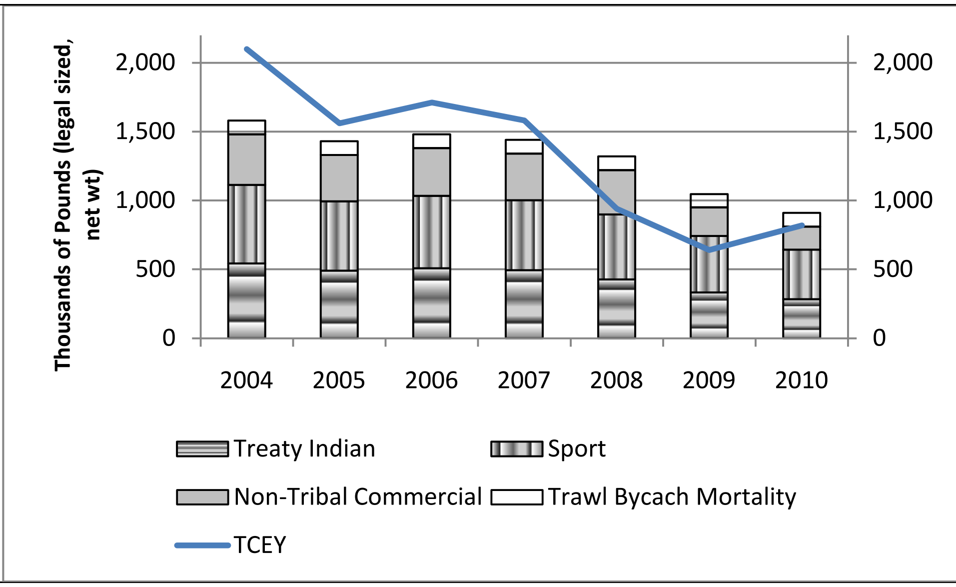

Figure 4-4. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the Alternative 1 with a 100,000 pound upper limit, 2004 through 2010.

Impact on Both Trawl Bycatch and Retention Fisheries

The Council's November 2010 motion language indicated that under Alternative 2, the trawl bycatch mortality allocations would be specified as "a specific amount . . . rather than a percentage…." If this language is followed strictly, the absence of flexibility to use a ratio could result in some potential negative effects for all the fisheries (bycatch and retention). Under Alternative 2, the Council would be setting allocations before the TCEY is available for the first year of the upcoming biennial period and over a year before more certain information on the TCEY for the second year is available. For example, in the spring of 2010 the Council would have been setting the trawl bycatch set aside amount for the 2011 and 2012 fisheries. To the extent that stock assessment documents accurately forecast the TCEYs for future years this might not be a problem. However, if those forecasts are not always accurate a problem could occur if the fishery, without sufficient advance warning, ran into a series of TCEYs such as occurred from 2007 to 2009, when the TCEY dropped by nearly 50%. If the trawl bycatch amounts had been set based on 2007 levels, the directed fisheries might have been more constrained than would otherwise have been desirable. The effect could also run in the opposite direction, with an unexpected increase resulting in a situation where the trawl fishery is more constrained than necessary. Under Alternative 2, this potentiality might be handled during the biennial process if rather than a specific amount the allocations can be set using a percent or a schedule, tied to the TCEY, for determining the amount of trawl halibut bycatch mortality for the second year of the biennial period.

4.1.3.2 **Impacts on Communities**

The decision on halibut bycatch set asides is more likely to affect communities along the northern coast where halibut bycatch rates are higher and communities which are involved in the directed halibut fisheries. On the one hand, inadequate amount of halibut IBQ for the trawl fishery could lead to a shift of substantial portions of the groundfish trawl fishery landings into more southern areas were bycatch rates are lower, assuming there are not also constraining species in those areas. On the other hand, to the degree that bycatch amounts set aside for the trawl fishery are minimized (without constraining trawl groundfish harvest), there will be more halibut available for retention fisheries, which also benefit coastal communities. The communities involved with halibut retention fisheries also tend to be more northerly distributed.

4.1.3.3 **Impacts on Agencies and Public Decision Processes**

Each of the alternative provides for making adjustments to the trawl bycatch set asides in a somewhat different manner. Under the No Action Alternative the limit and the adjustment opportunities are stated as follows.

> The trawl mortality limit for legal and sublegal Pacific halibut be set at 15% 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 [2015]. This total bycatch limit may be adjusted downward or upward through the biennial specifications and management measures process

For this analysis, the interpretation of this provision for the no action alternative is that the 15% value can be modified or the 130,000 pound (100,000 pound) value can be modified. This interpretation is based on the fact that the "limit" is derived as the combined effect of applying both of these parameters and that what is subject to modification, as described in the second sentence, is the limit. Further, when the Council discussed this issue at its June 2009 Council meeting, there was considerable concern that the limit would not be sufficient to meet the needs of the trawl fishery and that an opportunity should be provided to move that limit up or down (as compared to the initial proposal that the limit just be downwardly modifiable). As indicated by the hindcast analysis provided in Table 2-1, for most years modifying the 15% would not result in an upward increase in the amount of halibut available to the trawl sector (due to the effect of the upper bound constraint). The upper bound would have had to have been modified to effect a change.

Under Alternative 1, the Council motion with respect to adjustment of the trawl allocations through the biennial management process has been interpreted as follows.

> The bycatch allocation ratio percent can be adjusted downward or upward (above or below 15%) through the biennial specifications and management measures process but the upper bound on the maximum allocations can only be changed though an FMP amendment.

This language makes explicit the intent behind the motion that only the percent applied to the TCEY could be modifiable through the biennial specifications process but that the value used as the upper pounds could not.

Under Alternative 2, there would be a biennial determination of the amount of Pacific halibut provided to the trawl fishery and that amount would be capped (an upper bound of 100,000 pounds or 130,000 pounds for Alternatives 2a and 2b respectively). There would not be a default allocation rate (e.g. 15% up to an upper limit). Therefore, the Council would have to make an allocation decision during each biennial management process. In order for the upper bound to be a constraint on the biennial process, it cannot be adjusted through that process. Therefore, for this alternative it has been assumed that the upper bounds could be adjusted only through the FMP amendment process.

Setting the issue of the level of the upper bound aside, for any particular biennial process the same allocational result could be achieved under either Alternative 1 or 2. The only difference is that under Alternative 2 the Council would have to deliberate over the trawl halibut bycatch amount during every biennial process and under Alternative 1, while the Council would have the option to deliberate the issue during every process a default allocation formula would be in place (15%). Thus Alternative 1 and 2 have similar flexibility with respect to outcome but Alternative 1 has more flexibility with respect to process (the option to go with the default allocation and not take up the trawl halibut allocation during a particular biennial process). While the allocation formula under the no Action Alternative differs from those of Alternatives 1 and 2, the No Action Alternative has greater flexibility than under Alternative 1 or 2 because it also includes the opportunity modify the upper bounds through the biennial process (as well as the opportunity to modify the percentage or go with the default allocation). A comparison of the flexibility differences among the alternatives is provided in Table **4-5**

Table 4-5. Summary of the flexibility provided under each Alternative during the biennial specifications process.

	No Action Alternative	Alternative 1	Alternative 2
During the biennial specifications process			
Would there be a default allocation?	Yes	Yes	No
Could the percent of TCEY used to calculate the trawl bycatch mortality allocation be modified?	Yes	Yes	Not Applicable
Could the upper bound of the allocation be modified?	Yes	No	No

Note: a more flexible approach to Alternative 2 is described below.

In terms of impact on agency resources, including those of the Council, the flexibility provided by the No Action Alternative (combined with the presence of a default allocation formula) would be the least burdensome. On the surface, Alternative 2 could be the most burdensome, requiring Council deliberation on the trawl bycatch mortality allocations during every biennial management process and requiring a plan amendment to modify the upper bounds of the allocation. However, if under Alternative 2 it is specified that a percent could be adopted rather than a specific amount, the Council would have the flexibility to select an amount or establish a default allocation formula that would run for several management cycles (or be a default formula, in place until changed). The advantage of this approach to Alternative 2 would be that by the spring of 2012 there will be substantially more information available indicating the amount of halibut mortality that may be required to reasonably prosecute the trawl fishery. At that time it might be easier for the Council to set a default allocation through the biennial specifications process or it could continue to set an allocation every two years if it so desired.[5] However, **if the Alternative 2 is selected, it will need to be augmented with an explicit allocation decision for the 2012 fishery, since the fishery will occur before the Council the next biennial management process.**

During the Council discussions about increasing the amount of halibut set aside for trawl bycatch mortality, concern was expressed that such an action would have far reaching effects on halibut retention fisheries, to which halibut are allocated through the catch sharing plan. It was held by some that a change to the allocation would require a substantial analysis as well as the explicit inclusion in the process of Council advisors representing all affected groups. The degree to which such an extensive analysis and involvement is required during the biennial specifications process might be contingent on the degree to which the proposed allocations vary from the range considered in the alternatives. For example, Alternatives 1 and 2 might be considered to provide a framework under which, during the biennial specifications process, any allocation level might be selected with minimal additional analysis and advisory body involvement, as long as the allocation was below the upper bounds (100,000 pounds or 130,000 pounds). An allocation above the upper bound would require an FMP amendment and the level of rigor required for the modification process would likely increase. Under the No Action Alternative the upper bound may be increased through the biennial process. The level of analysis and advisory body involvement required for such a modification during the biennial process is left open. If modification of the upper bound had also been frameworked and analyzed (e.g. the allocation is 15% not to exceed 100,000 pounds, modifiable through the biennial specifications process but in no case to exceed 200,000 pounds without an FMP amendment) then there might be less uncertainty about the rigor of analysis and process required for such a modification.

