APPENDIX B

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT FOR THE GROUNDFISH RESOURCES OF THE GULF OF ALASKA

Compiled by

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Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska

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Summary

by

The Plan Team for the Groundfish Fisheries of the Gulf of Alaska

Introduction

The *National Standard Guidelines for Fishery Management Plans* published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE reports are intended to summarize the best available scientific information concerning the past, present, and possible future condition of the stocks and fisheries under federal management. The FMPs for the groundfish fisheries managed by the Council require that drafts of the SAFE reports be produced each year in time for the December North Pacific Fishery Management Council (Council) meetings.

The SAFE report for the Gulf of Alaska (GOA) groundfish fisheries is compiled by the Plan Team for the Gulf of Alaska Groundfish FMP from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC) and the Alaska Department of Fish and Game (ADF&G). The stock assessment section includes recommended acceptable biological catch (ABC) levels for each stock and stock complex managed under the FMP. The ABC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other management strategies for the fisheries.

The GOA Groundfish Plan Team met in Seattle on November 14-18th, 2011 to review the status of stocks of twenty three species or species groups that are managed under the FMP. The Plan Team review was based on presentations by ADF&G and NMFS AFSC scientists with opportunity for public comment and input. Members of the Plan Team who compiled the SAFE report were James Ianelli and Diana Stram (co-chairs), Sandra Lowe, Chris Lunsford, Jon Heifetz, Kristen Green, Tom Pearson, Nick Sagalkin, Mike Dalton, Nancy Friday, Leslie Slater, and Paul Spencer. Ken Goldman and Steve Hare were unable to attend. Craig Faunce from the AFSC observer program was nominated to the Plan Team and participated as a Team member at this meeting. Additional AFSC staff (Cindy Tribuzio, Kalei Shotwell, and Pete Hulson) assisted with the meeting and report preparation.

Background Information

Management Areas and Species

The Gulf of Alaska (GOA) management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Figure 1). Formerly, five categories of finfishes and invertebrates were designated for management purposes: target species, other species, prohibited species, forage fish species and non-specified species. Effective for the 2011 fisheries, these categories have been revised in Amendments 96 and 87 to the FMPs for Groundfish of the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA), respectively. This action was necessary to comply with requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to prevent overfishing, achieve optimum yield, and to comply with statutory requirements for annual catch limits (ACLs) and accountability measures (AMs). Species and species groups must be identified "in the fishery" for which ACLs and AMs are required. An ecosystem component (EC) is also be included in the FMPs for species and species groups that are not

1) targeted for harvest
2) likely to become overfished or subject to overfishing, and
3) generally retained for sale or personal use.

The effects of the action amended the GOA and BSAI groundfish FMPs to:

1) identify and manage target groundfish stocks "in the fishery"

2) eliminate the "other species" category and manage (GOA) squids, (BSAI and GOA) sculpins, (BSAI and GOA) sharks, and (BSAI and GOA) octopuses separately "in the fishery";
3) manage prohibited species and forage fish species in the ecosystem component category; and
4) remove the non-specified species outside of the FMPs.

Species may be split or combined within the "target species" category according to procedures set forth in the FMP. The three categories of finfishes and invertebrates that have been designated for management purposes are listed below.

In the Fishery:

1) Target species – are those species that support a single species or mixed species target fishery, are commercially important, and for which a sufficient data base exists that allows each to be managed on its own biological merits. Accordingly, a specific total allowable catch (TAC) is established annually for each target species or species assemblage. Catch of each species must be recorded and reported. This category includes walleye pollock, Pacific cod, sablefish, shallow and deep water flatfish, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker rockfish, rougheye/blackspotted rockfish, northern rockfish, "other " rockfish (formerly "other slope" rockfish), dusky rockfish (formerly "pelagic shelf" rockfish), demersal shelf rockfish, thornyhead rockfish, Atka mackerel, squid, sculpin, sharks, octopus, big skates, longnose skates, and other skates.

Ecosystem Component:

2) Prohibited Species – are those species and species groups the catch of which must be avoided while fishing for groundfish, and which must be immediately returned to sea with a minimum of injury except when their retention is authorized by other applicable law. Groundfish species and species groups under the FMP for which the quotas have been achieved shall be treated in the same manner as prohibited species.
3) Forage fish species – are those species listed in the table below, which are a critical food source for many marine mammal, seabird and fish species. The forage fish species category is established to allow for the management of these species in a manner that prevents the development of a commercial directed fishery for forage fish. Management measures for this species category will be specified in regulations and may include such measures as prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility.

The following lists the GOA stocks within these FMP species categories:

In the Fishery	
Target Species[2]	Walleye pollock, Pacific cod, Sablefish, Flatfish (shallow-water flatfish, deep-water flatfish, rex sole, flathead sole, arrowtooth flounder), Rockfish (Pacific ocean perch, northern rockfish, shortraker rockfish, rougheye/blackspotted rockfish, other rockfish [formerly "other slope" rockfish], dusky rockfish [formerly in the "pelagic shelf" rockfish], demersal shelf rockfish[3], thornyhead rockfish), Atka mackerel, Skates (big skates, longnose skates, and other skates), Squids, Sculpins, Sharks, Octopus
Ecosystem Component	
Prohibited Species[1]	Pacific halibut, Pacific herring, Pacific salmon, Steelhead trout, King crab, Tanner crab
Forage Fish Species[4]	Osmeridae family (eulachon, capelin, and other smelts), Myctophidae family (lanternfishes), Bathylagidae family (deep-sea smelts), Ammodytidae family (Pacific sand lance), Trichodontidae family (Pacific sand fish), Pholidae family (gunnels), Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys), Gonostomatidae family (bristlemouths, lightfishes, and anglemouths), Order Euphausiacea (krill)

[1]Must be immediately returned to the sea
[2]TAC for each listing. Species and species groups may or may not be targets of directed fisheries.
[3]Management delegated to the State of Alaska
[4]Management measures for forage fish are established in regulations implementing the FMP

This SAFE report describes stock status of target and non-target species in the fishery, and the forage fish category of the ecosystem component. Although grenadiers are no longer in the GOA FMP, a summary is provided in Appendix 1 if in the future grenadiers are moved back into the FMP.

A species or species group from within the fishery category may be split out and assigned an appropriate harvest level. Similarly, species in the fishery category may be combined and a single harvest level assigned to the new aggregate species group. The harvest level for demersal shelf rockfish in the Eastern Regulatory Area is specified by the Council each year. However, management of this fishery is deferred to the State of Alaska with Council oversight.

The GOA FMP recognizes single species and species complex management strategies. Single species specifications are set for stocks individually, recognizing that different harvesting sectors catch an array of species. In the Gulf of Alaska these species include Pacific cod, pollock, sablefish, Pacific ocean perch, flathead sole, rex sole, arrowtooth flounder, northern rockfish, shortraker rockfish, dusky rockfish (formerly in the "pelagic shelf" rockfish category), Atka mackerel, big skates, and longnose skates. Other groundfish species that are usually caught in groups have been managed as complexes (also called assemblages). For example, other rockfish (formerly "other slope" rockfish), rougheye and blackspotted rockfish, demersal shelf rockfish, thornyhead rockfish, deep water flatfish, shallow water flatfish, and other skates have been managed as complexes.

Beginning in 2011, squids, sculpins, octopus, and sharks are managed as individual complexes (previously they were managed as "other species"). Also in 2011, the rockfish categories were reorganized: widow and yellowtail rockfish were removed from the pelagic shelf rockfish complex leaving dusky rockfish as a single species category. Widow and yellowtail rockfish were added to the 15 species that were part of the former "other slope" rockfish group to form a new category in the Gulf of Alaska, "other rockfish". Previously, yellowtail and widow rockfish were part of the "pelagic shelf" rockfish group in the Gulf of Alaska, which will no longer exist (for assessment purposes) in 2012. This year both shortraker rockfish and "other rockfish" are each presented as separate SAFE chapters.

Separating these two chapters responds to recommendations from the Gulf of Alaska Plan Team and the NPFMC Scientific and Statistical Committee.

The FMP authorizes splitting species, or groups of species, from the complexes for purposes of promoting the goals and objectives of the FMP. Atka mackerel was split out from "other species" beginning in 1994. In 1998, black and blue rockfish were removed from the GOA FMP and management was conferred to the ADF&G. In 2008, dark rockfish were similarly removed from the GOA FMP with sole management taken over by the ADF&G. Beginning in 1999, osmerids (eulachon, capelin and other smelts) were removed from the "other species" category and placed in a separate forage fish category. In 2004, Amendment 63 to the FMP was approved which moved skates from the other species category into a target species category whereby individual OFLs and ABCs for skate species and complexes could be established.

Groundfish catches are managed against TAC specifications for the EEZ and near coastal waters of the GOA. State of Alaska internal water groundfish populations are typically not covered by NMFS surveys and catches from internal water fisheries generally not counted against the TAC. The Team has recommended that these catches represent fish outside of the assessed region, and should not be counted against an ABC or TAC. Beginning in 2000, the pollock assessment incorporated the ADF&G survey pollock biomass, therefore, the Plan Team acknowledged that it is appropriate to reduce the Western (W), Central (C) and West Yakutat (WY) combined GOA pollock ABC by the anticipated Prince William Sound (PWS) harvest level for the State fishery. Therefore, the 2012 and 2013 PWS GHL of 2,770 t should be deducted from the W/C/WY pollock ABC before area apportionments are made.

The Plan Team has provided subarea ABC recommendations on a case-by-case basis since 1998 based on the following rationale. The Plan Team recommended splitting the EGOA ABC for species/complexes that would be disproportionately harvested from the West Yakutat area by trawl gear. The Team did not split EGOA ABCs for species that were prosecuted by multi-gear fisheries or harvested as bycatch. For those species where a subarea ABC split was deemed appropriate, two approaches were examined. The point estimate for WY biomass distribution based on survey results was recommended for seven species/complexes to determine the WY and East Yakutat/Southeast Outside subarea ABC splits. For some species/complexes, a range was recommended bounded by the point estimate and the upper end of the 95% confidence limit from all three surveys. The rationale for providing a range was based on a desire to incorporate the variance surrounding the distribution of biomass for those species/complexes that could potentially be constrained by the recommended ABC splits.

No Split	Split, Point Estimate	Split, Upper 95% CI
Pacific cod	Pollock	Pacific ocean perch
Atka mackerel	Sablefish	Dusky rockfish
Shortraker rockfish	Deep-water flatfish	
Rougheye/blackspotted rockfish	Shallow-water flatfish	
Thornyhead	Rex sole	
Northern rockfish	Arrowtooth flounder	
Demersal shelf rockfish	Flathead sole	
All skates	Other rockfish	

Biological Reference Points

A number of biological reference points are used in this SAFE. Among these are the fishing mortality rate (F) and stock biomass level (B) associated with MSY (F_{MSY} and B_{MSY}, respectively). Fishing mortality rates reduce the level of spawning biomass per recruit to some percentage P of the pristine level ($F_{P\%}$). The fishing mortality rate used to compute ABC is designated F_{ABC}, and the fishing mortality rate used to compute the overfishing level (OFL) is designated F_{OFL}.

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 to the GOA Groundfish FMP, approved by the Council in June 1998, defines ABC and OFL for the GOA groundfish fisheries. The new definitions are shown below, where the fishing mortality rate is denoted F, stock biomass (or spawning stock biomass, as appropriate) is denoted B, and the F and B levels corresponding to MSY are denoted F_{MSY} and B_{MSY} respectively.

Acceptable Biological Catch is a preliminary description of the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The fishing mortality rate used to calculate ABC is capped as described under "overfishing" below.

Overfishing is defined as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The SSC will have final authority for determining whether a given item of information is reliable for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. For Tier (1), a pdf refers to a probability density function. For tiers (1-2), if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For tiers (1-5), if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For tiers (1-3), the coefficient α is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For tiers (2-4), a designation of the form "$F_{X\%}$" refers to the F associated with an equilibrium level of spawning per recruit (SPR) equal to X% of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view SPR calculations based on a knife-edge maturity assumption as reliable. For tier (3), the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

Tier

1) Information available: *Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.*
   - 1a) Stock status: $B/B_{MSY} > 1$
     $F_{OFL} = \mu_A$, *the arithmetic mean of the pdf*
     $F_{ABC} \leq \mu_H$, *the harmonic mean of the pdf*
   - 1b) Stock status: $\alpha < B/B_{MSY} \leq 1$
     $F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     $F_{ABC} \leq \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 1c) Stock status: $B/B_{MSY} \leq \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
2) Information available: *Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.*
   - 2a) Stock status: $B/B_{MSY} > 1$
     $F_{OFL} = F_{MSY}$
     $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$
   - 2b) Stock status: $\alpha < B/B_{MSY} \leq 1$
     $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 2c) Stock status: $B/B_{MSY} \leq \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
3) Information available: *Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.*
   - *3a) Stock status:* $B/B_{40\%} > 1$
     $F_{OFL} = F_{35\%}$
     $F_{ABC} \leq F_{40\%}$
   - *3b) Stock status:* $\alpha < B/B_{40\%} \leq 1$
     $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
     $F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
   - *3c) Stock status:* $B/B_{40\%} \leq \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
4) Information available: *Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.*
   $F_{OFL} = F_{35\%}$
   $F_{ABC} \leq F_{40\%}$
5) Information available: *Reliable point estimates of B and natural mortality rate M.*
   $F_{OFL} = M$
   $F_{ABC} \leq 0.75 \times M$
6) Information available: *Reliable catch history from 1978 through 1995.*
   OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information
   $ABC \leq 0.75 \times OFL$

<u>Overfished or approaching an overfished condition</u> is determined for all age-structured stock assessments by comparison of the stock level in relation to its MSY level according to the following two harvest scenarios (Note for Tier 3 stocks, the MSY level is defined as $B_{35\%}$):

Overfished (listed in each assessment as scenario 6):

In all future years, F is set equal to F_{OFL}. (Rationale: This scenario determines whether a stock is overfished. If the stock is expected to be 1) above its MSY level in 2011 or 2) above ½ of its MSY level in 2011 and above its MSY level in 2021 under this scenario, then the stock is not overfished.)