[5] See end of Section 4.1.3.1 (Fishery Impacts) for a discussion of the potential challenges in setting a bycatch mortality level for the second year of a biennial management period if such a level cannot be set using a percentage.

Agenda Item H.5.a
Attachment 4
March 2011

TRAWL CATCH SHARES AND INTERSECTOR ALLOCATION AMENDMENTS

ISSUE: SEVERABILITY OF WHITING MOTHERSHIP CATCHER VESSEL ENDORSEMENTS/CATCH HISTORY

1st Draft of Environmental Assessment

PREPARED BY
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FEBRUARY 2011

Table of Contents

List of Tables

List of Figures

CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

This document provides background information about, and analyses for, a provision that would allow the mothership catcher vessel (MS/CV) endorsement and/or associated catch history to be separated from the limited entry permit to which it was issued and transferred to a different limited entry trawl permit. 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.

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

1.2.1 Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

The proposed action is to amend the regulations implementing the groundfish FMP to change provisions related to the transferability of MS/CV endorsements and/or catch history.

1.3 Purpose and Need for the Proposed Action

1.3.1 Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

Under Amendment 20 trawl rationalization (the catch shares program), MS/CV endorsements were issued for limited entry trawl permits that met required minimums for participation in the mothership sector of the whiting fishery. These endorsements included a catch history assignment based on the catch history of the individual permits during the allocation period. There are some permits that during the allocation period participated primarily in the shoreside fishery but had some relatively minor amounts of MS/CV catch history. These permits received MS/CV endorsements with some very small allocations of whiting catch history. In order to use the catch history associated with an MS/CV endorsement, the endorsed permit must join a co-op. Once a permit has joined the co-op the annual allocation associated with that permit's catch history is assigned to the co-op and any vessel in or fishing for the co-op, may harvest it. For any permit that does not join the co-op, the annual allocation associated with that permit's catch history is assigned to the non-co-op fishery. In the non-co-op fishery, any vessel with an MS/CV endorsement which has not joined the co-op competes with other such vessels to harvest the non-co-op fishery allocation. If a number of vessels fishing for different motherships participate, the non-co-op fishery could likely encounter many of the problems associated with the traditional derby style fisheries. However, under the trawl rationalization program it is believed that not many (if any) vessels will choose to participate in the non-co-op fishery.

For the small amounts of mothership whiting catch history that some permits received, the burden (transaction costs) of joining a co-op may not be worth the benefits from that permit's allocation. Maintaining membership in the co-op and conducting the annual transfers would entail annual transaction costs for both the co-op and the permits receiving the small allocation. Alternatively, these permit holders could sell their permits to mothership whiting fishery participants; however, they might not want to because they need the permits for use in the shoreside fishery.

Given this situation, there are a number of concerns.

1. If permit holders with very small amounts of quota join co-ops each year, there will be transaction costs that may largely offset the benefits of the small allocation, reducing the overall efficiency and benefits from the trawl rationalization program.
2. If permits with very small amounts do not join a co-op, their allocations will automatically go to the non-co-op fishery where
    a. it may go unharvested, if all other MS/CV endorsed permits have joined co-ops and the owners of the permits with small allocations do not have interest in gearing up for the mothership whiting fishery;
    b. it may contribute toward an incentive for MS/CV endorsed permits to enter the non-co-op fishery instead of joining a co-op, decreasing the effectiveness of the trawl rationalization program.

In addressing these concerns, the purpose of this action is to reduce transaction costs, increase the probability that the fishery and communities are able to fully benefit from the allowable levels of whiting harvest, and reduce the chances that incentives will develop for vessels to enter into a non-co-op derby style fishery.

CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

2.1.1.1 Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

No Action Alternative -- Status quo. *The language on severability contained in Appendix E to the groundfish FMP (reflecting the regulatory language) would remain unchanged.*

> Appendix E, Section B-2.1.1.b: The [MS/CV] whiting endorsement (together with the associated catch history) ***may not be*** severed from the groundfish LE trawl permit. Catch history associated with the whiting endorsement may not be subdivided.

Alternative 1 –MS/CV Endorsement Severability. *Modify the regulations to achieve the following.*

a. The MS/CV whiting endorsement (together with the associated catch history) ***may be*** severed from the groundfish LE trawl permit (the endorsement and catch history stay together).
b. Catch history associated with the whiting endorsement may not be subdivided.
c. The severed endorsement and catch history may be transferred together to any limited entry trawl permit (if the permit to which the MS/CV endorsement is transferred already has an MS/CV endorsement, multiple MS/CV endorsements would be stacked on the single permit).
d. The endorsement and catch history would be maintained separately on the limited entry permit (i.e., stacked, but not merged or combined with any other endorsement or catch history on the permit). Such endorsements could later be transferred away from the permit.

Alternative 1was developed by the Council at its November 2010 meeting. An alternative considered but not developed would have allowed the catch history to be transferred separate from the MS/CV endorsement. A trawl permit with an MS/CV endorsement alone, but without catch history, would confer little relative to a trawl permit that does not have an MS/CV endorsement. Vessels with MS/CV endorsed permits and those without MS/CV endorsed permits are allowed to fish for co-ops. A permit without an MS/CV endorsement permit is not allowed to formally join the co-op, while a permit with an MS/CV endorsement permit is. However, co-op membership of an MS/CV endorsed permit without any catch history would not provide an advantage to the co-op, except possibly by helping the co-op meet the minimum requirement for number members (B-2.2.3.b “A minimum of 20 percent of the CV(MS) permit holders are required to form a co-op”).

CHAPTER 3 AFFECTED ENVIRONMENT

CHAPTER 4 IMPACTS ON THE AFFECTED ENVIRONMENT

4.1 Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

Modification of the trawl rationalization program to allow the severance of MS/CV endorsements from limited entry trawl permits will not substantially impact the physical or biological environment. Its primary effects will be to on the distribution of benefits from the trawl rationalization program and socio-economic performance of the program.

4.1.1 Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem, and Biological Environment

Under the alternative to status quo, potential impacts on the physical and biological would likely be minor. The means by which harvest is taken (trawl gear) would not be changed but there could be a minor effect on the level of harvest. In a separate process, regulations for the level of harvest in the whiting fishery are developed based on the assumption that all authorized harvest will be fully taken. As identified in the purpose and need statement (Section 1.3.1), under status quo permits with small amounts of catch history might not join co-ops, in which case their allocations will go to the non-co-op fishery. If no MS/CV endorsed vessels enter the non-co-op fishery, the allocations to the non-co-op fishery would go unharvested. Under the Alternative 1, it would become somewhat more likely that the authorized harvests would be fully taken.

4.1.2 Direct and Indirect Impacts to the Socioeconomic Environment

4.1.2.1 Fishery Impacts

Allowing MS/CV endorsement severability will introduce additional flexibility into the management system. This flexibility will apply not only to the permits with small catch history allocations (as discussed in the purpose and need section) but to all permits with MS/CV endorsements.

This increased flexibility would allow individuals to stack MS/CV endorsements onto limited entry trawl permits and release unneeded limited entry trawl permits for use in the shoreside trawl fishery (which is managed under an IFQ program). Under its IFQ program, the shoreside trawl fleet is expected to consolidate. With substantially fewer trawl vessels operating a surplus of permits is expected to result. The surplus of permits from trawl vessels may be transferred to nontrawl vessels. Any vessels with a trawl permit (including nontrawl vessels) may use nontrawl gear to fish under the IFQ program. This is the result of the gear switching opportunities provided by the program. Allowing the severance of MS/CV endorsements from their limited entry permits would contribute to the pool of permits available for use by non-trawl vessels in the shoreside fishery (or by shoreside trawl vessels).

While increased program flexibility and the opportunity to sell off unneeded permits could make a marginal contribution to the likelihood that MS/CV catch history will be aggregated, accumulation limits in place for the MS/CV co-op program will continue to restrict the degree of consolidation.

4.1.2.2 **Impacts on Communities**

To the degree the flexibility provided by Alternative 1 reduces the number of events in which whiting is allocated to the MS/CV non-co-op fishery only to go unharvested, there will be more whiting caught to the benefit of communities reliant on the mothership whiting fishery.

4.1.2.3 **Impacts on Agencies**

Allowing the transfer of MS/CV endorsements may require some adjustments to the data systems in place to track transfers under the catch share program. Additionally, the flexibility provided by MS/CV endorsement transferability separate from the permit could increase the number of transactions which need to be processed by the NMSF Limited Entry Office, particularly when the regulations are first changed. Overtime, as endorsements are stacked the number of MS/CV endorsement holders would be expected to decline, potentially reducing paperwork, depending on the amount of transferring of stacked endorsements among permits.

Agenda Item H.5
Supplemental Attachment 4 (2)
March 2011

ISSUE: SEVERABILITY OF WHITING MOTHERSHIP CATCHER VESSEL ENDORSEMENTS/CATCH HISTORY

The following permit data were provided by the National Marine Fisheries Service Limited Entry Permit Office. The table shows for various amounts of initial catch history allocations (classes), the number of mothership catcher vessel (MS/CV) permits receiving that amount, the average percent allocated per permit, the total percent for all permits in the row, and the cumulative total for that class and all classes receiving smaller amounts. The final column (added by Council staff) provides an estimate of the poundage equivalent of the average permit for each class, assuming a 25,000 mt allocation of whiting to the mothership at-sea sector.

Table. Mothership catcher vessel endorsement and associated whiting catch history assignments

Class (by amount of total catch history)		Percent of Total History Allocated			Pounds Assuming a 25,000 mt Allocation
	Number of MS/CV Endorsed Permits	Average Per Permit	Total for Class	Cumulative Total	Average Per Permit
Permits with					
Under 0.5%	5	0.2	1.0	1.0	105,912
0.5 to 1.0 %	5	0.7	3.5	4.5	390,979
1.0% to 2.0%	7	1.5	10.2	14.7	804,678
2.0% to 3.0%	3	2.3	6.9	21.6	1,268,916
3.0% to 4.0%	6	3.4	20.5	42.1	1,883,568
4.0% to 5.0%	7	4.6	32.3	74.4	2,542,876
5% or greater	4	6.4	25.6	100.0	3,522,501
Total	37				

PFMC
02/28/11

Agenda Item H.5.a
Supplemental Council Staff PowerPoint
March 2011 Briefing Book

Trailing Amendment/Action Alternatives

Pacific Halibut Trawl Bycatch Mortality

MS/CV Endorsement/Catch History Severability

Pacific Halibut
Trawl Bycatch Mortality Allocation

- Primary objective for the A-21 allocation
  - Limit and reduce trawl bycatch mortality.
- Problem
  - The Amendment 21 allocation was excessively restrictive
  - There was no expansion from legals to legals+sublegals
- Primary response in the alternatives
  - Add an expansion to the allocation to go from legals to legals + sublegals

Central Elements of the Alternatives

- Status Quo – 15% of TCEY but not more than 130,000 lbs (net legals) (100,000 lbs in year 5).
  - Expand from net to round weight.
  - Allow adjustments to the limits during bi-spex.
- Alternative 1 – Add an expansion from legals to legals+sublegals.
  - The 15% but not the cap can be adjusted thru bi-spex
- Alternative 2 – Same as Alt 1 but set an amount (not %) during the bi-spex.
  - Amount capped at either 100,000 lbs or 130,000 lbs (net legals) – same expansions as Alt 1
  - Need to set 2012 allocation as part of PPA/FPA

MS/CV Endorsement Severability

- Problem: Some permits have relatively small allocations.
  - A permit does not need to harvest its own allocation the alternative is to join a co-op and let another co-op member harvest.
  - Transactions costs of joining co-ops may be significant relative to benefits.
  - If permits don't join, their allocation goes to non-co-op fishery
    - May go unused, or
    - Encourage participation in the non-co-op fishery

Alternatives

- Status quo – MS/CV endorsements may not be transferred separate from the permits.
- Alternative – MS/CV Endorsements (with catch history) can be severed from permit and transferred to other permits
  - Stacked on permits with or without other MS/CV endorsements
  - MS/CV endorsements/catch history may not be subdivided or combined with other endorsements.

THEODORE R. KULONGOSKI
Governor

December 30, 2010

The Honorable Gary Locke
Secretary of Commerce
U.S. Department of Commerce
1401 Constitution Ave., NW
Washington, DC 20230

Dear Secretary Locke:

I write in support of funding to help the Pacific Coast groundfish trawl fisheries transition to a catch share program.

As noted in the December 6th, 2010 letter from members of the Washington, Oregon and California congressional delegations, President Obama requested $12.6 million for FY 2011 for the West Coast. I consider this level of funding to be an important and wise investment to help fishermen through the transition. Specifically this funding should be directed to cover the key expenses of at-sea monitoring and to address the thoughtful development of community fishing associations so that coastal communities have an avenue to participate in this fishery and the ability to anchor opportunities for economic development in their areas.

While the currently approved program addresses only the trawl sector of the fishery, other important gear sectors, such as the fixed-gear fleet, remain vitally important to the overall success of the groundfish fishery. Looking ahead, a comprehensive well-funded catch share program that encompasses all gear sectors and integrates the needs of the broad range of fishermen is key to Oregon's coastal and other communities along the West Coast that are dependent upon this fishery.

Thank you for your leadership and attention to this matter. I am confident that with adequate funding, the Pacific Coast groundfish trawl fishery can be a model for how to effectively implement a catch share program.

Sincerely,

Theodore R Kulongoski

THEODORE R. KULONGOSKI
Governor

TRK:jk:sd

ENFORCEMENT CONSULTANTS REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS

The Enforcement Consultants (EC) have reviewed *Agenda Item H.5, Situation Summary, March 2011, Trawl Renationalization Trailing Actions and Allocation Amendments* and have the following comments. The EC strongly recommends the Pacific Fishery Management Council (Council) make the proposed National Marine Fisheries Service (NMFS) Program Improvement and Enhancement Rule (PIE) a top priority for Council action in calendar year 2011.

The West Coast groundfish regulations have undergone a dramatic transformation over the past twelve months to include implementation of the Trawl Rationalization Program (TRat), and a complete reorganization of the commercial and recreational groundfish regulations. As a result, there are still aspects of basic TRat Program and its supporting regulation package that need further attention. Within 50 CFR 660 there were some inevitable errors. These include, inconsistencies in the crossover provisions, and unclear, confusing regulatory language that needs to be corrected.

Further revisions of the TRat Program components may be needed to address items that did not get thoroughly addressed last year as a result of the tight timeline and/or to address areas where the fishery could be more flexible or efficient. Some items affect all sectors: trawl, limited entry fixed gear, open access (OA), and recreational.

Examples include:

- Review requirements/limitations on switching between limited entry (LE)/OA fisheries
- Revisit removing LE permit for California halibut/ridgeback/sea cucumber, etc.) (affects all commercial fisheries)
- Address whether first receiver must complete/submit a Federal e ticket before fish leaves the offload site. (affects individual fishing quota)
- Address emerging issues coming from industry, including: observer/offload issues, gear modifications, and processing at-sea.

Noted Physiologist, Dr. Karl Weick, a professor at Cornell University wrote a book entitled, *The Social Psychology of Organizing.* In it, Professor Weick’s academic thesis or “theme” can be summed as follows: “I don’t know what I want until I see what I have done.”

The fact that we find ourselves in this situation regarding regulatory development should not alarm or suggest that egregious errors have been made by the Council or NMFS in this process, but rather per Professor Weick, this situation is an expected outcome. “I don’t know what I want until I see what I have done.”

The EC believes that existing errors, inconsistencies, and unclear intent relating to certain aspects of the regulation package creates an environment where the industry can unwittingly make erroneous assumptions and put them in harm's way. Conversely, these errors and/or inconsistencies create an affirmative defense for those knowingly breaking the law. Either way, the situation erodes the enforceability of the regulations, and therefore needs to be corrected in a timely manner.

With this recognition the EC reiterates our opening statement: The Council should make the proposed NMFS PIE a top priority for Council action in calendar year 2011.

PFMC
03/08/11

GROUNDFISH ADVISORY SUBPANEL REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS

The Groundfish Advisory Subpanel (GAP) considered the following list of trailing amendments in the H.5 situation summary that are already in the Council process:

1) Superseding A-6 with A-21 allocations;
2) halibut reallocation;
3) cost recovery;
4) quota share (QS)/quota pound (QP) control rule and safe harbors;
5) mothership/catcher vessel catch history severability; and
6) adaptive management program quota pounds pass-through.