Approaching an overfished condition (listed in each assessment as scenario 7):

In 2012 and 2013, *F* is set equal to *max* F_{ABC}, and in all subsequent years, *F* is set equal to F_{OFL}. (Rationale: This scenario determines whether a stock is approaching an overfished condition. If the stock is expected to be above its MSY level in 2024 under this scenario, then the stock is not approaching an overfished condition.)

For stocks in Tiers 4-6, no determination can be made of overfished status or approaching an overfished condition as information is insufficient to estimate the MSY stock level.

Overview of Stock Assessments

The current status of individual groundfish stocks managed under the FMP is summarized in this section. The abundances of Pacific cod, sablefish, flathead sole, arrowtooth flounder, northern and southern rocksole, Dover sole, Pacific ocean perch, rougheye and blackspotted rockfish, northern rockfish, and dusky rockfish are above B_{MSY}. The abundance of pollock is below B_{MSY} (Fig. 2). The target biomass levels for other deep-water flatfish (excluding Dover sole), other shallow-water flatfish, rex sole, shortraker rockfish, demersal shelf rockfish, other rockfish, thornyhead rockfish, Atka mackerel, skates, sculpins, squid, octopus, and sharks are unknown.

Summary and Use of Terms

Tables 1 and 2 provide a summary of the current status of the groundfish stocks, including catch statistics, ABCs, and TACs for 2011, and recommendations for ABCs and overfishing levels (OFLs) for 2012 and 2013. The added year was included to assist NMFS management since the TAC setting process allows for a period of up to two years to review harvest specifications. Fishing mortality rates (*F*) and OFLs used to set these specifications are listed in Table 3. ABCs and TACs are specified for each of the Gulf of Alaska regulatory areas illustrated in Figure 1. Table 4 provides a list of species for which the ABC recommendations are below the maximum permissible. Table 5 provides historical groundfish catches in the GOA, 1956-2011.

The sum of the preliminary 2012, 2013 ABCs for target species are 618,659 t (2012), 626,273 t (2013) which are within the FMP-approved optimum yield (OY) of 116,000 - 800,000 t for the Gulf of Alaska. The sum of 2012 and 2013 OFLs are 763,371 t and 773,770 t, respectively. The Team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 2012 will be considerably under this upper limit. For perspective, the sum of the 2011 TACs was 318,291 t, and the sum of the ABCs was 590,124 t.

The following conventions in this SAFE are used:

(1) "Fishing mortality rate" refers to the full-selection *F* (i.e., the rate that applies to fish of fully selected sizes or ages). A full-selection *F* should be interpreted in the context of the selectivity schedule to which it applies.

(2) For consistency and comparability, "exploitable biomass" refers to projected age+ biomass, which is the total biomass of all cohorts greater than or equal to some minimum age. The minimum age varies from species to species and generally corresponds to the age of recruitment listed in the stock assessment. Trawl survey data may be used as a proxy for age+ biomass. The minimum age (or size), and the source of the exploitable biomass values are defined in the summaries. These values of exploitable biomass may differ from listed in the corresponding stock assessments if the technical definition is used (which requires multiplying biomass at age by selectivity at age and summing over all ages). In those models assuming knife-edge recruitment, age+ biomass and the technical definitions of exploitable biomass are equivalent.

(3) The values listed as 2010 and 2011 ABCs correspond to the values (in metric tons, abbreviated "t") approved by NMFS. The Council TAC recommendations for pollock were modified to accommodate revised area apportionments in the measures implemented by NMFS to mitigate pollock fishery interactions with Steller sea lions and for Pacific cod removals by the State water fishery of not more than 25% of the Federal TAC. The values listed for 2012 and 2013 correspond to the Plan Team recommendations.

(4) The exploitable biomass for 2010 and 2011 that are reported in the following summaries were estimated by the assessments in those years. Comparisons of the projected 2012 biomass with previous years' levels should be made with biomass levels from the revised hindcast reported in each assessment.

(5) The values used for 2012 and 2013 were either updated directly with new survey data (typically for Tiers 4-6), or based on updated model projections including new survey data. Note that projection values often assume catches and hence their values are likely to change (as are the Tiers 4-6 numbers when new data become available).

Two year OFL and ABC Determinations

Amendment 48/48 to the GOA and BSAI Groundfish FMPs, implemented in 2005, removed the requirement for annual assessments of rockfishes, flatfish, and Atka mackerel since new survey data were unavailable in alternating years. Full assessments were provided in 2011 to coincide with new survey data available from the 2011 GOA trawl and longline surveys.

This amendment also requires proposed and final specifications for a minimum of two years thus ABC and OFL levels are provided for 2012 and 2013 (Table 1). In the case of stocks managed under Tier 3, 2012 and 2013 ABC and OFL projections are typically based on the output for Scenarios 1 or 2 from the standard projection model using assumed (best estimates) of actual catch levels. For stocks managed under Tiers 4 and 5 the latest survey data (2011) was used. Tier 6 stocks may have alternatives based on updated catch information.

The 2013 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2013 because data from 2013 surveys are anticipated and a re-evaluation on the status of stocks will improve on the current available information for recommendations.

Economic Summary of the GOA Commercial Groundfish Fisheries in 2009-10

The domestic groundfish fishery off Alaska is the largest fishery by volume in the U.S. The Economic SAFE report (appendix bound separately) contains detailed information about economic aspects of the fishery, including figures and tables, market profiles for the most commercially valuable species, a summary of the relevant research being undertaken by the Economic and Social Sciences Research Program (ESSRP) at the Alaska Fisheries Science Center (AFSC) and a list of recent publications by ESSRP analysts.

More specifically, the figures and tables in the report provide estimates of total groundfish catch, groundfish discards and discard rates, prohibited species catch (PSC) and PSC rates, the ex-vessel value of the groundfish catch, the ex-vessel value of the catch in other Alaska fisheries, the gross product value (F.O.B. Alaska) of the resulting groundfish seafood products, the number and sizes of vessels that participated in the groundfish fisheries off Alaska, vessel activity, and employment on at-sea processors. Generally, the data presented in this report cover the years 2006 through 2010, but limited catch and ex-vessel value data are reported for earlier years in order to illustrate the rapid development of the domestic groundfish fishery in the 1980s and to provide a more complete historical perspective on catch.

In addition, the Economic SAFE report contains links to data on some of the external factors that, in part, determine the economic status of the fisheries. Such factors include foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, domestic per capita consumption of seafood products, and fishery imports.

The Economic SAFE report also updates the set of market profiles for pollock, Pacific cod, sablefish, and flatfish published here in the last four years' reports. These analyses discuss the relatively recent states of the markets for these species in terms of pricing, volume, supply and demand. Trade patterns and market share are also discussed.

A new section has been added to the Economic SAFE report this year that analyzes economic performance using indices. Indices for different sectors of the North Pacific relate changes in value, price, and quantity across species, product and gear types to aggregate changes in the market. The tables from this and past Economic SAFE reports are available online at http://www.afsc.noaa.gov/REFM/Socioeconomics/documents.php.

A decomposition of the change in first-wholesale revenues from 2009-10

The following brief analysis summarizes the overall changes that have occurred in the quantity produced, value, and revenue generated from Alaska groundfish (Figure 3). According to data reported in the 2011 Economic SAFE report, first-wholesale revenues from the processing and production of Alaska groundfish in the Gulf of Alaska (GOA) grew from approximately $251.1 million in 2009 to $309.8 million in 2010, an increase of 23.4%. During that same time-period, the total quantity of groundfish products from the GOA increased from 67.1 thousand metric tons to 91.5 thousand metric tons, a difference of 21.4 thousand metric tons. These changes in the GOA account for part of the change in first wholesale revenues from Alaska groundfish fisheries overall which increased by 2.4% in 2010 relative to 2009 levels.

By species, positive quantity effects for Pacific cod and pollock in 2009-10 dominate results of the first-wholesale revenue decomposition in the GOA, with a combined net effect of $55.3 million. In addition, there were modest positive price and quantity effects for rockfish which added $7.2 million to the total change in GOA first-wholesale revenues for 2009-2010, but these were offset by negative effects for flatfish of -$6.2 million for these years. Positive quantity effects for cod and pollock correspond to positive quantity effects for the fillet, whole head & gut, and surimi product groups for all species.

Overall, the GOA had positive quantity effects across product groups in the decomposition of the 2009-10 change in first-wholesale revenues, and by species, these were driven by positive quantity effects for cod and pollock. To summarize, these changes implied positive net effects in first-wholesale revenues of $58.6 million for the GOA, compared to negative net effects that lead to a -$14.3 million decrease in first-wholesale revenues for the Bering Sea Aleutian Islands (BSAI) area.

Ecosystem Considerations-Gulf of Alaska

The Ecosystem Considerations chapter (appendix bound separately) consists of three sections: ecosystem assessment, ecosystem status indicators, and ecosystem-based management indices and information. The ecosystem assessment section, introduced in 2003, combines information from the stock assessment chapters with the two other sections of this chapter to summarize the climate and fishery effects. The Gulf of Alaska Ecosystem Assessment Team has scheduled a workshop in the winter of 2012 after which an ecosystem assessment of the GOA will be completed. Until then, we summarize GOA contributions to the ecosystem considerations chapter below.

New trends highlighted in the 2011 ecosystem considerations chapter include:

- Physical conditions: North Pacific atmosphere-ocean system during 2010-2011 reflected the typical response to La Niña. Cooler than normal upper ocean temperatures prevailed in the eastern portion of the North Pacific and warmer than normal temperatures occurred in the west-central and then central portion of the basin. Eddy Kinetic Energy (EKE) levels were very low in both NGOA and off Kodiak in 2009 and higher 2010. The mixed layer depths in the Gulf have been near their seasonal norms. The poleward branch of the Alaska Current in the southeastern portion of the Gulf declined considerably over the last 18 months since its peak in the winter of 2009-10.
- The pattern in water temperatures was generally similar to the pattern seen during the 2009 survey. East of 160°W, the water column was stratified with relatively warm near-surface waters and temperatures rapidly dropping to 6°C or less in the upper 50 meters. West of 160°W, near surface temperatures (<50 m) were much cooler and deeper waters were generally warmer than further east with a prominent inversion pattern noted at most stations.
- Phytoplankton biomass was probably more tightly confined to the shelf during 2009 due to the absence of eddies, while in 2007 and 2010, phytoplankton biomass likely extended farther off the shelf. Cross-shelf transport of heat, salinity and nutrients were likely to be smaller in 2009 than in 2007 and 2010 (or other years with large persistent eddies).

- Within year spatial patterns in chlorophyll a (chla) were apparent during a new annual survey of the Alexander Archipelago in 2010. Elevated concentrations of chla were found north of Cross Sound in spring and summer, and north of the entrance to Chatham Strait during summer.
- The seasonal cycle of mesozooplankton biomass in the eastern North Pacific during 2010 was average in terms of timing and duration of season. Mesozooplankton community analysis identified transition years: 2003 transitioning from cold to warm, 2006 transitioning from warm to cold, and neutral years in 2009 and 2010.
- Forage species catch rates in small mesh surveys remain at low levels, one to two orders of magnitude lower than peak values observed in the 1970s and early 1980s. The exception to this trend is eulachon which has had the highest catch rates of the time series in recent years.
- Arrowtooth flounder, flathead sole, and other flatfish continue to dominate the catches in the ADF&G Kodiak trawl survey. In 2010, above average anomaly values were recorded for both inshore and offshore skates, and Tanner crabs, while arrowtooth flounder, flathead sole, and Pacific cod have decreased to below average values.
- Total trawl survey CPUE in the western GOA varied over time with a decrease between 2005 and 2007. A similar pattern in the eastern GOA shows the trend increasing significantly.
- Bottom and pelagic trawl fishing has remained below the long term mean. Fishing effort with pot gear has declined recently; longline effort has increased. Discarded tons of groundfish decreased in 2010, as the discard rate decreased from approximately 16% in 2009 to 10% in 2010. The catch of forage species has undergone large variations, peaking in 2005 and 2008 and decreasing in 2006-2007 and 2009-2010.

Other Plan Team discussions

Two “Hot Topics” were identified in the GOA. 1) “Mushy" Halibut Syndrome has been observed with varying frequency for over 5 years, mostly in smaller halibut of 15-20 lb in the Cook Inlet area. There have been only been 2 recorded reports from outside Cook Inlet - one from Kodiak, and one from Yakutat. In 2011 sport fishers noticed increasing numbers of affected fish. The leading hypothesis is that a nutritional deficiency is the cause. 2) Infectious salmon anemia— was identified in i2 of 48 British Columbia wild sockeye salmon smolts (http://www.nytimes.com/2011/10/18/science/18salmon.html). This is the first incidence of this virus on the West Coast of North America. Efforts are underway to determine the impacts of the virus on West Coast salmon farms and wild populations.

1. Walleye pollock

Status and catch specifications (t) of pollock and projections for 2012 and 2013. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th , 2011. Note that the projections for 2013 are subject to change in 2012. The 2012 and 2013 ABCs have been reduced by 2,770 t to accommodate the anticipated Prince William Sound GHL.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
GOA	2010	795,192	115,536	84,745	84,745	75,167
	2011	941,585	130,356	96,215	96,215	79,805
	2012	911,725	158,086	116,444		
	2013		169,766	125,334		
W/C/WYK	2010	754,104	103,210	75,500	75,500	75,167
	2011	893,700	118,030	86,970	86,970	79,805
	2012	863,840	143,720	105,670		
	2013		155,400	114,560		
EYK/SEO	2010	41,088	12,326	9,245	9,245	0
	2011	47,885	12,326	9,245	9,245	0
	2012	47,885	14,366	10,774		
	2013		14,366	10,774		

Changes from previous assessment

The age-structured model developed using AD Model Builder and used for GOA W/C/WYK pollock assessments in 1999-2010 is unchanged. This year's pollock chapter features the following new data: (1) 2010 total catch and catch at age from the fishery, (2) 2011 biomass and length composition from the NMFS bottom trawl survey, and (3) 2011 biomass and length composition from the ADF&G crab/groundfish trawl survey. Recent estimates from both surveys are fit adequately by the model, and there are no large residuals to the fit to recent age data. The fit of Shelikof Strait acoustic survey age composition shows large residuals at age 2 and age 3 in 2006-2009 due to inconsistencies between the initial estimates of abundance and subsequent information about the magnitude of these year classes. The acoustic surveys were cancelled in winter of 2011 so less information was available to assess stock trends and status. Model fits are similar to previous assessments and general trends in survey time series fit reasonably well. The discrepancy between the NMFS trawl survey and the Shelikof Strait acoustic survey biomass estimates in the 1980s accounts for the poor model fit to both time series during those years. The survey time series in the last three years (2009-2011) appear consistent in showing increases, but the magnitudes of the change vary between survey biomass estimates.

Status determination and stock trends

The 2011 NMFS bottom trawl survey biomass estimate was very close to the 2009 estimate (<1% increase). The ADF&G crab/groundfish survey biomass estimate declined 19% from the 2010 biomass estimate, but is 32% above the mean for 2006-2008. The estimated abundance of mature fish in 2012 is projected to be 11% higher than in 2011, and is projected to increase gradually over the next five years.

The model estimate of spawning biomass in 2012 is 227,723 t, which is 33.6% of unfished spawning biomass. The $B_{40\%}$ estimate is 271,000 t. This represents a 2% decrease from the 2010 assessment, and is due to the small reduction in average recruitment.

Pollock are not overfished nor are they approaching an overfished condition. Catches remain below levels where overfishing would be a concern.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Plan Team concurred with the author's recommendation to use the standard model projection and the more conservative adjusted $F_{40\%}$ harvest rate. There are some elements of risk-aversion in this recommendation, such as fixing trawl catchability at 1.0. Until an ABC framework is in place that deals explicitly with scientific uncertainty, the author suggests (and the Team agrees) that this approach is reasonable.

Because model estimated 2012 female spawning biomass is below $B_{40\%}$, the W/C/WYK Gulf of Alaska pollock are in Tier 3b. The Plan Team accepted the author's recommendation to reduce F_{ABC} from the maximum permissible using the "constant buffer" approach (first accepted in the 2001 GOA pollock assessment). The projected 2012 age-3+ biomass estimate is 863,840 t (for the W/C/WYK areas). Markov Chain Monte Carlo analysis indicated the probability of the stock being below $B_{20\%}$ will be negligible in all years. Therefore, the ABC for 2012 based on this precautionary model configuration and adjusted harvest control rule is 108,440 t (F_{ABC} = 0.14) for GOA waters west of 140°W longitude, an increase of 22% from the 2011 ABC. **The ABC is 105,670 for 2012** (reduced by 2,770 t to account for the Prince William Sound GHL). The 2012 OFL under Tier 3b is 143,720 t (F_{OFL}= 0.19). In 2013, the recommended ABC and OFL are 114,560 t (reduced by Prince William Sound GHL) and 155,400 t, respectively.

Southeast Alaska pollock (East Yakutat and Southeastern areas) are in Tier 5 and the ABC and OFL recommendations are based on natural mortality (0.30) and the biomass from the 2011 NMFS bottom trawl survey. The biomass from the 2011 NMFS bottom trawl survey increased to 47,885 t. This results in **2012 ABC of 10,774 t**, and a **2012 OFL of 14,366 t**. Recommendations for 2013 are the same as 2012.

Additional Plan Team Recommendations

A Center for Independent Experts (CIE) review of the pollock assessment is scheduled for 2012. The assessment authors plan to develop some alternative models for comparison at this review. The Plan Team recommends extending the model to cover ages 1-15. The Team also recommends estimating trawl catchability and natural mortality. In September 2011 the Plan Team recommended applying the stock structure template to GOA pollock. The Team recommended that it be completed prior to the CIE review and may help determine the utility of developing area/seasonal models for GOA pollock. Information on the Southeast Alaska stock has increased and may be sufficient for developing a more detailed assessment model. The Plan Team expressed concern that the winter survey was canceled.

Ecosystem Considerations

There were no additions to the pollock stock assessment ecosystem considerations section this year. Previous results suggested that high predation mortality plus conservative fishing mortality might exceed GOA pollock production at present, and that this condition may have been in place since the late 1980s or early 1990s.

Area apportionment

The assessment was updated to include the most recent data available for area apportionments within each season (Appendix C of the GOA pollock chapter). The Team concurred with these updates since they are more likely to represent the current distribution. Area apportionments, reduced by 2,770 t for the State of Alaska managed pollock fishery in Prince William Sound, are tabulated below:

Area apportionments (reduced by 2,770 t) for 2012 and 2013 pollock ABCs for the Gulf of Alaska (t).

Year	610	620	630	640	650	
	W	Central	Central	W. Yakutat	E.Yak/SE	Total
2012	30,270	45,808	26,348	3,244	10,774	116,444
2013	32,816	49,662	28,565	3,517	10,774	125,334

2. Pacific cod

Status and catch specifications (t) of Pacific cod in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5, 2011.

Year	Age 0+ biomass	OFL	ABC	TAC	Catch
2010	701,200	94,100	79,100	59,563	58,003
2011	428,000	102,600	86,800	65,100	58,836
2012	521,000	104,000	87,600		
2013		108,000	91,000		

Changes in assessment data

All survey and commercial data series for CPUE, catch at age, and catch at length were updated. The 2011 NMFS bottom trawl survey estimate of 348 million fish is a 33 percent decrease in abundance over the 2009 survey estimate, which was a 199% increase from the 2007 estimate.

Change in assessment methods

The 2011 GOA Pacific cod assessment evaluated four assessment models. Model 1 is identical to the model accepted by the 2010 GOA Plan Team. Model 3 (a Model 2 was developed, but applied only to the BSAI Pacific cod) included internal estimation of aging bias, a parameter in the length-at-age equation that was increased to correspond to the age of age 1 fish at the time of the survey, and the variability in length-at-age was re-estimated external to the model. Relative to Model 3, Model 3b estimates the variability in length at age internally, includes all size composition records, excludes the fit to the mean size at age, fixes the selectivity and catchability in the 27-plus trawl survey to be constant over time, and uses a normal prior distribution for the catchability deviations in the sub-27 cm survey. Relative to Model 3b, Model 4 does not estimate the ageing bias internally, the age composition data were excluded, and the pre-1977 mean recruitment was constrained to be less than the post-1976 mean recruitment.

Author and Team evaluation of alternative models

The author proposed 6 model evaluation criteria. Because no model met all criteria, the criteria were prioritized with the highest four criteria being: 1) use of (and fit to) the age composition data; 2) internal estimation of aging error bias; 3) correspondence between the model-estimated mean size-at-age and the empirical survey mean-size-at-age and first few modes of the average survey size composition; and 4) correspondence of the product of survey catchability and survey selectivity (for the 61-80 cm size range) from the model and the value of 0.92 estimated by Nichol et al. (2007). The author recommended Model 3 because of the good fit to the age composition data, and correspondence to the age 1 and 3 survey size

composition modes and the Nichol et al. (2007) estimate of the product of survey catchability and selectivity.

The Plan Team agrees with the authors that Model 3 is the preferred model. Model 1 can interpret age 1 fish as the sum of age 0 and age 1 fish, which can bias recruitment estimates. This issue is addressed in the other models by specifying age 0 data in the age composition and mean size at age input files. Internal estimation of ageing bias is considered an improvement from the 2010 model, and is not included in Model 4. Model 3b estimates the product of catchability and selectivity for 61-80 cm fish at 0.67, substantially below the value of 0.92 obtained by Nichol et al. (2007). In the absence of other data indicating the catchability of the stock, the Plan Team agreed that matching the Nichol et al. (2007) estimate was a useful criterion. Finally, the retrospective patterns indicate that inclusion of additional data tends to decrease estimates of abundance, which further supports models with a higher level of survey catchability.

Status determination and stock trends

Recent catches have been well below OFL. The stock was not subjected to overfishing in 2010, and is not determined to be overfished in 2011. Estimated age-0 recruitment has been relatively strong since 2005, and stock abundance is expected to increase in the near term.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

$B_{40\%}$ for this stock is estimated to be 104,000 t and projected spawning biomass in 2012 according to Model 3 is 121,000 t, so this stock is assigned to Tier 3a. Neither the author nor the Team saw any compelling reason to recommend OFL or ABC values lower than prescribed by the standard control rule. The current values of $F_{35\%}$ and $F_{40\%}$ are 0.53 and 0.44.

Area apportionment

At present, the ABC of Pacific cod is apportioned among regulatory areas based on the three most recent trawl surveys. The apportionments based on the average area-specific biomass estimates from the 2007-2011 surveys are 32% in the Western GOA, 65% in the Central GOA, and 3% in the Eastern GOA. An alternative that is used in the Bering Sea - Aleutian Islands based on a Kalman filter approach would result in apportionments of 35% in the Western GOA, 61% in the Central GOA, and 4% in the Eastern GOA. The Team did not see any compelling biological reason to recommend one alternative over another. The numbers below use the same approach as in past years.

	Western	Central	Eastern	Total
2012	28,032	56,940	2,628	87,600
2013	29,120	59,150	2,730	91,000

3. Sablefish

Status and catch specifications (t) of sablefish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Age 4+ biomass	OFL	ABC	TAC	Catch
2010	140,000	12,270	10,370	10,370	10,086
2011	149,000	13,340	11,290	11,290	11,057
2012	180,000	15,330	12,960		
2013		15,129	12,794		

Changes in assessment data

Relative abundance and length data from the 2011 longline survey, relative abundance and length data from the 2010 longline and trawl fisheries, relative abundance and length data from the 2011 GOA trawl survey, age data from the 2010 longline survey and 2010 longline fishery, updated 2010 catch and estimated 2011 catch were added to the assessment model. The fishery abundance index was down 9% from 2009 to 2010 (the 2011 data are unavailable). The survey abundance index increased 3% from 2010 to 2011 following a 10% increase from 2009 to 2010.

Change in assessment methods

There were no changes in the assessment model.

Author and Team evaluation of alternative models

The model likelihood components and key parameter estimates from 2010 were compared with the 2011updated model. The 2011 update shows some increases in recent recruitment and an increase in total biomass from previous projections.

A reanalysis of the longline survey index, specifically to address the depredation issues with both killer whales and sperm whales was discussed. While substantial progress has been made, the new index is not ready to be utilized until several issues are fully explored. The authors expect to incorporate the new index into the 2012 assessment. Work is also in progress on an updated migration model through 2009.

Status determination and stock trends

Recent catches have been below OFL therefore overfishing is not occurring. The Alaska-wide sablefish stock is not overfished and is not approaching an overfished condition.

Spawning biomass has increased from a low of 30% of unfished biomass in 2002 to 37% projected for 2012. The 1997 year class has been an important contributor to the population but has been reduced and should comprise 10% of the 2012 spawning biomass. The 2000 year class appears to be larger than the 1997 year class, and is now mature and should comprise 23% of the spawning biomass in 2012. The 2002 year class is estimated to be about 10% of spawning biomass in 2012 and is 92% mature.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

$B_{40\%}$ for this stock is estimated to be 108,600 t and projected spawning biomass in 2012 is 101,300 t, so this stock is assigned to tier 3b. Neither the author nor the Team saw any compelling reason to recommend OFL or ABC values lower than prescribed by the standard control rule. The current values of $F_{35\%}$ and $F_{40\%}$ are 0.114 and 0.096, respectively; the Tier 3b adjusted values are 0.106 and 0.089, respectively.

Area apportionment

Sablefish are apportioned based on a 5-year exponential weighting of the survey and fishery abundance indices. The same algorithm is used to apportion the 2012 and 2013 ABC and OFL.

	2011				2012		2013	
Region	OFL	ABC	TAC	Catch*	OFL	ABC	OFL	ABC
BS	3,310	2,850	2,850	617	2,640	2,230	2,605	2,201
AI	2,450	1,900	1,900	849	2,430	2,050	2,398	2,024
GOA	12,270	11,290	11,290	11,057	15,330	12,960	15,129	12,794
Alaska-wide	18,950	16,040	16,040	12,523	20,400	17,240	20,132	17,019
W	--	1,620	1,620	1,390	--	1,780	--	1,757
C	--	4,740	4,740	4,799	--	5,760	--	5,686
WYAK	--	1,990+	1,990+	1,876	--	2,247	--	2,219
SEO	--	2,940+	2,940+	2,992	--	3,173	--	3,132
GOA total	12,270	11,290	11,290	11,057	15,330	12,960	15,129	12,794

* Catch through Nov 5 2011.