The GAP, in general, believes all these trailing actions are important and should move ahead with the exception of community fishing associations, which is under #4. The pass-through of the adaptive management program (AMP) pounds should continue and could be handled through the biennial specifications process. The GAP believes these two items are of lower urgency and can be put on the back burner. Other trailing amendments – both regulatory and Fishery Management Plan (FMP) amendments – are much more pressing in nature to facilitate the trawl individual quota (TIQ) program's success.

Additional GAP comments regarding these six amendments are as follows:

1. A-21/A-6 and set-asides: The GAP reviewed Agenda Item H.5.a, Attachment 2 regarding the issue of Amendment 21 allocations superseding Amendment 6 allocations. The GAP unanimously recommends the Amendment 21 trawl/non-trawl allocations supersede the Amendment 6 limited entry/open access allocations for those species subject to Amendment 21 (i.e., Alternative 1 in Attachment 2 under Agenda item H.5 in the council's briefing book). The GAP has understood through the Amendment 21 process that Amendment 6 allocations were part of the No Action Alternative, which was explicitly rejected in favor of the preferred Amendment 21 allocations. Further, the GAP is concerned that the option of specifying both Amendment 21 and Amendment 6 allocations for Amendment 21 species could result in an over-allocation of a stock's annual catch limit (ACL) or the inability to fully allocate a sector's share of the harvestable surplus. This result could be realized in cases where a stock's ACL is fully accessible.

   The GAP also discussed the National Marine Fisheries Service (NMFS) implementation of the management of yield set-asides under the Amendment 21 action. Yield has been routinely set aside to account for catches from research, exempted fishing permits (EFPs), tribal fisheries, non-capped bycatch in at-sea whiting fisheries, and bycatch in non-groundfish fisheries. Under Amendment 21, yield is set aside during the biennial specifications decision-making process to cover these sources of catch before any of the harvestable surplus is allocated to directed groundfish fisheries. However, under the

NMFS implementation of Amendment 21, this yield is held static for two years and cannot be re-allocated during inseason management. This effectively strands resources that could otherwise be utilized in directed fisheries even in cases where it is not needed to cover the proposed activity. For instance, if there is a set-aside for EFPs during the biennial specifications process, but EFPs are not approved or are conducted and completed without using the entire yield set aside to cover EFPs, this yield cannot be used for directed fisheries. The GAP recommends the Council adopt a more flexible strategy where that yield can be re-allocated if the set-aside is no longer needed for its intended use. This is how set-asides and buffers in the scorecard were used prior to the adoption of Amendment 21 and how the GAP believes management of set-asides should continue. The details on how set-asides are managed could be the subject of decision-making in the biennial specifications process.

2. Halibut reallocation: The GAP recommends a new alternative be analyzed that is a slight modification to Alternative 1 summarized on Table 2-1 of Attachment 3 under Agenda Item H.5.a. The new GAP alternative would set the trawl allocation of Pacific halibut to 15 percent of the Area 2A total catch exploitation yield (TCEY) without a poundage cap. In situations when trawl opportunities on the northern shelf are severely constrained (e.g., an important shelf target species like Dover sole is declared overfished), a ratio of less than 15 percent of the TCEY can be specified as the sector limit. These cases could be analyzed and considered in the biennial specifications process. This alternative would scale the trawl halibut bycatch limit to the abundance of halibut on the west coast while taking into consideration the availability of trawl target species on the shelf. The objective of this alternative would be to reduce halibut bycatch by 50 percent. Since the GAP alternative is based on a percentage of the Area 2A TCEY, this is fair to the non-trawl sectors since non-trawl sector allocation increases with increased abundance of halibut. The conversion to address the legal/sublegal issues contained in alternatives 1 and 2 and the proposed GAP alternative is necessary. Modifying the trawl halibut limit should be fast-tracked, even though the trawl industry realizes this will not bring any bycatch relief in 2011.

3. Cost recovery: Again, the GAP understands the necessity for this but reiterates that transparency is necessary.

   We recapitulate from our November 2010 statement:

   “The GAP recognizes the complexity surrounding development of the cost recovery program. In part due to that complexity, and in part in order to maintain as open a process as possible, we firmly believe that the Council should play a strong and active role in the development of the cost recovery program.

   “The GAP notes that cost recovery should be limited to the incremental costs of administering the trawl rationalization program. The appropriate formula to determine incremental costs should be new costs that wouldn’t occur but for the transition to individual quota (IQ)/coop management reduced by any cost savings due to the transition to IQ/coop management. This should include savings, if any, in reduced modeling for the trawl fleet, reduced enforcement needs over time etc.

"One existing cost which the GAP feels needs to be taken into account when calculating incremental costs of the program is the amount required to provide for the current observer coverage rate in the fleet. The GAP is adamant that that cost be reduced from each sector's incremental cost accordingly."

4. QS/QP control rule and safe harbors: The GAP feels this should move forward, but without the community fishing association (CFA) part. CFAs will do little – if anything – to keep the TIQ program on schedule and operating efficiently, as we have stated earlier and in previous statements.

5. MS/CV severability: This is an easy fix and, as the GAP stated in September and November 2010, should be done quickly.

   We recapitulate from the GAP's November 2010 statement:

   "Approximately 22 more permits were allotted mothership (MS)/catcher vessel (CV) history than currently participate. In general, the allocations to those permits are very small. Without the ability to sever that quota from the permit, a current participant will have to buy the permit in order to have permanent access to the catch history. The cost of buying the permit will be disproportionate to the value of the catch history. Severability will also allow those who wish to participate in the fishery the ability to retain their permit to harvest non-MS individual quota to sell their catch history rather than choosing to join a co-op, fish in the non-co-op fishery or just strand their fish.

   "Severability is supported by the MS sector and is consistent with the goals of Amendment 20."

As the GAP has said on several occasions, we believe the priority for trailing actions on Amendment 20 should focus on those things that make the trawl rationalization program work and thus meet the objectives established by the Council, which are:

1. Provide a mechanism for total catch accounting.
2. Provide for a viable, profitable, and efficient groundfish fishery.
3. Promote practices that reduce bycatch, discard mortality, and minimize ecological impacts.
4. Increase operational flexibility.
5. Minimize adverse effects from an IFQ program on fishing communities and other fisheries to the extent practical.
6. Promote measurable economic and employment benefits through the seafood catching, processing and distribution elements and support sectors of the industry.
7. Provide quality product for the consumer.
8. Increase safety in the fishery.

In looking at those objectives – especially numbers 2, 3, 4, 6, and 7 – what stands out to us is the need to be creative, to develop new business practices, and, most importantly, to develop different ways to catch fish. Unfortunately, we are having a problem.

Over the past 20-plus years, the Council, NMFS and the states have built up a body of regulations based on the way we used to operate. These include restrictions on how trawls are constructed and used, where they are used, and even when they are used. All of these regulations were for a good cause: to properly conserve and manage groundfish stocks. But now we are operating under a rationalized system that forces us to be creative in order to be successful and we can't be creative under the new system if we are stuck operating under the regulations developed for the traditional system.

The Council has heard some of these suggestions before: changing the whiting season start date, allowing use of midwater trawl gear, letting fishermen experiment with mesh size and net construction to exclude bycatch, among others. If we maintain strict individual accountability, we believe these changes can be identified and included as either separate regulatory trailing actions or as part of the 2013-2014 biennial specifications. But we need to start working on identifying them now so they can be folded into the regulatory process.

NMFS and Council staff have identified the following potential amendments, brought up by various entities that may require a closer look. They have been lumped together under the Program Improvement and Enhancement (PIE) rule.

1. Review requirements and limits for gear switching and multiple gear use. This is one issue the GAP feels is important. If all catch is fully accounted, there's no reason one vessel should not be able to carry and fish both fixed-gear (longline and/or pots) and trawl gear at the same time. This would provide the trawl industry more flexibility to make the TIQ program work. It also would save fishermen time and money when running from port to the fishing grounds – distances that can be more than 260 miles round-trip in some cases. This modification increases efficiency in the trawl rationalization program and better accomplishes the bycatch savings objective associated with gear switching.

2. Revisit the need to remove permits to fish California halibut south of Point Arena and ridgeback prawn, sea cucumber non-groundfish trawl gears (all non-groundfish trawl except pink shrimp). The Council's Amendment 20 final preferred alternative specified that vessels with LE trawl permits would be able to participate in these fisheries without removing the permit from the vessel. The GAP believes a declaration process would suffice to address enforcement concerns on this matter.