+ 95:5 split in the EGOA following the trawl ban in SEO

4. Shallow water flatfish

Status and catch specifications (t) of shallow water flatfish and projections for 2012 and 2013. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	398,961	67,768	56,242	20,062	5,534
2011	398,961	67,768	56,242	20,062	3,945
2012	443,069	61,681	50,683		
2013		56,781	46,483		

Changes in assessment methodology and data

The shallow water flatfish complex is made up of northern rock sole, southern rock sole, yellowfin sole, butter sole, starry flounder, English sole, sand sole, Alaska plaice and other minor species. There were no changes in the assessment methodology for Tier 5 (non-rock sole species) but a Tier 3 assessment methodology was adopted for northern and southern rock sole. This catch-at-age model was updated with fishery catch data, fishery catch-at-length data, NMFS bottom trawl survey age composition and size-at-age data from 1984, 1987, 1990, 2001, 2003, 2005, 2007, and 2009 and bottom trawl survey biomass and size compositions from the 2011 survey. For the remainder of the flatfish complex, the 2011 survey biomass was the only new input data. Relative the 2009 survey biomass (436, 590 t), total shallow water flatfish biomass decreased 9% in 2011.

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria for the complex. For the rock sole species, the assessment model indicates they are not overfished nor are they approaching an overfished condition. Catch levels for this complex remain below the TAC and below levels where overfishing would be a concern.

Stock status for shallow water flatfish is based on the NMFS bottom trawl survey (triennial from 1984 to 1999 and biennial from 1999 to 2011). Survey abundance estimates for the entire shallow-water complex were lower in 2011 compared to 2009; decreasing by 37,629 t. By species, southern rock sole has a generally increasing trend in abundance, although biomass decreased between 2009 and 2011. Northern

rock sole has general increasing trend through 2007 and then has been decreasing since. The remainder of the species in the shallow water flatfish complex have varying trends, although most species increased in abundance between 2009 and 2011 with the exception of sand sole and English sole.

Tier determination/Plan Team discussion resulting ABCs and OFLs

The F_{ABC} and F_{OFL} values for southern rock sole were estimated as: $F_{40\%}$=0.16 and $F_{35\%}$ = 0.19, respectively. For northern rock sole the values are: $F_{40\%}$=0.18 and $F_{35\%}$ =0.214. Other flatfish ABCs were estimated with F_{ABC}=0.75 M and F_{OFL}=M.

For the shallow water flatfish complex, ABC and OFL for southern and northern rock sole are combined with the ABC and OFL for the rest of the shallow water flatfish complex. This yields a combined ABC of 50,683 t and OFL of 61,681 t for 2012. For 2013 the combined ABC of 46,483 t and the OFL is 56,781 t.

The ABC and OFL for 2012 and 2013 shallow-water flatfish are lower than the 2010 and 2011 due to a decline in survey biomass. The GOA Plan Team agrees with authors' recommended ABC for the shallow water flatfish complex which was equivalent to maximum permissible ABC.

Ecosystem Considerations summary

Flatfish consume a variety of benthic organisms. Fish prey make up a large part of the diet of rock sole adults and possibly sand sole (although the sample size was small for sand sole). Other flatfishes consume mostly polychaetes, crustaceans and mollusks.

Area apportionment

Area apportionments of shallow water flatfish ABCs (using $F_{40\%} = F_{ABC}$ for northern and southern rock sole and F_{ABC}= 0.75*M for the rest of the flatfish complex*)* for 2012 and 2013 are based on the fraction of the 2011 survey biomass in each area.

Year	Western	Central	West Yakutat	East Yakutat/SE	Total
2012	21,994	22,910	4,307	1,472	50,683
2013	20,171	21,012	3,950	1,350	46,483

5. Deep water flatfish complex (Dover sole and others)

Status and catch specifications (t) of deep water flatfish (*Dover sole and others*) and projections for 2012 and 2013. Biomass for each year corresponds to the estimate given when the ABC was determined. Catch data in this table are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	89,682*	7,680	6,190	6,190	544
2011	89,691*	7,823	6,305	6,305	460
2012	77,531	6,834	5,126		
2013		6,834	5,126		

* Model and survey biomass estimates from the 2009 assessment.

Changes in assessment data

Updated fisheries catch data for 2010 and 2011, fisheries size compositions for 2010 and 2011, survey biomass estimates for 2011, survey size compositions for 2011, and survey age compositions for 2009 were incorporated into an age-structured model for Dover sole. The 2011 NMFS bottom trawl survey biomass estimate (77,531 t) showed a 2% percent increase in biomass over the 2009 survey (76,277 t).

Changes in assessment methods

The deep water flatfish complex is comprised of Dover sole, Greenland turbot, and deepsea sole. Catch and trawl survey biomass data for Dover sole, Greenland turbot and deepsea sole are updated to 2011. For Dover sole, an updated age-structured assessment model was presented.

Author and Team evaluation of alternative models

The sex and age-structured model for Dover sole is similar to what was presented in 2009. The model fit the survey biomass relatively well, but underestimated large catches in the early 1990s. The model resulted in unrealistically high biomass values and was substantially different than the previous model estimates. The author and Team were concerned with this and concluded that further evaluation was needed and was inappropriate to apply for management recommendations. Some parameters converged at their bounds and the selectivity estimates seemed questionable.

The Team agrees with the author's recommendation to move Dover sole into Tier 5 until the model can be more fully evaluated. The Team requested a review of the revised model in September 2012.

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria for Tier 5 and 6 species. Catch levels for this complex remain below the TAC and below levels where overfishing would be a concern.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Dover Sole was in Tier 3a but due to concerns about the validity of the model the Plan Team recommended that it be moved to Tier 5. Both Greenland turbot and deepsea sole are in Tier 6. The Tier 6 calculation (based on average catch from 1978-1995) for the remaining species in the deep water flatfish complex ABC is 183 t and the OFL is 244 t. These values apply for 2012 and 2013 ABC and OFLs.

For the Dover sole Tier 5 assessment the 2012 and 2013 ABC using F_{ABC}=0.75* M = 0.064 results in **4,943 t**. The 2012 and 2013 OFL using F_{OFL}=M = 0.085 results in **6,590 t**. The GOA Plan Team agrees with the authors' recommendation to use the combined ABC (5,126 t) and OFL (6,834 t) for the deep water flatfish complex. The ABC is equivalent to the maximum permissible ABC.

Area apportionment

Area apportionments of deep water flatfish (excluding Dover sole) are based on proportions of historical catch. Area apportionments of Dover sole are based on the fraction of the 2011 survey biomass in each area.

Area apportionments of deep water flatfish (*Dover sole and others*) ABC's for 2012 and 2013 (using F_{ABC}) are based on the fraction of the 2011 survey biomass in each area.

Year	Western	Central	West Yakutat	East Yakutat/SE	Total
2012	176	2,308	1,581	1,061	5,126
2013	176	2,308	1,581	1,061	5,126

6. Rex Sole

Status and catch specifications (t) of rex sole and projections for 2012 and 2013. Biomass for each year corresponds to the projections given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Adult Biomass	OFL	ABC*	TAC	Catch
2010	88,221	12,714	9,729	9,729	3,636
2011	86,974	12,499	9,565	9,565	2,853
2012	87,162	12,561	9,612		
2013		12,326	9,432		

*ABC values are calculated using the catch equation applied to beginning year biomass values estimated by author's age structured model.

Changes from previous assessment

An age-structured model for rex sole was first presented in 2004. One model was presented which was the same as the base model used in 2009. The assessment input data was updated as follows:

1. The fishery catch and length compositions for 2010 and 2011 (through Sept. 24, 2011) were incorporated in the model.
2. The 2009 fishery catch and length compositions were updated.
3. The 2011 GOA groundfish survey biomass estimate and length composition data were added to the model.
4. Two years (1999, 2009) of survey age compositions were added to the model.

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria. Catches of rex sole are well below TACs and below levels where overfishing would be a concern.

Survey biomass decreased from 124,744 t in 2009 to 95,134 t in 2011 which is a 24% decline. Despite the decrease, the 2011 estimate is similar to the 2003-2011 mean due to an exceptionally high 2009 biomass estimate. The assessment model indicates that total biomass (age 3+) increased for the years 2000-2010 and slightly decreased in 2011. Female spawning biomass followed a similar pattern but increased in 2011 and is the largest in the time series (52,600 t).

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Beginning in 2005, the Plan Team adopted a Tier 5 approach (using model estimated adult biomass) for rex sole ABC recommendations due to unreliable estimates of $F_{40\%}$ and $F_{35\%}$. For 2012, the author and Team continue to recommend this approach. Using $F_{ABC} = 0.75M = 0.128$ results in a 2012 ABC of 9,612 t and an OFL of 12,561 t. These estimates are slightly higher than the 2011 ABC and OFLs. Using the model's projection of 85,528 t adult biomass for 2013 results in an ABC of 9,432 t and an OFL of 12,326 t for 2013.

The Team recommended the author continue to consider obtaining fishery age composition data for input into the model.

Ecosystem Considerations summary

Rex sole are benthic feeders and little is known about prey species abundance trends. Major predators are longnose skates and arrowtooth flounder. Prohibited species such as halibut, salmon, and crab are taken to some extent in the rex sole directed fishery. In 2011 (through September), the overall prohibited species catch (PSC) for halibut was 172 t, which was much lower than the exceptionally high 2010 catch of 388 t.

Area apportionment

Area apportionments of rex sole ABCss (using $F_{40\%}$) for 2012 and 2013 are based on the fraction of the 2011 survey biomass in each area.

	Western	Central	West Yakutat	East Yakutat/SE	Total
2012	1,307	6,412	836	1,057	9,612
2013	1,283	6,291	821	1,037	9,432

7. Arrowtooth flounder

Status and catch specifications (t) of arrowtooth flounder and projections for 2012 and 2013. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data in this table are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	2,139,000	254,271	215,882	43,000	24,334
2011	2,121,440	251,068	213,150	43,000	29,703
2012	2,161,690	250,100	212,882		
2013		249,066	212,033		

Changes in assessment data

New data include updated 2009, 2010, and 2011 catch (through September 17, 2011). The 2011 survey biomass and length data were added to the model. Fishery length data for 2009 was updated and 2010 and 2011 were added to the model. Survey age data were added for 2007 and 2009.

Change in assessment methods

The same model configuration was used as in 2009, but the added constraint on the last three estimated recruitments was removed.

Author and Team evaluation of alternative models

No alternative models were evaluated.

Status determination and stock trends

The stock is not overfished nor approaching an overfished condition. Catch levels for this stock remain below the TAC and below levels where overfishing would be a concern.

The estimated age 3+ biomass from the model has increased by an order of magnitude since 1961 and peaked at about 2.2 million t in 2006. Since then the stock has stabilized. The age 3+ biomass estimates are slightly higher in the current assessment than the projected 2009 assessment estimates. Female spawning biomass in 2011 is estimated to be 1,238,210 t, a <1% decrease from the projected 2011 biomass from the 2009 assessment.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Arrowtooth flounder has been determined to fall under Tier 3a. The 2012 ABC using $F_{40\%}$=0.174 is 212,882 t, a slight decrease from the 2011 ABC of 213,150 t. The 2012 OFL using $F_{35\%}$=0.207 is 250,100 t. The 2013 ABC (212,033 t) and OFL (249,066 t) were estimated using the projection model and catch in 2012 estimated using the recent 5-year average (F=0.020). The final catch for 2011 was not projected ahead for the year; the author used 2011 catch through Sept. 17, 2011. The Team recommends that the author project the catch to the end of the year for the next assessment.

The GOA Plan Team agrees with authors recommended ABC for arrowtooth flounder which was equivalent to maximum permissible ABC.

Ecosystem Considerations summary

The ecosystem considerations section was updated in 2011 to include an expanded appendix of trends and model-based information on the role of arrowtooth flounder in the GOA ecosystem. Arrowtooth flounder continue to dominate the catches in the Gulf of Alaska trawl survey and likely play an important role in the Gulf of Alaska ecosystem as a predator and competitor.

Area apportionment

Area apportionments of arrowtooth flounder ABCs for 2012 and 2013 are based on the fraction of the 2011 survey biomass in each area and applying that fraction to the ABC.

Year	Western	Central	West Yakutat	East Yakutat/SE	Total
2012	27,495	143,162	21,159	21,066	212,882
2013	27,386	142,591	21,074	20,982	212,033

8. Flathead Sole

Status and catch specifications (t) of flathead sole in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
2010	303,140	59,295	47,422	10,411	3,842
2011	297,130	61,412	49,133	10,587	2,671
2012	292,189	59,380	47,407		
2013		60,219	48,081		

Changes from previous assessment

The authors' and Team's preferred model was the same as the base model used in 2009. The assessment was updated as follows:

1. The fishery catch and length compositions for 2010 and 2011 (through Sept. 24, 2011) were incorporated in the model.
2. The 2009 fishery catch and length compositions were updated.
3. Age compositions from the 2001 and 2009 groundfish surveys were added to the model.
4. The 2011 GOA groundfish survey biomass estimate and length composition data were added to the model.