3. Open access/limited entry catch accounting regulations between sectors. This is a Council staff-identified issue that the GAP understands needs to be fixed. The GAP would like a more complete explanation before offering recommendations on how to address this issue.

4. First receivers' completion of tickets before fish leaves the first-receiver's site. The GAP identified one potential solution. In situations where fish are being transported prior to processing, an e-ticket should be assigned to the first-receiver site from the home office to prevent double counting of landings. It should be required that an e-ticket be assigned to each dock receiving document at the first receiver site during the course of the offload and that signatures should be required on each document prior to the weighed and sorted product leaving the first receiver site from a vessel

representative, the observer/monitor, and the first receiver. That e-ticket number would follow the observer's paperwork and dock tickets when they are faxed from the first receiver to the home office – and the home office would submit the final e-ticket within 24 hours of the completion of the off-load.

5. Procedural provisions to allow end-of-year resolution of accounts for purpose of determining carryover (possibilities include restricting fishing, restricting transfers, issuing carry-over at the end of January, etc.). This is a NMFS/Council staff-identified issue that needs to be fixed. The GAP would like to point out that new quota will be available for vessel accounts at the start of the year and that there is not an immediate need for vessels to access their carry-over QP on January 1. NMFS could take until, for example, the end of January to complete the carryover calculations based on end of year data and then add those amounts to the vessel accounts at that time. On that basis, there may not be a need to restrict fishing or transfers at the end of the year to resolve QP account balances.

6. Requirement that observer (and a crewman) remain on board until the offloading is completed (observer chain of custody issue). The GAP identified two potential solutions for this, one of which had been discussed informally outside the Council process: 1) securing the fish hold with either a lock or a numbered metal tag like those used in the trucking industry; or 2) a paper can be signed by both the captain and observer agreeing the recorded data is accurate, thus eliminating the need for anyone to stay on the boat. This works since the observer and fisherman have been on the boat during the whole trip and the observer has recorded the overfished species' catch. The GAP realizes this would not work for Pacific whiting because the catch is not sorted. Further, the GAP believes this issue is as important as the halibut allocation issue. It would provide a cost savings to the industry and eliminate a lot of frustration on behalf of the industry and observers.

   Without fixing the chain of custody issue, fishermen will continue to incur significant costs. For instance, a trawler fished 13 days but had to pay for 22 days of observer coverage, an additional cost of more than $3,150.

   The GAP believes that streamlining observer costs and looking at alternative monitoring technologies is necessary. In the long term, we need to look at alternative monitoring technologies to bring the costs down overall. Streamlining monitoring costs should be addressed as soon as possible.

7. Allow gear modifications that increase efficiency and selectivity. The GAP generally agreed that all trawl gear regulations previously implemented under traditional management would not be eliminated but that some changes are necessary and could prove beneficial. For example, allowing the use of a four-seam net as opposed to a two-seam net could make it easier to use certain types of halibut excluders. Allowing this type of modification would prove beneficial to fishermen, the industry, and the fish.

During GAP discussion, other items that seemed either a) relatively simple; b) integral to the success of the TIQ program; or c) a combination of both (a) and (b) became apparent and should be added to the PIE:

1. Changing the shoreside Pacific whiting start date. Under a rationalized fishery, it may be reasonable for all sectors to start fishing at the same time and earlier in the year. Some members of the GAP deemed this as critical as the halibut allocation issue and the observer chain-of-custody issue.

2. Rockfish Conservation Area (RCA) modifications. The GAP agreed the boundaries of the RCA should not be eliminated at this time, but should at least be relaxed so fishermen can experiment using modified gear types in areas that are now closed to reduce bycatch and more selectively access target species. This would afford the participants the flexibility needed to make the TIQ program successful. The GAP realizes that this could be taken up under the decision-making processes for biennial specifications or though inseason adjustments.

3. The IFQ Holding Requirement. The GAP recommends changes to the IFQ holding requirement that requires deficits greater than 10 percent to be covered within 30 days without being in violation. Ideally, a trawler should be able to continue fishing when the deficit is under the 10 percent carry-over limit. At the very least, the penalty for failure to cover deficits within 30 days is overly punitive and should be removed.

4. Processing at sea. Under the current groundfish regulations, processing black cod at sea is prohibited. Mr. Brett Hearne brought this concern before the GAP at this meeting as he has on prior occasions. The GAP feels an exemption in this case is justified and not unprecedented.

   In addition to the exemption for Mr. Hearne, the GAP also believes the subject of processing at sea generally will need to be further considered.

The last overarching GAP recommendation is that an ad-hoc committee or panel be organized to address these issues. In order to work most effectively and efficiently, in addition to constituent representation, such a group should include the fishery managers. Council staff, NMFS region and enforcement staff, and NOAA General Counsel representation on this committee would be needed to provide guidance and avoid wasting energy developing reports on proposals that may be non-starters (e.g., not be doable for reasons such as enforcement, NMFS regulations, or other system constraints).

PFMC
3/8/11

GROUNDFISH MANAGEMENT TEAM REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS AND ALLOCATION AMENDMENTS

Pacific Halibut

The Amendment 21: Intersector Allocation environmental assessment identified the following objectives relative to the individual halibut bycatch quota (IBQ) for the west coast shoreside groundfish fishery.

1. Account for total mortalities of all halibut bycatch in the trawl fishery.
2. Prosecute a successful Trawl Rationalization Program that is not overly restricted by halibut bycatch limits.
3. Hold individual harvesters accountable for halibut bycatch.
4. Provide incentives to minimize halibut bycatch and halibut bycatch mortality.

It appears that all alternatives, including no action, meet objectives 3 and 4. The Groundfish Management Team (GMT) notes that Alternatives 1 and 2 expand the total constant exploitation yield (TCEY) to include legal and sublegal size halibut, therefore meeting objective 1. Alternatives 1 and 2 also provide the Council an opportunity to adjust the halibut allocation to ensure that the trawl fishery is not overly restricted by halibut bycatch limits, which meets objective 2.

The GMT recommends the Council adopt Alternative 1 as the preliminary preferred alternative (PPA). Alternative 1 not only expands the TCEY to include legal and sublegal sized halibut, but it also reduces work load requirements compared to Alternative 2. Alternative 1 provides the flexibility for the Council to recommend altering the allocation (percent of the TCEY), but it does not require the Council to specify new levels. Alternative 2, on the other hand, requires that the Council explicitly specify an allocation (in pounds) for the 2012 fishery and requires that the Council evaluate and specify allocations each biennial period thereafter.

Set-asides

Beginning with the 2011–2012 biennial specifications process and prior to the setting of fishery allocations, the annual catch limit (or annual catch target 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. The GMT referred to this process in the 2011-2012 biennial cycles as “deductions from the ACL or ACT” or, sometimes, set asides.

The GMT notes that there are two descriptions for set asides as found in 660.55 (j) and (k):

> (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 1a through 2d of this subpart and may be adjusted through the biennial harvest specifications and management measures process.

(k) Exempted fishing permit set-asides. Annual set-asides for EFPs described at §660.60(f), will be deducted from the OY. Set-aside amounts will be adjusted through the biennial harvest specifications and management measures process.

It is the GMT's understanding that the need for flexibility, as described in Agenda Item H.5.a, Supplemental Attachment 2, March 2011, is specifically described for the off the top deductions (i.e., research estimates, tribal, incidental open access, and EFPs) and does not address fishery set asides as specified in paragraph (j). The GMT recommends that, if flexibility in the off the top deductions and fishery set-asides is desired, that should be so stated, and notes that this may increase the scope to a level outside of that described in Agenda Item H.5.a, Supplemental Attachment 2, March 2011.

Hardwiring the off the top deductions, which occurred as a result of the Amendment 21 framework, makes it more complicated to revise the estimates once we get new and perhaps better estimates during the biennium. **The GMT recommends that the Council include flexibility in off the top deductions, specifically the research estimates, tribal, groundfish catch in non-groundfish fisheries (incidental open access), and EFPs, in their preliminary preferred alternative.**

PFMC
03/09/11

U.S. SENATOR MARIA CANTWELL

WASHINGTON

FOR IMMEDIATE RELEASE **CONTACT: JARED LEOPOLD**
MARCH 8, 2010 **(202) 224-8277**

Cantwell Secures Commitment from Obama Administration to Make Groundfish Program 'a Top Priority' in Budget

Fisheries administrator tells Cantwell: 'We will do everything within our power' to protect crucial program for Washington fishing industry

VIDEO AVAILABLE

WASHINGTON, D.C. – Today, U.S. Senator Maria Cantwell (D-WA) secured a commitment from the Obama Administration to make the Pacific Coast groundfish trawl catch share program "a top priority" in budgetary decisions. The program is crucial to limiting overfishing, improving safety, and increasing economic stability for Washington state's West Coast groundfish fishery, part of the state's $3.7 billion fishing industry which accounts for more than 70,000 jobs.

At a Senate Oceans, Atmosphere, Fisheries, and Coast Guard Subcommittee hearing Tuesday morning, Cantwell pressed National Marine Fisheries Service (NMFS) administrator Eric Schwaab to ensure that the catch share program has the funding to be implemented. Schwaab committed to making the program 'a top priority' of the NMFS. *Watch a video of their discussion.*

"I want to ask you, specifically on the record: Can you commit that the West Coast groundfish catch share funding will be a top priority for your agency?" Cantwell asked.

"Senator Cantwell, yes, we can," Schwaab replied. "**We certainly appreciate the intensive effort in developing that program put forth by the council, put forth by the fishermen of the region. We recognize how important it is to them going forward. .... It is a top priority for us and we will do everything within our power to see that we meet the commitments that have been made there from the agency."**

Schwaab also told the Oceans subcommittee that the NMFS had requested the necessary funding for implementation of the Pacific Coast groundfish catch share program in the 2011 and 2012 budgets.

Tens of thousands of Washington jobs depend on the health of the ocean's resources, but overfishing could threaten long-term sustainability and the health of the fishing economy. Fisheries along Washington's coast produced roughly $3.7 billion in sales impacts and supported 72,000 jobs in 2008, according to the National Marine Fisheries Service.

The West coast groundfish fishery has been working for years to end the race for fish by implementing a catch share system. Implementation of the Pacific Coast groundfish trawl catch share program began in 2011, but Washington state fishermen are worried that promised program support from the NMFS might fall victim to federal government cuts.

The *Seattle Times* praised the catch share program in a December 2010 editorial, saying it would "reduce economic and environmental waste."

"If the new system works, it should remove the economic waste of the 'race for fish,' improve fisheries management and provide fish lovers with a supply of delicious whiting, turbot, sole, Pacific cod and black cod," the *Times* editorial board wrote on December 27.

Cantwell, a member and former chair of the Senate Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard, has long been a lead Senate advocate of programs that protect the health of the ocean's resources and coastal economies. In Washington state, the coastal region supports 162,000 jobs and generates $9.5 billion in economic activity. Nationwide, the coastal economy supports 3.6 million jobs.

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MTC

OREGON TRAWL COMMISSION

UNITED CATCHER BOATS
Washington • Oregon • California • Alaska

UCB

December 1, 2010

William Stelle
NMFS Regional Administrator, Northwest Region
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115-0070

Dear Mr. Stelle,

As concerned stakeholders of the groundfish trawl fishery, we write to you asking for a meeting to discuss a critical element of the groundfish trawl rationalization program – namely the monitoring program and the associated costs. Monitoring costs represent one of the primary factors that could make or break a successful transition to IFQ/co-op management. We understand that accountability is a vital component of a fishery managed under catch shares, but would like to discuss with you and your staff the agency's policies and the status of the monitoring program development.

Of particular concern is the recent NMFS policy to reimburse fishermen only for "sea days." It appears that some observer providers are requiring monthly contracts with fishermen in order to provide local observers that live in fishing communities. NMFS' policy of only reimbursing for sea days does not take into account the reality of fishing off the west coast. The primary and laudable purpose of the decision to reimburse fishermen for 90% of observer costs in the first year was to provide fishermen time to adjust to the new regulatory environment including the costs that come with it.

In addition to seeking a better understanding of the monitoring program overall we would also like to begin the broader discussion of how to reduce the overall cost of the monitoring program.

We would like to find a time to meet with you and your staff this month about the issues presented above. Please contact Brent at (206) 282-2599 to see if we can find a time to meet.

Thank you very much,

Brent Paine, Executive Director, United Catcher Boats

David Jincks, Executive Director, Midwater Trawlers Cooperative

Brad Pettinger, Executive Director, Oregon Trawl Commission

William Stelle
Regional Administrator, Northwest Region
National Marine Fisheries Service
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115-0070

November 8, 2010

Dear Mr. Stelle,

Permit holders, skippers, processors, and other stakeholders in the west coast groundfish trawl fishery are preparing for the transition to the new catch share management system that will be implemented on January 1, 2011. Under the new system, fishermen have the opportunity to improve both the economic and environmental performance of the fishery, however, to accomplish this goal key challenges must be overcome. Today, fishermen and the Pacific Fishery Management Council are developing tools and approaches to address these challenges. For instance, there is currently a program trailing amendment in development to outline how risk pools and community fishing associations can be used to help manage overfished species and stabilize traditional groundfish ports. Likewise, there has also been a tangible increase in the level of dialogue between fishermen and stakeholders related to gear innovation, collective arrangements and harvest planning, along with other tools that would allow to the fishery to best avoid constraining stocks while maximizing value from target stocks. Another key area of focus should be exploration and development of methods that can reduce the cost of monitoring while maintaining the full-catch accountability standard.

The purpose of this letter is to seek your support on the development of a new Electronic Monitoring system for the west coast groundfish fishery. The authors of this letter believe in the concept of full-accountability, however, we also strongly encourage the use of the best technology available to achieve that goal. The high cost of the 100% human observer requirement that has been placed on the fleet has created great concern among fishermen and other stakeholders because of its potential to have negative economic repercussions on the fleet as a whole, and in particular its potential to create a disproportionate impact on small operators as well as fishermen contemplating gear switching.

While this human observer costs will be subsidized in the first year and to a lesser extent in years 2 and 3, the industry's responsibility to ultimately pay for monitoring costs will likely have significant impact on the current structure of the fleet. In order for an individual fishing operation to cover observer costs, it will require that the vessel reach and maintain a certain scale and revenue threshold. While some vessels may be able to achieve this, many smaller vessels may not. This dynamic could be another driver of quota share consolidation and net loss of fishery participation from smaller scale fishing ports.

The time to develop the Electronic Monitoring technology to provide more affordable catch accounting is in the first years of the program, while resources allocated to monitoring of the fleet are available. It is crucial that while the monitoring subsidies are being removed from the fishery in years 2 and 3 of the program, that we compensate for the cost to the fleet with more affordable means of maintaining 100% catch accountability and Electronic Monitoring is a means of achieving this.

There are several Electronic Monitoring pilot programs now underway in domestic groundfish fisheries. The partners of the Morro Bay/Port San Luis Exempted Fishing Permit project have launched a second year of research testing the effectiveness of auditing captain catch records with video camera footage. Likewise, NOAA has launched a new Electronic Monitoring study in the New England groundfish fishery. Closer to home, the shoreside whiting fishery has been operating using electronic monitoring for several years. These projects, while providing critical information and experience, will not result in the implementation of Electronic Monitoring for the trawl rationalization program more broadly without the engagement and assistance of NMFS.

The authors of this letter request that NMFS engage in this effort by providing the fishery stakeholders with a clear and achievable list of criteria for a future Electronic Monitoring program that can be implemented to replace or supplement the current human observer catch accounting requirement. In contemplating what criteria will likely need to be met for an EM system to be declared acceptable by NMFS, we suggest the agency consider what information and data such a system would need to provide from a regulatory, scientific, and enforcement perspective. By providing this "target" outlining a viable process for the implementation of a new Electronic Monitoring program, NMFS will help catalyze the development of new partnerships and research efforts focused on building the technologies necessary to improve this aspect of the fishery. Ultimately, we believe EM could be a vital component of the success of the west coast groundfish catch share program.

Sincerely,

FMA — FORT BRAGG

California Shellfish — San Francisco/Astoria

OTC — Brookings

FMA — McKinleyville, CA

[signature]	F/V Little Joe	Brookings, OR
Christopher Kubiak	CCSGA	Los Osos, CA
[signature]	TNC	Morro Bay, CA
[signature]	Ocean Hunter LLC	Mt Vernon Wa
[signature]	Midwater Trawlers Cooperative	
[signature]	F/V Perseverance	Newport OR
Paul Kujala	F/V Cape Windy	Warrenton, OR
[signature]	Bornstein Seafoods	Astoria, OR
Michelle Norvell	F/V Donna J	FORT BRAGG CA
Tom Estes	F/V TARA DAWN	Fort BRAGG, CA
Julie Estes	Noyo Women for Fisheries	Fort Bragg, CA

B. NORVELL	F/V DONNA J	FORT BRAGG CA.
Lynn Langford Walton	The Ilwaco Cooperative	F/V Nicole, F/V Cassandra Anne, F/V Sea Valley II, F/V Ballad, F/V Buckin Acne, F/V Northern Endeavor, F/V Watchman Ilwaco, WA. / Astoria, OR.
[signature]	F/V PACIFIC PRINCE	
[signature]	F/V MORNING STAR	Seattle, WA
~~[signature]~~	~~Coos Bay Trawlers~~	
[signature]	EDF	Portland, OR

cc: Donald McIsaac, Executive Director, Pacific Fishery Management Council
Mark Cedergreen, Chairman, Pacific Fishery Management Council

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December 13, 2010

RE: Public Hearing on Commercial Fishing Associations held in Monterey, CA on Thursday, October 28th, 2010

Dear Dr. McIsaac,

Please accept this letter as comments from Food & Water Watch (FWW) with regard to the public hearing held on the topic of commercial fishing associations (CFAs) in Monterey, CA on October 28, 2010. FWW is a non-profit consumer advocacy group working with grassroots organizations across the country to create an economically and environmentally viable future. Our Fish Program promotes safe and sustainable seafood for consumers, while helping to protect the environment and supporting the long-term well being of coastal and fishing communities. Among other issues, we defend and support public access to and management of natural resources, including fish.