Status determination and stock trends

The stock is not overfished nor approaching an overfished condition. Catch levels for this stock remain below the TAC and below levels where overfishing would be a concern.

Survey biomass increased from 225,377 t in 2009 to 235,639 t in 2011. Projected female spawning biomass is estimated at 104,301 t for 2012, which is less than the projected 2010 model estimate for 2012 (115,427 t).

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Flathead sole are determined to be in Tier 3a based on the age-structured model. The Team agreed with the author's preferred model which gives a 2012 ABC using $F_{40\%}$ (0.450) of 47,407 t. This ABC is 1,726 t lower than the 2011 ABC. The 2012 OFL using $F_{35\%}$ (0.593) is 59,380 t. The Team noted the model's starting point is 1984 and encouraged the author to investigate starting the model in 1977 since catches from 1977-1984 are presented in the assessment. In addition, the Team recommends the author work to

incorporate an ageing error matrix for flathead sole for use in the model. The Team also encourages the model be configured to accept fishery ages and that the available sample sizes be evaluated.

Ecosystem Considerations summary

Flathead sole are benthic feeders and little is known about prey species abundance trends. Major predators are arrowtooth flounder and other groundfish. Ecosystem models have found that the largest component of mortality on adult flathead sole is unexplained.

Area apportionment

Area apportionments of flathead sole ABCs for 2012 and 2013 are based on the fraction of the 2011 survey biomass in each area.

Year	Western	Central	West Yakutat	East Yakutat/SE	Total
2012	15,300	25,838	4,558	1,711	47,407
2013	15,518	26,205	4,623	1,735	48,081

Slope Rockfish

GOA slope rockfish are on a biennial stock assessment schedule to coincide with new survey data. This year's assessments are full assessments as a GOA survey was conducted in 2011. Area apportionments for rockfish ABC are based on a weighted average of the percent exploitable biomass distribution for each area in the three most recent trawl surveys (2007, 2009 and 2011). Each successive survey is given a progressively heavier weighting using factors of 4, 6, and 9, respectively. For all rockfish stocks with the exception of Pacific Ocean Perch, the OFL is specified Gulfwide. For POP, the OFL is apportioned to individual area by the same weighting scheme used to apportion the ABC. Note that for other rockfish the recommended ABC in Western and Central have been combined for management purposes.

9. Pacific ocean perch

Status and catch specifications (t) of Pacific ocean perch and projections for 2012 and 2013. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	334,797	20,243	17,584	17,584	15,617
2011	330,480	19,560	16,997	16,997	14,096
2012	348,168	19,498	16,918		
2013		19,021	16,500		

Changes from previous assessment

Pacific ocean perch are assessed on a biennial schedule to coincide with the timing of survey data. This year a full assessment was presented which included 2011 bottom trawl survey information, 2009 survey age compositions, 2010 fishery age compositions, and updated catch estimates for 2010 and 2011. There were no changes in assessment methodology.

Status determination and stock trends

The stock is not overfished, nor is it approaching an overfished condition. The stock was not subjected to overfishing in 2010.

The 2012 spawning biomass estimate (107,769 t) is above $B_{40\%}$ (93,876 t) and projected to be stable through 2013. Recruitment as measured by age 2 fish is highly variable and large recruitments comprise much of the biomass for future years. Recruitment appears to have increased since the early 1970s, with the 1986 year class remaining the highest in the time series.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Pacific ocean perch are determined to be in Tier 3a. The F_{OFL} is set at $F_{35\%}$ (0.138) and gives an OFL of 19,498 t. The Team accepted the author recommended model resulting in an estimated ABC of 16,918 t (with $F_{ABC} = F_{40\%}$ of 0.119).

Additional Plan Team Recommendations

The Team appreciated the effort to evaluate bycatch rates pre- and post-Rockfish Pilot Program (RPP) and supports the methods to standardize estimates of catch for the current year and projected catch.

The four age-structured models for rockfish in the GOA rely on age compositions instead of bottom trawl survey length compositions. Based on Team comments at the August 2011 meeting, the authors presented an analysis that examined the effect of including length compositions for the current survey year, when age compositions are pending, then removing them when they become available. Model runs for the last four full assessment years (2005, 2007, 2009, and 2011) were compared for POP, dusky and northern rockfish. The results were inconclusive as to whether including length compositions increased or decreased variability in estimates of ABC and recruitment and varied by species. The Team requests that the analysis of variability in estimated quantities address changes in model structure as well as omitting some years of input data. Additional discussions and recommendations with respect to this analysis are contained in the GOA Plan Team minutes.

Ecosystem Considerations summary

Some habitat information from the EFH EIS update has been added to the ecosystem considerations section of the assessment.

Area apportionment

Apportionment of the ABCs and OFLs is based on a weighted average of the percent distribution of biomass for each area using the three most recent trawl survey estimates (from 2007, 2009, and 2011). Each successive survey is given a progressively heavier weighting using factors of 4, 6, and 9, respectively. The revised apportionment values are: Western area, 12.4%; Central area, 66.6%; and Eastern area, 21.0%.

Amendment 41 prohibited trawling in the Eastern area east of 140° W longitude. Since Pacific ocean perch are caught exclusively with trawl gear, there is concern that the entire Eastern area TAC could be taken in the area that remains open to trawling (between 140° and 147° W longitude). Thus, as was done for the last four years, the Team recommends that a separate ABC be set for Pacific ocean perch in WYAK. The ratio of biomass still obtainable in the W. Yakutat area (between 140° W and 147° W) is lower than last year at 0.48. This corresponds to a 2012 ABC of 1,692 t for WYAK. Under this apportionment strategy, very little of the 1,861 t assigned to the remaining Eastern area (East Yakutat/Southeast Outside area) will be harvested.

Area apportionment of 2012-2013 ABC and OFL for POP in the Gulf of Alaska:

Year		Western	Central	Eastern	WYAK	SEO	Total
2012	ABC	2,102	11,263	-	1,692	1,861	16,918
2013		2,050	10,985	-	1,650	1,815	16,500
2012	OFL	2,423	12,980	4,095	-	-	19,498
2013		2,364	12,662	3,995	-	-	19,021

10. Northern rockfish

Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through Nov 5th , 2011.

Year	Age 2+ biomass	OFL	ABC	TAC	Catch
2010	113,200	6,070	5,100	5,100	3,902
2011	108,298	5,784	4,857	4,857	3,395
2012	104,155	6,574	5,507		
2013		6,152	5,153		

Changes in assessment methods and data

A new maturity curve was fit to data from two separate field studies. In addition, the "plus" age group was extended from 23 years to 33 years. Input data were updated to include catch data for 2010, preliminary catch data for 2011, and projected catch for the period following October 4, 2011. Survey based input data were updated to include 2011 trawl survey biomass estimates, and survey age compositions for 2009. Other updated input data are fishery age compositions for 2008 and 2010, and fishery size compositions for 2009 and 2011.

Author and Team evaluation of alternative models

Changes in the recommended assessment model were evaluated using two alternative models compared to the base model from 2009 with the updated data. The Team concurred with authors' recommended model (Model 3). The Team commended the authors on their analysis of the intermediate maturity curve.

Status determination and stock trends

The northern rockfish stock is not being subjected to overfishing. This stock is not overfished nor is it approaching an overfished condition. Recent catches have been well below OFL.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

$B_{40\%}$ for this stock is estimated to be 24,547 t and projected spawning biomass in 2012 according to Model 3 is 32,671 t, so this stock is assigned to Tier 3a. Neither the author nor the Team saw any compelling reason to recommend OFL or ABC values lower than prescribed by the standard control rule. The values of $F_{35\%}$ and $F_{40\%}$ are 0.074 and 0.062, respectively. This results in a recommended 2012 ABC of 5,509 t, and a 2012 OFL of 6,574 t, for northern rockfish.

Area apportionment

The 2012 recommended allocation is 39.13% for the Western area, 60.83% for the Central area, and 0.04% for the Eastern area. This results in area specific ABCs of:

Year	Western	Central	Eastern	Total
2012	2,156	3,351	2	5,509
2013	2,017	3,136	2	5,155

11. Shortraker rockfish

Status and catch specifications (t) of shortraker rockfish and projections for 2012 and 2013. Biomass estimates are based on 3 most recent trawl surveys (2007, 2009, and 2011). The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	40,626	1,219	914	914	457
2011	40,626	1,219	914	914	547
2012	48,048	1,441	1,081		
2013		1,441	1,081		

Changes from previous assessment

Shortraker are assessed on a biennial schedule to coincide with the timing of survey data. This year a full assessment was presented which included 2011 bottom trawl survey information. There were no changes in assessment methodology.

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria. Catch levels for this stock remain below levels where overfishing would be a concern.

Averaging the biomass from the last three Gulf of Alaska trawl surveys (2007, 2009, and 2011), results in a biomass of 48,048 t for shortraker rockfish.

Tier determination, ABCs, and OFLs

Shortraker rockfish are Tier 5 species for specifications. Under Tier 5 the maximum permissible that $F_{\mathrm{ABC}} = 0.75M = 0.0225$ and $F_{OFL} = 0.03$. Applying this definition to the exploitable biomass of shortraker rockfish results in an ABC of 1,081 t in 2012 with an OFL of 1,441 t.

Additional Plan Team Recommendations

The Team agrees with the author that age validation is a high priority so that an age-structured model can be used for assessment.

Ecosystem Considerations summary

Some habitat information from the EFH EIS update has been added to the ecosystem considerations section of the assessment.

Area apportionment

Apportionment of the ABCs amongst management areas of the Gulf of Alaska is based on a weighted average of the percent exploitable biomass distribution for each area in the three most recent trawl surveys (2007, 2009, and 2011). Each successive survey is given a progressively heavier weighting using factors of 4, 6, and 9, respectively. Apportionments values for shortraker rockfish are: Western area, 9.59%; Central area, 41.82%; and Eastern area, 48.59%.

Area apportionment of 2012 and 2013 ABC for shortraker rockfish in the Gulf of Alaska:

Western	Central	Eastern	Total
104	452	525	1,081

12. Dusky rockfish (Pelagic Shelf Rockfish)

Status and catch specifications (t) of dusky rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Years prior to 2012 include yellowtail and widow rockfish. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Age 4+ biomass	OFL	ABC	TAC	Catch
2010	69,632	5,803	4,871	4,957	3,111
2011	66,498	6,142	5,059	4,663	2,515
2012	66,771	6,257	5,118		
2013		5,822	4,762		

Changes in assessment data

The biomass estimate and age composition from the 2011 and 2009 trawl surveys, respectively, were added to the model. The 2011 NMFS bottom trawl survey showed a 16 percent increase in biomass over 2009. The catch data were updated including fishery age composition for 2008 and the fishery size compositions for 2009-2011. New maturity information was included in the model.

Change in assessment methods

The dusky rockfish assessment evaluated three models. Model 1 is the 2009 assessment model. Model 2 estimates a maturity ogive using maturity information collected from two previous studies. Model 3 is identical to Model 2, but uses a logistic selectivity curve for the fishery and survey selectivity rather than estimating selectivity individually for each age.

Author and Team evaluation of alternative models

The authors recommend Model 3, and the Plan Team agrees with this recommendation. Models 2 and 3 have the advantage of estimation of the maturity ogive within the model, thus allowing uncertainty in estimated model quantities to reflect the uncertainty in the maturity data. The three models have comparable fits to the data, but Model 3 has fewer parameters.

Status determination and stock trends

Recent catches have been well below OFL. The stock was not subjected to overfishing in 2010, and is not determined to be overfished in 2011. Estimated recruitment has been low in recent years with high uncertainty, with the most recent strong year class occurring in 1998. The stock abundance is expected to decrease in the near term.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

For 2012, widow and yellowtail rockfish have been removed from the pelagic shelf rockfish complex, resulting in single-species management for dusky rockfish. $B_{40\%}$ for this stock is estimated to be 19,873 t and projected spawning biomass in 2012 according to Model 3 is 66,771 t, so this stock is assigned to tier 3a. Neither the author nor the Team saw any compelling reason to recommend OFL or ABC values lower than prescribed by the standard control rule. The current values of $F_{35\%}$ and $F_{40\%}$ are 0.122 and 0.098, respectively.

Area apportionment

At present, the ABC of dusky rockfish is apportioned by regions, based on a weighted average of the three most recent surveys. The apportionments are 8% in the Western GOA, 75.2% in the central GOA, and 16.8% in the eastern GOA. These apportionments result in ABCs of 409 t in the western GOA, 3,849 t in the central GOA, and 860 t in the eastern GOA. The eastern GOA ABC is further divided into 542 t in the West Yakutat area and 318 t in the East Yakutat/Southeast Outside area.

For 2013 the apportionments are 381 Western, 3,581 Central, 504 West Yakutat and 296 East Yakutat/Southeast Outsidefor a total 4,762

13. Rougheye and blackspotted rockfish

Status and catch specifications (t) of rougheye and blackspotted rockfish and projections for 2012 and 2013. Biomass for each year corresponds to the projections given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	45,751	1,568	1,302	1,302	450
2011	45,907	1,579	1,312	1,312	538
2012	42,856	1,472	1,223		
2013		1,492	1,240		

Changes from previous assessment

The assessment methodology is very similar to the 2011 model. New data added to this model were the updated estimates of 2010 and 2011 fishery catch,1990 and 2008 fishery ages, 2011 trawl survey biomass estimate, 2009 trawl survey age compositions, 2010-2011 longline survey relative population weights, and 2010-2011 longline survey size compositions.