We are deeply concerned with the way Amendments 20 and 21 (the Amendments) were developed and are being adopted. Privatized catch share schemes have a track record of hurting coastal and fishing communities, skewing fisheries towards industrial fleets and through poor initial allocations of shares, rewarding those that fish the hardest and fastest, without concern for historic fisheries participants or ecological impacts. The Amendments acknowledge that both smaller-scale processors and fishermen will be harmed, but provide little to no remedy.[1] For the shore-side trawl sector alone, it is estimated that a 60% fleet reduction is necessary to achieve the economic goals of the program.[2] Measures to assist in this sector include provisions for CFAs, which are only being discussed now rather than during the Amendments' development process, and will be implemented after the initial allocation, further disadvantaging smaller-scale fishermen.

Despite our overall opposition to the Amendments, we will continue to monitor and participate in public comment periods for trailing actions. Recently, a representative from our organization, Marie Logan, attended a public hearing on CFAs held in Monterey, CA and this letter is to follow up on our public testimony at that meeting. We have many concerns with both how the meeting was conducted and some of the proposals put forth for the development of CFAs, in particular with regards to the discussion of quota for use as collateral.

First, we want to express our disappointment with the informal nature of this session. Although it was billed as a "public hearing" on the Council's website, the only two administrators conducting the hearing were independent consultants for the PFMC (Don Hansen and Ron Boyce), and *there were no sitting Council members in attendance* when the hearing began, and for the first two hours of proceedings. That sends a clear message to the participants that the hearings on CFAs were being conducted as an afterthought – indeed, a "trailing action" – to be addressed by the Council's staff, but not worthy of meaningful discussion by the full Council, or even several of the members. This is especially concerning given the expected severe socioeconomic affects from the implementation of the Amendments on small boat operators and independent fishermen – many of whom were in attendance at this meeting to share their concerns with the Council.

Furthermore, those conducting the hearing appeared ambivalent, even dismissive of the comments that were provided for the public record. As numerous fishermen voiced their specific concerns with the implementation of the trawl rationalization program, and made suggestions as to how the crafting of CFAs could help to protect their communities, the administrators took few notes, relying on a small tape recorder to capture the comments, but made no attempts to ensure that each person's comments were in fact fully recorded. Participants were permitted to speak from their seats, and it was not clear that voices from the back of the room were adequately captured. Participants were also not asked to identify themselves or their organizational affiliations. At the conclusion of the meeting, Don Hansen remarked, perhaps jokingly, that "the Council doesn't really like to read things," so explained to the audience that the comments that he would submit for consideration by the Council would likely be "only a paragraph or two." This is outrageous.

Clearly, the Council is considering these hearings a mere formality in the implementation of these Amendments, with insufficient regard for the smaller participants in the fishery, many of whom will likely be adversely affected by the new regulations. That more than twenty individuals attended this hearing in Monterey is evidence of their desire to be actively engaged in the process. Thus, complete and thorough representation of the public comments delivered at this meeting is necessary to ensure that participants' messages reach the Council – especially since there were no current Council members present at this meeting until more than halfway through, and only one in attendance for the last hour of the meeting).

Additionally, we propose that CFAs may be one means to lessen the negative impacts of catch share programs on fish, fishermen and the public. We hope that all fishermen, smaller-scale and historical participants in particular, will continue to have a meaningful voice in the discussion. When designed with meaningful participation by fishing communities, these programs may allow fishermen to retain some portion of their historical catch, and share the earnings within their own community and local port. The public hearing in Monterey however, clearly was not sufficient to gather meaningful public input. It is questionable whether or not the testimony from participants will be properly conveyed to the Council. Future meetings should be held with Council members present for the entire hearing, and people should be required to identify themselves and testimony should be clearly recorded with proper equipment.

food&watercwatch
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One way to retain viable working waterfronts through CFAs may be to tie the allocated quota to shore-side activities of fisheries in individual ports. This would necessitate regulations allowing for geographically-based CFAs. We support efforts to analyze this approach further.

Finally, we have concerns about the proposed use of catch share allocations as collateral for loans.

We strongly urge the Council to carefully consider the harmful implications of allowing quota shares to be used as collateral in a loan, which is referenced on page 8 of "Trawl Catch Shares Trailing Actions Scoping Information Document" distributed at the meeting. Fisheries of the United States are a natural resource to be held in the public trust, and if these resources are permitted by the Council to be traded and utilized as if they are private property, it will create a weak and highly questionable financial structure.

Additionally, allowing shares of the total allowable catch to become property of banks is a clear privatization of a public trust resource. A collateral loan based on quota would necessitate that shares are private property to be repossessed by the bank in the event of a default. As financial institutions become shareholders, another powerful interest is created to maintain the status quo of a catch share system, even if the program or allocation has jeopardized the sustainability of the stock or the safety of fishermen. To avoid these problems, we strongly urge you to ban the use of quota share as collateral for loans.

Thank you for your consideration of these comments. Food & Water Watch will continue to monitor the implementation of the Amendments and plans to stay involved as the process moves forward.

Sincerely,

Christina Lizzi, Policy Analyst, Fish Program

Marie Logan, Policy Analyst and Researcher, Fish Program

CC: Members of Pacific Fishery Management Council and Staff

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[1] 75 Fed. Reg. 53380, 53398 (Aug. 31, 2010)
[2] 75 Fed. Reg. 53380, 53402 (Aug. 31, 2010)

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February 10, 2011
Mr. Mark Cedergreen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Mr. Cedergreen,

As we enter our second month of the IFQ program in the groundfishery, a number of trailing amendments and "artifact" items are on the council's agenda.

One of the primary goals of the IFQ program is to empower fishermen and permit owners to fish when they believe it is most beneficial for them based on their own unique fishing plans. To achieve that, we should have consistency between both the shoreside and offshore sectors when it comes to start dates for the whiting fishery.

Currently, shoreside continues to have a start date that is a month after offshore. This runs counter to the intent of the IFQ program and as an artifact of the previous management system should be addressed by the council and remedied.

We look forward to discussions on this issue in state meetings, the GAP and other subcommittees at the coming March meeting and encourage the council to make this issue a priority. We believe it can be dealt with relatively simply in comparison with some of the other more daunting tasks on the council's agenda, which should encourage the council to take it under consideration rather than discourage discussion.

Thank you in advance for your careful consideration. We look forward to the discussion and to a timeline to be set in place for this issue to be resolved before the 2012 season.

Sincerely,

Heidi Happonen
Ocean Companies

ALASKAN OBSERVERS

F/V Western Breeze
9667 Yaquina Bay Rd.
Newport, OR 97365

Feb 28, 2011

CS INVOICE #64-11

Invoice Date: 2/28/11
Due Date: 3/15/11
Terms: Net 15

	Total Charges	10% Due from Vessel
Catch Share Observer Coverage - Western Breeze - Obs. Cory Lescher		
:5/11(1735) thru 2/27/11(1335) @ $350.00 per Sea-day x 2 days + 6.5 hours x $45.00/hour =	$992.50	$99.25
Catch Share Observer Coverage - Western Breeze - Obs. Cory Lescher		
2/27/11(1336) thru 2/28/11(0934) @ $45.00/hour per Monitor x 5.11 hours =	$229.95	$23.00

Total charges = $1,222.45

Total Due From Vessel Owner By 3/15/11 = $122.25

Agenda Item Topic Number: H.5.c
Trawl Rationalization Trailing Actions and Allocation Amendments

MRAG
Americas

Chain of Custody and Catch Share Observers

MRAG Americas and the vessels we provide observer coverage for in the West Coast Trawl IFQ Observer Program are concerned about the wording and interpretation of the regulations regarding observers on the vessels and the requirement to stay onboard until all IFQ products are offloaded. The regulation sections of concern are listed below:

(xiii) Retain any IFQ species/species group onboard a vessel unless the vessel has observer coverage during the entire trip and until all IFQ species from the trip are offloaded. A vessel may deliver IFQ species/species groups to more than one IFQ first receiver, but must maintain observer coverage until all IFQ species from the trip are offloaded. Once transfer of fish begins, all fish aboard the vessel are counted as part of the same landing as defined at § 660.11If a vessel comes into port and does not immediately begin offloading, the observer must remain on the vessel until the offload starts at which point the catch monitor will take over.

5) Receives lodging, per diem, and any other services necessary to observers assigned to fishing vessels.
(i) An observer under contract may be housed on a vessel to which he or she is assigned: Prior to their vessel's initial departure from port; for a period not to exceed twenty-four hours following the completion of an offload when the observer has duties and is scheduled to disembark; or for a period not to exceed twenty-four hours following the vessel's arrival in port when the observer is scheduled to disembark.
(ii) During all periods an observer is housed on a vessel, the observer provider must ensure that the vessel operator or at least one crew member is aboard.

MRAG Americas, the other observer providers, and multiple vessels owners raised concerns about the regulation requiring observers to stay on the vessel until all fish are offloaded in October. We received an official response from NMFS regarding those inquiries on January 20th. As per a notice sent by the observer program:

In order to ensure we're all on the same page regarding the regulatory requirements, please ensure that:

1. If a vessel comes into port and does not immediately begin offloading, the observer must remain on the vessel until the offload starts at which point the catch monitor will take over.
2. Any time an observer is on a vessel, at least one crew member must be present.
3. An observer (does not have to be the same observer who took the trip) must confirm that all catch has been offloaded by physically viewing the hold. The observer must report to the catch monitor that they confirmed the hold was empty.

MRAG Americas and the vessels on which we provide observer coverage have multiple concerns regarding the feasibility and objectives of these regulations. What is the goal of the regulation in regards to the observer staying with the catch? Is that goal accomplished by requiring the observer to remain onboard? Are there better options to achieve that goal than to have observers staying on vessels overnight in port? Many of these vessels have limited facilities; no showers, a bucket on deck for a bathroom, limited food and water available in port. Remaining on boat until offload requires a crew member or the captain to remain on the boat as well. The observer must be compensated for time spent on the vessel. The boat/government will be paying for this time. The vessel crew member staying onboard will require payment.

NMFS enforcement has stated that the primary goal of the chain of custody regulation, in regards to the observer staying with the catch until offload begins, is to deter the removal of the eight species of concern prior to the offload. In our opinion places the observer in a very dangerous spot, in a direct enforcement roll without proper training to handle the potential problems that can arise. This issue was not discussed in the initial training class in December and observers were not prepared to "guard the catch."

Observers are filling an enforcement/deterrant role under this regulation. MRAG Americas holds that observer data and unbiased observations provide critical information to enforcement officers, however, by placing observers in a direct role of enforcing regulations or acting as a deterrent is a very slippery slope. Enforcement is an entirely different position and requires additional training and skills. The observer's enforcement responsibility is to record who, when, where, why, and how when they see a violation occur. Requiring observers to do more than record their observations creates additional antipathy; industry vs. government trust issues and observer vs. crew trust issues. The observers' job is difficult enough without these additional tensions.

The regulation 5(i&ii) is taken out of context in regards to requiring an observer to stay onboard until all IFQ product is offloaded. MRAG understands that this regulation was put in place as a compromise to concerns about housing observers on vessels and mitigating costs to the vessels. The cost of housing observers in ports can get expensive and the vessels and government are indirectly responsible for those costs through a daily rate per deployed day.

In some fisheries, observers are assigned to a vessel for multiple trips and stay onboard when the vessel is in port, the North Pacific Groundfish Observer Program (NPGFOP) is the best example of this. In the NPGFOP, however, the crew and captain typically reside on the vessel and observers are not placed on vessels under 60 feet. Observers in the NPGFOP are also allowed to leave the vessel in port. In most shoreside fisheries crews do not live on the vessels, if they do the environment may not be suitable to require an observer to stay aboard. Most national programs such as the Northeast Fisheries Observer Program, Hawaii Longline Observer Program, and the California Drift Gillnet Observer Program prohibit observers from staying aboard the vessels overnight unless the vessel is at sea.

Many of these vessels have limited facilities; no showers, a bucket on deck in lieu of a functioning head, and potentially limited provisions available to the vessel while in port. Crews often eat away from the vessel while in port, following the regulations to the letter, would require the observer to physically get off of the vessel and stand as sentry until the crew or a crew member returns. If observers are not allowed to leave the vessel, additional provisions will need to be made to ensure observers have sufficient food and potable water. The last thing an observer and crew wants to do after returning from a fishing trip is sit on the boat and wait, especially overnight if they haven't showered in 3-4 days. If the vessel does not have a functioning head, this creates a legal issue concerning proper waste disposal. MRAG Americas raises the question of what is prudent and what is reasonable?

Remaining on boat until the offload requires a crew member or the captain to remain on the boat as well. This creates a potentially uncomfortable dynamic between boat crew and observers. Crews typically leave boat to see family, do laundry, and get food/drink, etc., after returning to dock. Resentment has arisen; some crew members see it as "babysitting the observer". Crews may bring alcohol back to the vessel and MRAG Americas is concerned with the very real potential for increased harassment and conflict of interest issues.

The observer will have to be compensated for time spent on the vessel. If an observer spends more than eight hours in port on the boat prior to offload, it becomes more cost effective to pay them an additional seaday. As a result if a vessel lands at 11pm at night and offloads at 6am the following day, a common occurrence, the vessel would incur an additional seaday, as opposed to the First Receiver paying for several hours of dockside monitoring.

The boat/government will be paying for this time. MRAG Americas estimates that our clients will average ¾ of seaday per trip in additional cost. MRAG Americas observers have completed 22 trips to date. Vessels and the government have been billed for 92.1 days for an average of 4.19 days per trip when the observer stays onboard until the offload. If we had only billed the deployed time at sea on those same trips the total number of days would be 75.54 or an average of 3.43 days per trip. The difference is .76 days per trip or $277.40 per trip. That equates to $6,102.80 additional cost to the program. While in this pilot year of the program that cost is greatly subsidized by the federal government those are limited funds. Failure to create a reasonable solution will pass higher costs to the vessel owners when they become responsible for the entire observer costs.

If the offload occurs within 4 hours of landing, it is not an issue for the observer to be aboard. In many cases the offload will not occur within 4 hours of docking, and may occur 24 to 48 or more later. MRAG observers have spent upto 86.75 hours on the vessel between docking and offload, that is over 3 ½ days! Weather, tide, size of catch, and changing offload schedules are just a few of the unknowns we all know define a trip.

What are some potential solutions? If chain of custody on the overfished stocks is the real concern, then create a chain of custody form. The observers are weighing or estimating the weight of the eight species of concern. The observer can record the number and weight of those species and both the observer and captain sign the form. If those fish are not onboard the vessel at offload the captain will be dealing with NMFS enforcement. In addition some form of tagout/lockout device could be used, however, this may prove difficult or impossible with standard hatch covers. One idea is to use a unique taper-proof tape. If the tape has been broken or damaged, additional evidence could be taken. Other ideas include a combination of observers measuring the ice and fish in the hold by using the bin board height upon landing and prior to offload and enlisting the help of the local Harbor Masters to note the movement of the vessel or offloading of fish. If Electronic Monitoring (EM) gets funded in this program, mounting a camera on the vessel overlooking the hold access would do a much better job than an observer sleeping in the forepeak.

Ultimately, as we all know the goal within any observed fishery is to use observer data to make informed policy decisions on regulation that preserves and rebuilds viable stocks for future generations of fishers. But we need to be careful with our at-sea observers and create workable solutions that do not blur the lines between data gathering and enforcement, and all the while finding ways to objectively foster a relationship with industry where NMFS is seen more and more as a resource and ally that defends fishers and families.

Thank you,

Bryan Belay
Observer Operations Manager
MRAG Americas

CONSIDERATION OF INSEASON ADJUSTMENTS – PART II, IF NECESSARY

This agenda item considers inseason adjustments to 2011 groundfish fisheries. Inseason adjustments are also considered under Agenda Item H.4. Should the Council adopt preliminary recommendations under Agenda Item H.4, then final action will be taken under this agenda item. However, should the Council make final recommendations under Agenda Item H.4, then this agenda item will be cancelled.

Council Action:

1. Adopt final inseason adjustments to 2011 groundfish fisheries, as necessary.

Reference Materials:

1. None.

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 Final Recommendations for Adjustments to 2011 Groundfish Fisheries

PFMC
02/09/11