Status determination and stock trends

The stock is not overfished, nor is it approaching an overfished condition. Catches remain well below levels where overfishing would be a concern.

Female spawning biomass (12,610 t) is well above $B_{40\%}$ (9,732 t) with projected biomass stable. The author noted that the 2011 trawl survey biomass was decreased by 13%, while the longline survey relative population weight increased by 27% in 2010 and another 12% in 2011. The current biomass estimate is about 30% above the long term average.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The rougheye/blackspotted complex is in Tier 3a. For the 2012 fishery, the Team accepts the authors' recommended maximum allowable ABC of 1,223 t ($F_{ABC} = F_{40\%} = 0.04$) and OFL ($F_{OFL}=F_{35\%} = 0.047$) of 1,223 t. This is less than a 1 % decrease from last year's ABC of 1,312 t.

Ecosystem considerations

Some habitat information from the EFH EIS update has been added to the ecosystem considerations section of the assessment. Furthermore with the two species being identified separately, additional species-specific information on blackspotted and rougheye have been added.

Area apportionment

Area apportionments using the weighted average of the percent exploitable biomass distribution for each area in the three most recent trawl surveys (2007, 2009, and 20011) result in the following by area: 6.6% Western, 69.46% Central and 23.94% Eastern.

The 2012 and 2013 ABC apportionments for the rougheye and blackspotted rockfish complex in the Gulf of Alaska:

	Western	Central	Eastern	Total
2012	80	850	293	1,223
2013	82	861	297	1,240

Additional Plan Team recommendations

The Plan Team endorses the authors' efforts to conduct sensitivity analysis on optimum plus group for age compositions, and to continue to explore selectivity patterns. The author also discussed the need to continue research in life history characteristics of rougheye rockfish versus blackspotted rockfish and the plan team strongly supported this concept.

14. Demersal shelf rockfish

Status and catch specifications (t) of Demersal Shelf Rockfish in recent years. Yelloweye rockfish biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011

Year	Biomass	OFL	ABC	TAC	Catch
2010	14,321	472	295	295	128
2011	14,395	479	300	300	82
2012	14,307	467	293		
2013	14,307	467	293		

[1] ABC, TAC, and catch reflect contributions from commercial and sport fisheries.

Changes in assessment data

Although a new assessment of yelloweye rockfish was scheduled in 2011, funding constraints and submersible availability prevented a new submersible survey in 2011. The only new information for Demersal Shelf Rockfish (DSR) was catch data in 2011 for Southeast Outside Subdistrict (SEO), and updated average weights for yelloweye rockfish catch from port sampling of the commercial fishery in all four SEO management areas.

Change in assessment methods

No change in assessment methods was reported.

Author and Team evaluation of alternative models

An age structured stock assessment model for yelloweye rockfish is under development as an alternative to the habitat-based stock assessment method that is currently used. The motivating factor for an alternative assessment method is uncertainty about future availability of the submersible for fish density surveys. Data to support an age based assessment model are available, e.g., the annual IPHC long line survey.

Status determination and stock trends

The DSR stock is not being subjected to overfishing. The DSR stock is not overfished nor is it approaching an overfished condition.

Currently, allocation of the SEO DSR TAC is 84% to the commercial fishery and 16% to the recreational fishery. There is a proposal to increase the percentage allocated to the recreational sector. An increase in halibut catch would imply greater DSR bycatch that could cause overfishing. In that case, a process to end overfishing would be required.

Density and biomass estimates for this complex are based on yelloweye rockfish only. The density estimate in EYKT from the 2009 surveys was 1,930 adult yelloweye per km^2 which is 46% lower than the 2003 estimate. Yelloweye rockfish biomass for stock status evaluations are based on the most recent estimate by management area. The SSEO was last surveyed in 2005, and NSEO was surveyed in 2001. Density estimates by area range from 1,068 to 3,557 adult yelloweye per km^2. The density estimate for CSEO in 2007 was 1,068 adult yelloweye/km^2 (CV=17%). As in previous assessments, biomass is

estimated using the lower 90% confidence limit of the point estimate by management area. This results in a biomass estimate of 14,307 t for adult yelloweye rockfish. Overall, the trend indicates a decline.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

There are reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$ for yelloweye rockfish, therefore the species complex is managed under Tier 4. Maximum allowable ABC under Tier 4 is based on $F_{40\%}$ which is equal to 0.026. The OFL fishing mortality rate under Tier 4 is $F_{35\%}$ =0.032. Demersal shelf rockfish are particularly vulnerable to overfishing given their longevity, late maturation, and sedentary and habitat-specific residency. As in previous assessments, the Plan Team concurred with the authors' recommendation to establish a harvest rate lower than the maximum allowed under Tier 4 by applying F=M=0.02 to the biomass estimate and adjusting for other DSR species. This results in a recommended **2012 ABC of 293 t for DSR**. Adjusting for the DSR species other than yelloweye results in an **OFL for 2012 of 467 t for DSR**.

Area apportionment

The ABC and OFL for DSR are for the SEO Subdistrict. DSR management is deferred to the State of Alaska and any further apportionment within the SEO Subdistrict is at the discretion of the State.

15. Thornyheads

Status and catch specifications (t) of thornyheads in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data for 2011 are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	78,795	2,360	1,770	1,770	565
2011	78,795	2,360	1,770	1,770	609
2012	73,990	2,220	1,665		
2013		2,220	1,665		

Changes from previous assessment

Thornyheads continue to be on a biennial stock assessment schedule to coincide with the timing of the NMFS trawl survey data. New assessment information includes updated biomass and length compositions from the 2011 NMFS trawl survey data, total catch for 2010 and partial 2011, and length composition from the 2009, 2010 and 2011 trawl and longline fisheries. Additionally, Relative Population Numbers (RPN's) and weight and size composition from the AFSC 2010 and 2011 longline surveys were included.

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria. Catch levels for this stock remain below the TAC and below levels where overfishing would be a concern.

Estimates of spawning biomass are not available for thornyheads which are assessed under Tier 5. The 2011 GOA bottom trawl survey covered depths shallower than 701m (11% of the estimated biomass for thornyheads in 2009 trawl survey occurred in the 701-1000m stratum). The recommended alternative for this year's assessment inflated the 2011 survey estimate to account for the lack of sampling in the 701-1000m depth stratum. Area-specific mean percentages of biomass in the 701-1000 m stratum relative to the other depth strata for the Western, Central, and Eastern GOA from the 2005, 2007, and 2009 trawl surveys were calculated and the 2011 area-specific biomass estimates were increased by these percentages. This modification results in a total estimated biomass of 73,990 t, a 6% decrease from the 2009 total biomass estimate. Most of this decrease was observed in the Western Gulf where there was a

65% decrease, which was a concern highlighted by the plan team. The estimated biomass in the Central and Eastern Gulf were a 20% and 6% increase, respectively.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Thornyhead rockfish are in Tier 5. Age-structured assessments for this stock is currently hampered by insufficient age data for this species; two recent studies showed widely variable maximum ages of 115 and 150 years, highlighting the difficulty in ageing thornyheads. It is possible that production ageing could occur, but only for individuals younger than 10 years of age. An average natural mortality (M) of 0.03 is used in this assessment as it is currently considered the best estimate based on the age data available.

The GOA Plan Team approved of the authors recommendation for OFL and ABC for 2011 and 2012. The 2012 ABC recommendation from the current assessment (where F_{ABC} =0.0225) is 1,665 t and the OFL (F_{OFL} =0.03) is 2,220 t.

Ecosystem Considerations summary

This section is unchanged from the previous assessment. Examining the trophic relationships of shortspine thornyheads suggests that the direct effects of fishing on the population are likely to be the major ecosystem factors to monitor for this species, because fishing is the dominant source of mortality for shortspine thornyheads in the Gulf of Alaska, and there are currently no major fisheries affecting their primary prey. However, if fisheries on the major prey of thornyheads—shrimp and to a lesser extent deepwater crabs—were to be re-established in the Gulf of Alaska, any potential indirect effects on thornyheads should be considered.

Area apportionment

Area apportionments are based upon the relative distribution of biomass by area from the 2011 GOA bottom trawl survey. Area apportionment of 2012-2013 ABC for thornyhead rockfish:

	Western	Central	Eastern	Total
2012	150	766	749	1,665
2013	150	766	749	1,665

16. Other rockfish (NEW in 2011)

Status and catch specifications (t) of other rockfish. In 2010 and 2011, other rockfish were called "other slope rockfish" and did not include yellowtail and widow rockfish. Biomass estimates are based on the three most recent trawl survey estimates. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5, 2011.

Year	Survey biomass	OFL	ABC	TAC	Catch
2010	76,867	4,881	3,749	1,192	942
2011		4,881	3,752	1,195	868
2012	85,774	5,305	4,045		
2013		5,305	4,045		

Changes in assessment methods and data

The other rockfish complex was created in 2011 by combining yellowtail and widow rockfish with the 15 species that comprised the 'other slope' rockfish and the complex then renamed as 'other rockfish'. The assessment was updated with inclusion of the 2011 GOA survey data. Survey biomass estimates have been highly variable, as demonstrated by the increase of other rockfish species from 37,461 t in the 2009 GOA trawl survey to 145,246 t in the 2011 trawl survey. A new estimate of natural mortality was used for harlequin rockfish, increasing from 0.06 to 0.09.

Status determination and stock trends

Because the other rockfish complex did not exist in previous years, it is not possible to determine whether overfishing occurred. However, overfishing did not occur in 2010 for the other slope rockfish and pelagic shelf rockfish complexes, which contained the species in the other rockfish category. Information is not available to determine stock status relative to overfished criteria.

Survey biomass estimates for species in the other rockfish complex are characterized by high variability, both within individual survey years and between biomass point estimates over time. Silvergrey rockfish had been low in recent surveys, but the 2011 estimate was an order of magnitude larger than the 2009 estimate. In contrast, harlequin rockfish was low for the third consecutive survey after being one of the more abundant members of the complex in several earlier surveys.

Tier determination/ Plan Team discussion and resulting ABC and OFL recommendations

The other rockfish complex is assessed by applying a Tier 5 approach for each species (with the exception of sharpchin rockfish, where a Tier 4 method is used) and aggregating the species-specific harvest levels into an aggregate complex ABC and OFL. This approach is consistent with the methods applied to the former other slope rockfish complex. Application of the Tier 5 and Tier 4 methods to the member species of the other rockfish complex results in an OFL on 5,305 and an ABC of 4,045 t.

Area apportionment

The proposed apportionment of the other rockfish ABC into GOA regulatory areas was 44 t for the Western GOA, 606 t for the Central GOA, and 2,295 t for the eastern GOA. The value of 44 t for the Western GOA is a decline from 212 t in the former other slope rockfish category, despite the addition of two species to the complex in 2011. The apportionments are derived from a weighted average of survey biomass from the three most recent surveys, and the decline in ABC for the western GOA results from dropping a high value for harlequin rockfish in the 2005 survey and replacing it with a low value in the 2011 survey.

The Plan Team discussion focused upon whether exceeding an area-specific ABC would represent a conservation concern. Given the variability in biomass estimates for the species in the other rockfish complex, it is difficult to assign a high level of confidence on area apportionments based upon only the three most recent surveys. Relative stability in the catches of harlequin rockfish (across the entire GOA) might suggest a lack of conservation concern, but the degree to which the fishery catches represent population abundance cannot be assessed without a more detailed analysis of spatial patterns of fishing effort. The Plan Team recommended an ABC of 230 t for West Yakutat and 3,165 t for SEO giving an eastern GOA total ABC of 3,395 t. As in interim measure, the Team recommended that the ABCs for western and central GOA be combined to give an aggregate Western/Central ABC of 650 t in order to provide a measure of spatial apportionment that does not restrict target fisheries based on limited and relatively uncertain estimates of recent survey spatial distributions. These values apply for both 2012 and 2013.

17. Atka mackerel

Status and catch specifications (t) of Atka mackerel in recent years. Atka mackerel are managed under Tier 6 and reliable estimates of biomass are not available. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010		6,200	4,700	2,000	2,417
2011		6,200	4,700	2,000	1,613
2012		6,200	4,700		
2013		6,200	4,700		

Changes from previous assessment

Atka mackerel are assessed on a biennial schedule to coincide with the timing of survey data. This year a full assessment is presented which includes 2011 bottom trawl survey biomass and length information. Fishery length data from 2009-2011 is presented along with age data from the 2009 trawl survey. New catch information includes updated 2010 catch (2,417 t), and 2011 catch (1,613 t). The 2010 GOA Atka mackerel catch was 20% over the 2010 TAC but 50% less than the recommended ABC. However, as of November 5, the 2011 catch (1,613 t) is currently below the 2011 TAC (2000 t).

Status determination and stock trends

Information is insufficient to determine stock status relative to overfished criteria. Up until 2008, catches have been below the TAC, however, in 2009 and 2010 Atka mackerel catch was over TAC but still under the ABC and below levels where overfishing would be a concern.

Gulf of Alaska Atka mackerel have been managed under Tier 6 specifications since 1996 due to lack of reliable estimates of current biomass. The Plan Team agreed with the author that there is no reliable estimate of Atka mackerel biomass and recommended continuing management under Tier 6.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Since 1996, the maximum permissible ABC has been 4,700 t under Tier 6. However, ABC has been set lower than 4,700 t (1,000 t in 1997 and 600 t for 1998-2005) for conservation reasons to allow for bycatch needs of other trawl fisheries and minimize targeting. The 2006-2011 ABCs (under Tier 6), were increased to the maximum allowable of 4,700 t and in 2011 the TAC was set at 2,000 t to accommodate an increase in GOA Atka mackerel, and still allow for bycatch in other directed fisheries and minimize targeting. Given the very patchy distribution of GOA Atka mackerel which results in highly variable estimates of abundance, the Plan Team continues to recommend that GOA Atka mackerel be managed under Tier 6. The Plan Team recommends a 2012 ABC for GOA Atka mackerel equal to the maximum permissible value of 4,700 t. The 2012 OFL is 6,200 t under Tier 6.

Additional Plan Team recommendations

Atka mackerel catch exceeded TAC in 2009 and 2010 but as of November 5 the 2011 catch is 82% of TAC. Due to concerns over uncertainty with the ABC estimates using Tier 6, prudent management is warranted and an appropriate TAC is recommended to provide for anticipated incidental catch needs of other fisheries, principally for Pacific cod, rockfish and pollock fisheries. The 2011 TAC for GOA Atka mackerel was 2,000 t which the data suggest should be sufficient to meet bycatch needs for 2012.

Ecosystem Considerations summary

This section is unchanged from the previous assessment. Steller sea lion food habits data from the western Gulf of Alaska are relatively sparse, so it is not known how important Atka mackerel is to sea lions in this area. However, the close proximity of fishery locations to sea lion rookeries in the western Gulf suggests that Atka mackerel could be a prey item at least during the summer. Analyses of historic fishery CPUE revealed that the fishery may create temporary localized depletions of Atka mackerel and that these depletions may last for weeks after the vessels have left the area. These observations support the argument for a conservative TAC and for following a conservative harvest policy for Atka mackerel in the Gulf of Alaska.

18. Skates

Status and catch specifications (t) of skates in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. Catch data are current through November 5th, 2011.

Species	Year	Biomass*	OFL	ABC	TAC	Catch
Big skate	2010	44,381	4,438	3,329	3,329	2,509
	2011	44,381	4,438	3,329	3,329	2,116
	2012	50,229	5,023	3,767		
	2013	50,229	5,023	3,767		
Longnose Skate	2010	38,031	3,803	2,852	2,852	1,070
	2011	38,031	3,803	2,852	2,852	904
	2012	34,995	3,500	2,625		
	2013	34,995	3,500	2,625		
Other Skates	2010	27,908	2,791	2,093	2,093	1,477
	2011	27,908	2,791	2,093	2,093	996
	2012	27,061	2,706	2,030		
	2013	27,061	2,706	2,030		

*Average of the 2007, 2009, and 2011 bottom trawl survey estimates.

Changes in assessment data

Biomass estimates and length composition data from the 2011 GOA bottom trawl survey and fishery length composition data from 2010 were added to the assessment.

Change in assessment methods

There were no changes in the assessment method.

Status determination and stock trends

The catches have been below the TACs in recent years and thus are not expected to approach the OFL; therefore, the stock is unlikely to be approaching a condition where overfishing would be a concern. Catch as currently estimated does not exceed any Gulfwide OFLs established for skates, but given the potentially high unaccounted catch in the IFQ halibut fishery, we cannot definitively state that the stocks are not subject to overfishing. It is not possible to determine the status of stocks in Tier 5 with respect to overfished status.

The 2011 survey biomass information is used to update the harvest recommendations for skates. The 2011 survey biomass estimates for longnose skates and for many of the *Bathyraja* skates are down relative to the 2009 estimates. The 2011 biomass estimate for big skates shows an apparent increase from 2009. However, a review of the 2011 survey results suggests that the increase is due to a single large survey haul in the eastern GOA

Information is presently insufficient for population dynamics modeling for GOA skates, although the authors suggested that age structured models might be possible for big and longnose skates in the near future. The Team encourages this development as data improve.

Tier determination/Plan Team discussion and resulting ABC and OFL recommendations

Skates are managed in Tier 5. A single value of M=0.10 is applied to area-specific average biomass from the most recent three GOA trawl surveys to estimate the ABCs listed above using the maximum permissible F_{ABC} =0.075 (0.75*M), and the OFLs using F_{OFL} =0.10. The Team concurred with the authors' recommendation of area specific ABCs and bycatch-only status and continued to recommend Gulfwide OFLs. This is identical to the Team recommendations from previous years.

Area apportionment

The Plan Team concurred with the authors recommended area-specific ABCs (shown above) based on the average of the three most recent GOA bottom trawl surveys (2007, 2009, and 2011). Big and longnose skates have area-specific ABCs and gulfwide OFLs; other skates have a gulfwide ABC and OFL.

Year	Species	Western	Central	Eastern	Total
2012	Big skate	469	1,793	1,505	3,767
2013		469	1,793	1,505	3,767
2012	Longnose skate	70	1,879	676	2,625
2013		70	1,879	676	2,625
2012	Bathyraja skates				2,030
2013					2,030

19. Sculpins

Status and catch specifications (t) of GOA sculpin recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Prior to 2011 sculpins were managed as part of the "other species" category without a sculpin complex specific OFL, ABC, and TAC specification. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. 2011 catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	33,307	NA	NA	NA	911
2011	33,307	7,328	5,496	5,496	648
2012	34,610	7,641	5,731		
2013		7,641	5,731		

Changes in assessment data

Sculpin catch and retention data from the GOA fisheries from 2003-2010 have been updated and partial 2011 data (as of September 22, 2011) have been added along with biomass estimates and length compositions from the 2011 Gulf of Alaska survey.

Change in assessment methods

There were no changes to Tier 5 assessment method used in 2010. The biomass estimate was based on the average biomass estimate of the last four NMFS bottom trawl surveys in 2011, 2009, 2007, and 2005. The sculpin complex mortality rate is based on a biomass-weighted average of the instantaneous mortality rates for the four most abundant sculpins in the GOA; bigmouth, great, plain, and yellow Irish lord sculpins from the 2011 survey. As a result, the sculpin complex M was calculated as 0.22.

Status determination and stock trends

The sculpin complex is not currently being subjected to overfishing. As a Tier 5 stock there is not sufficient data to determine if the sculpin complex is in an overfished condition and therefore the status is unknown.

Recent catches of sculpins have been well below the ABC first established for the sculpin complex in 2011. The stock status trend is stable.

Tier determination/Plan Team discussion and resulting ABC and OFL recommendations The Plan Team concurred with the Tier 5 approach, including the biomass estimates based on the most recent 4 surveys. Based on the Tier 5 approach the gulfwide OFL and ABC for the sculpin complex in 2012 and 2013 is

7,641 t and 5,731 t respectively. Compared to 2010 the estimate of biomass has increased by 4 percent and the OFL and ABC have increased by 4 percent.

20. Sharks

Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Prior to 2011 sharks were managed as part of the "other species" category without a shark complex OFL, ABC, and TAC specification. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. 2011 catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010		NA	NA	NA	674
2011		8,263	6,197	6,197	510
2012		8,037	6,028		
2013		8,037	6,028		

Changes in assessment data

Total catch from 2003-2011 (October 11, 2011) has been updated. NMFS longline and IPHC survey data have been updated, including IPHC survey RPNs and new research catch tables and estimated bycatch in the halibut IFQ fishery are in included in Appendix 20A to the assessment.

Status determination and stock trends

The shark complex is not currently being subjected to overfishing. As Tier 5/6 stocks there is not sufficient data to determine if the shark complex is in an overfished condition and therefore the status is unknown.

Recent catches of sharks, from 1992 through 2011, have been well below the ABC first established for the shark complex in 2011. As a reliable total biomass estimates for the shark complex do not exist, there can be no determination of spawning biomass or stock status trend.

Tier determination/Plan Team discussion and resulting ABC and OFL recommendations

There were no changes to Tier 5/6 assessment method used for sharks in 2010. The Team concurred with the author's recommendation to use the same Tier 5/6 approach as used in 2010. Spiny dogfish are assessed as a Tier 5 species where OFL = B (3-survey average) * M (0.097) and ABC = 0.75 * OFL. For the remainder of the species in the shark complex a Tier 6 approach is used where OFL = average catch between 1997 and 2007 and ABC = OFL * 0.75. The resulting OFL for 2012 and 2013 is 8,037 t and the ABC is 6,028. The Plan Team recommended that sharks continue to be placed on bycatch status which prevents directed fishing for sharks.

21. Squid

Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Prior to 2011 squids were managed as part of the "other species" category without a squid complex OFL, ABC, and TAC specification. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. 2011 catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010					131
2011		1,530	1,148	1,148	229
2012		1,530	1,148		
2013		1,530	1,148		

Changes in assessment data

The 2011 GOA bottom trawl survey data and an appendix containing data regarding non-commercial catches of squid have been added.

Status determination and stock trends

The squid complex is not currently being subjected to overfishing. As a Tier 6 stock there is insufficient data to determine if the squid complex is in an overfished condition and therefore the status is unknown.

Recent catches of squids, from 1990 through 2011, have been well below the ABC first established for the squid complex in 2011, with the exception of 2006, the year in which the highest historical catch was observed (1,530 t, the basis for the OFL level adopted). As reliable biomass estimates for squid do not exist, there can be no determination of spawning biomass or stock status trend. However ecosystem models of consumption of squids as prey species suggest that biomass estimates from the groundfish trawl surveys are extremely low.

Tier determination/Plan Team discussion and resulting ABC and OFL recommendations

There were no changes to modified Tier 6 assessment method used in 2010. The Plan Team concurred with the author's recommendation to set the OFL equal to the maximum historical catch between 1997 and 2007 (1,530 t) and the ABC equal to 0.75 * OFL (1,148 t) because reliable estimates of biomass and natural mortality do not exist. The Plan Team recommended that squid continue to be placed on bycatch status which would prevent directed fishing for squid.

The Team requested a Tier 5 calculation last year which was not included in the assessment this year. The author noted that the data is not available for a true Tier 5 approach, but that the estimate could be potentially considered a minimum biomass estimate. An alternative Tier 6 approach using trophic studies as a basis for a minimum biomass estimate could be investigated for further consideration by the Plan Team.

Ecosystem considerations

Given the importance of squid as a prey species (and as a predator) in the ecosystem, were if not for the fact that most of the squid catch is retained (and occasional sold) for food and use as bait, squid would be an excellent candidate for inclusion in the FMP as an ecosystem component.

22. Octopus

Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Prior to 2011 octopus were managed as part of the "other species" category without an octopus complex OFL, ABC, and TAC specification. The OFL and ABC for 2012 and 2013 are those recommended by the Plan Team. 2011 catch data are current through November 5th, 2011.

Year	Biomass	OFL	ABC	TAC	Catch
2010	NA	NA	NA	NA	326
2011	NA	1,273	954	948	748
2012	NA	1,941	1,455		
2013	NA	1,941	1,455		

Changes in assessment data

Biomass estimates from the 2011 Gulf of Alaska survey have been added, results from an observer special project have been included which provide data from 2010 and 2011 on the condition of octopus discards, and catch data have been updated for 2010 and partial catch data in 2011 through October 23, 2011.

Status determination and stock trends

The octopus complex is not currently being subjected to overfishing. As a tier 6 stock, there is insufficient data to determine if the complex is in an overfished condition and therefore the status is unknown.

Recent catches of octopus, from 1997 through 2011, have been well below the ABC first established for the octopus complex in 2011. As a reliable total biomass estimates for octopuses do not exist, there can be no determination of spawning biomass or stock status trend. The author noted that the trawl biomass estimate and incidental catch of octopus in 2011 was the highest on record.

Tier determination/Plan Team discussion and resulting ABC and OFL recommendations

There were no changes to modified Tier 6 assessment method used in 2010. The modified Tier 6 approach involves averaging biomass estimates from the last three bottom trawl surveys in 2007, 2009 and 2011. This is considered as a minimum biomass estimate because much of the benthic habitat which octopus prefer cannot be surveyed with the bottom trawl gear used in the surveys. A conservative estimate of natural mortality of 0.53 is used in a Tier 5-like calculation of OFL, average minimum B×M (3,662 t × 0.53 = 1,941 t) and the ABC equal to 0.75 × OFL (1,455 t). The Team concurred with the author in recommending this approach. The Team also examined both Tier 6 and a maximum historical catch (1997-2007) approaches but considered them to be too conservative and thus adopted a modified Tier 6 approach as described above. The author has also developed a method for estimating total mortality based on predation by Pacific cod in the BSAI for the octopus stock assessment for the BSAI Team's consideration for 2012. This estimate was preliminary in September and the Team requested that it be developed further for application and consideration for GOA octopus in 2012.

The Plan Team recommended that octopus continue to be placed on bycatch status which prevents directed fishing for octopus.

Appendix 1: Grenadiers

An updated executive summary of the grenadier assemblage stock assessment is provided in Appendix 1; while not required, it is provided to assist the Council in its pending decision of whether to include the assemblage in the groundfish FMPs. The Plan Teams have recommended that the Council consider adding grenadiers to both FMPs.

Seven species of grenadiers are known to occur in Alaska. The giant grenadier is the most abundant and has the shallowest depth distribution on the continental slope. The assessment focused on the giant grenadier as it is the most common grenadier caught in both the commercial fishery and longline and trawl surveys. Pacific grenadiers and popeye grenadiers are occasionally caught. Grenadier species are not included in the BSAI and GOA Groundfish FMPs; however, the Teams recommend that the grenadier assemblage be moved into a managed category so that annual catch limits can be established.

Because grenadiers are outside the FMPs and reporting for this assemblage is not required no catch statistics exist. Catches have been estimated, however, based on observer data or the NMFS Alaska Region Catch Accounting System. The estimated annual catches of grenadiers in Alaska for the years 1997-2010 have ranged between ~11,000-21,000 t, with an average for this period of ~16,000 t. Highest catches have consistently been in the GOA, followed generally by the EBS and then the AI. By region, annual catches have ranged between ~6,000-15,000 t in the GOA, ~2,000-5,000 t in the EBS, and ~1,000-4,000 t in the AI. Most of the catch occurs in longline and pot fisheries.

If included in the fishery in the FMPs, Tier 5 determinations would result in the following OFLs and ABCs. The BSAI grenadier TAC would count against the 2 million t OY, while the GOA grenadier TAC would be included under the OY in the GOA (which has an upper limit of 800,000 t).

Area	OFL	ABC
EBS	46,200	34,600
AI	89,000	66,800
GOA	46,600	35,000

Appendix 2: Forage fish

An executive summary of the forage fish assessment for the GOA is provided in Appendix 2. The forage fish category in the Gulf of Alaska (GOA) Fishery Management Plan (FMP) contains over sixty species with diverse characteristics. Many of the species in this category are rare and poorly sampled with standard survey methods, therefore the exact number and types of species in the forage fish category is not known. Species in the forage fish category have been identified as having ecological importance as prey, and directed fishing is prohibited for the group. As of 2011, the forage fish category in the GOA FMP is considered an “ecosystem component”. Forage fish abundance and incidental catches are monitored and an annual report is prepared for the North Pacific Fishery Management Council. “Full” reports are submitted as new data become available or important developments occur. In other years, a brief report updating catch and biomass information are made. Due to the lack of new data in this year, an executive summary of the assessment is provided.

Tables

Table 1. Gulf of Alaska groundfish 2011 - 2013 OFLs and ABCs, 2011 TACs, and 2011 catches (reported through November 5th, 2011).

Stock/ Assemblage	Area	2011 OFL	2011 ABC	2011 TAC	2011 Catch	2012 OFL	2012 ABC	2013 OFL	2013 ABC
Pollock	W (61)		27,031	27,031	20,639		30,270		32,816
	C (62)		37,365	37,365	37,126		45,808		49,662
	C (63)		20,235	20,235	19,769		26,348		28,565
	WYAK		2,339	2,339	2,271		3,244		3,517
	Subtotal	118,030	86,970	86,970	79,805	143,716	105,670	155,402	114,560
	EYAK/SEO	12,326	9,245	9,245		14,366	10,774	14,366	10,774
	Total	130,356	96,215	96,215	79,805	158,082	116,444	169,768	125,334
Pacific Cod	W		30,380	22,785	22,104		28,032		29,120
	C		53,816	40,362	36,023		56,940		59,150
	E		2,604	1,953	709		2,628		2,730
	Total	102,600	86,800	65,100	58,836	104,000	87,600	108,000	91,000
Sablefish	W		1,620	1,620	1,390		1,780		1,757
	C		4,740	4,740	4,799		5,760		5,686
	WYAK		1,990	1,990	1,876		2,247		2,218
	SEO		2,940	2,940	2,992		3,173		3,132
	Total	13,340	11,290	11,290	11,057	15,330	12,960	15,129	12,794
Shallow-water flatfish	W		23,681	4,500	124		21,994		20,171
	C		29,999	13,000	3,819		22,910		21,012
	WYAK		1,228	1,228			4,307		3,950
	EYAK/SEO		1,334	1,334	2		1,472		1,350
	Total	67,768	56,242	20,062	3,945	61,681	50,683	56,781	46,483
Deep-water Flatfish	W		529	529	12		176		176
	C		2,919	2,919	440		2,308		2,308
	WYAK		2,083	2,083	7		1,581		1,581
	EYAK/SEO		774	774	1		1,061		1,061
	Total	7,823	6,305	6,305	460	6,834	5,126	6,834	5,126
Rex sole	W		1,516	1,517	131		1,307		1,283
	C		6,293	6,294	2,721		6,412		6,291
	WYAK		868	868	1		836		821
	EYAK/SEO		888	889			1,057		1,037
	Total	12,499	9,565	9,568	2,853	12,561	9,612	12,326	9,432
Arrowtooth Flounder	W		34,317	8,000	1,700		27,495		27,386
	C		144,559	30,000	27,787		143,162		142,591
	WYAK		22,551	2,500	146		21,159		21,074
	EYAK/SEO		11,723	2,500	70		21,066		20,982
	Total	251,068	213,150	43,000	29,703	250,100	212,882	249,066	212,033
Flathead Sole	W		17,442	2,000	393		15,300		15,518
	C		28,104	5,000	2,278		25,838		26,205
	WYAK		2,064	2,064			4,558		4,623
	EYAK/SEO		1,523	1,523			1,711		1,735
	Total	61,412	49,133	10,587	2,671	59,380	47,407	60,219	48,081

Table 1. continued.

Stock/ Assemblage	Area	2011 OFL	2011 ABC	2011 TAC	2011 Catch	2012 OFL	2012 ABC	2013 OFL	2013 ABC
Pacific ocean perch	W	3,221	2,798	2,798	1,818	2,423	2,102	2,364	2,050
	C	11,948	10,379	10,379	10,408	12,980	11,263	12,662	10,985
	WYAK		1,937	1,937	1,870		1,692		1,650
	SEO		1,883	1,883			1,861		1,815
	E(subtotal)	4,397	3,820	3,820		4,095	3,553	3,995	3,465
	Total	19,566	16,997	16,997	14,096	19,498	16,918	19,021	16,500
Northern rockfish[3]	W		2,573	2,573	1,742		2,156		2,017
	C		2,281	2,281	1,653		3,351		3,136
	E								
	Total	5,784	4,854	4,854	3,395	6,574	5,507	6,152	5,153
Shortraker	W		134	134	81		104		104
	C		325	325	236		452		452
	E		455	455	230		525		525
	Total	1,219	914	914	547	1,441	1,081	1,441	1,081
Other rockfish (previously "Other slope")	W		212	212	300				
	C		507	507	351		650[1]		650[1]
	WYAK		276	276	187		230		230
	EYAK/SEO		2,757	200	30		3,165		3,165
	Total	4,881	3,752	1,195	868	5,305	4,045	5,305	4,045
Dusky rockfish (previously "pelagic shelf rockfish")	W		611	611	367		409		381
	C		3,052	3,052	2,089		3,849		3,581
	WYAK		407	407	58		542		504
	EYAK/SEO		684	684	1		318		296
	Total	5,570	4,754	4,754	2,515	6,257	5,118	5,822	4,762
Rougheye and blackspotted rockfish	W		81	81	28		80		82
	C		868	868	364		850		861
	E		363	363	146		293		297
	Total	1,579	1,312	1,312	538	1,472	1,223	1,492	1,240
Demersal rockfish	Total	479	300	300	82	467	293	467	293
Thornyhead Rockfish	W		425	425	151		150		150
	C		637	637	295		766		766
	E		708	708	163		749		749
	Total	2,360	1,770	1,770	609	2,220	1,665	2,220	1,665
Atka mackerel	Total	6,200	4,700	2,000	1,613	6,200	4,700	6,200	4,700
Big Skate	W		598	598	69		469		469
	C		2,049	2,049	1,949		1,793		1,793
	E		681	681	98		1,505		1,505
	Total	4,438	3,328	3,328	2,116	5,023	3,767	5,023	3,767
Longnose Skate	W		81	81	48		70		70
	C		2,009	2,009	792		1,879		1,879
	E		762	762	64		676		676
	Total	3,803	2,852	2,852	904	3,500	2,625	3,500	2,625
Other skates	Total	2,791	2,093	2,093	996	2,706	2,030	2,706	2,030
Squid	GOA-wide	1,530	1,148	1,148	229	1,530	1,148	1,530	1,148
Sharks	GOA-wide	8,263	6,197	6,197	510	8,037	6,028	8,037	6,028
Octopus	GOA-wide	1,273	954	954	748	1,941	1,455	1,941	1,455
Sculpins	GOA-wide	7,328	5,496	5,496	648	7,641	5,731	7,641	5,731
Total		723,930	590,121	318,291	219,744	747,780	606,048	756,621	612,506

1 The ABC for other rockfish in the Western and Central GOA is combined for management purposes.

Table 2. Gulf of Alaska 2012 ABCs, biomass, and overfishing levels (t) for Western, Central, Eastern, Gulfwide, West Yakutat, and Southeast Outside regulatory areas.

		2012		
Species/Assemblage	Area	ABC	Biomass	OFL
Pollock	W (61)	30,270		
	C (62)	45,808		
	C (63)	26,348		
	WYAK	3,244		
	Subtotal	105,670	911,725	143,716
	EYAK/SEO	10,774	47,885	14,366
	Total	116,444	959,610	158,082
Pacific Cod	W	28,032		
	C	56,940		
	E	2,628		
	Total	87,600	521,000	104,000
Sablefish	W	1,780		
	C	5,760		
	WYAK	2,247		
	EY/SEO	3,173		
	Total	12,960	180,000	15,330
Shallow water flatfish	W	21,994		
	C	22,910		
	WYAK	4,307		
	EYAK/SEO	1,472		
	Total	50,683	77,531 [4]	61,681
Deep water Flatfish	W	176		
	C	2,308		
	WYAK	1,581		
	EYAK/SEO	1,061		
	Total	5,126	443,069 [5]	6,834
Rex sole	W	1,307		
	C	6,412		
	WYAK	836		
	EYAK/SEO	1,057		
	Total	9,612	87,162 [5]	12,561
Arrowtooth flounder	W	27,495		
	C	143,162		
	WYAK	21,159		
	EYAK/SEO	21,066		
	Total	212,882	2,161,690 [5]	250,100
Flathead sole	W	15,300		
	C	25,838		
	WYAK	4,558		
	EYAK/SEO	1,711		
	Total	47,407	292,189 [5]	59,380
Pacific ocean perch	W	30,270		
	C	45,808		
	WYAK	26,348		
	EY/SEO	3,244		
	EGOA	105,670	911,725	143,716
	Total	10,774	47,885	14,366

Table 2. Continued…		2012		
Species/Assemblage	Area	ABC	Biomass	OFL
Northern rockfish	W	2,156		
	C	3,351		
	E	[1]		
	Total	5,507	104,155	6,574
Shortraker	W	104		
	C	452		
	E	525		
	Total	1,081	48,048	1,441
Other rockfish (other slope)	W			
	C	650		
	WYAK	230 [1]		
	EYAK/SEO	3,165		
	Total	4,045	85,774	5,305
Dusky (Pelagic shelf rockfish)	W	409		
	C	3,849		
	WYAK	542		
	EY/SEO	318		
	Total	5,118	66,498	6,257
Rougheye	W	80		
	C	850		
	E	293		
	Total	1,223	42,856	1,472
Demersal shelf rockfish	Total	293	14,307	467
Thornyhead rockfish	Western	150		
	Central	766		
	Eastern	749		
	Total	1,665	73,990 [5]	2,220
Atka mackerel	Total	4,700	Unknown	6,200
Big skates	W	469		
	C	1,793		
	E	1,505		
	Total	3,767	50,229	5,023
Longnose skates	W	70		
	C	1,879		
	E	676		
	Total	2,625	34,995	3,500
Other skates	Total	2,030	27,061	2,706
Squids	Total	1,148	**NA**	1,530
Sharks	Total	6,028	**NA**	8,037
Octopuses	Total	1,455	**NA**	1,941
Sculpins	Total	5,731	34,610	7,641
All species	Total	606,048	6,489,721	747,780

1/ The EGOA ABC of 2 t for northern rockfish has been included in the WYAK ABC for other (slope) rockfish.
2/ Biomass of Dover sole; biomass of Greenland turbot and deep-sea sole is unknown.
3/ Historically lightly exploited therefore expected to be above the specified reference point.

Table 3. Summary of fishing mortality rates and overfishing levels for the Gulf of Alaska, 2012.

Species	Tier	F_{ABC}[1]	Strategy	F_{OFL}[2]	Strategy
Pollock	3b	0.14	F_{ABC}	0.19	$F_{35\%\ adjusted}$
Pacific cod	3a	0.44	$F_{40\%}$	0.53	$F_{35\%}$
Sablefish	3b	0.089	$F_{40\%\ adjusted}$	0.106	$F_{35\%\ adjusted}$
Deepwater flatfish	5, 6[3]	0.064	F=.75M , F_{ABC}[3]	0.085	F=M, F_{OFL}[4]
Rex sole	5	0.128	F=.75M	0.17	F=M
Flathead sole	3a	0.450	$F_{40\%}$	0.593	$F_{35\%}$
Shallow water flatfish (excl. rocksoles)	5[5]	0.15	F=.75M[5]	0.20	F=M[6]
Northern rocksole	3a[5]	0.16	$F_{40\%}$	0.19	$F_{35\%}$[6]
Southern rocksole	3a[5]	0.18	$F_{40\%}$	0.214	$F_{35\%}$[6]
Arrowtooth	3a	0.174	$F_{40\%}$	0.207	$F_{35\%}$
Pacific ocean perch	3a	0.119	$F_{40\%}$	0.138	$F_{35\%}$
Rougheye and blackspotted rockfish	3a	0.039	$F_{40\%}$	0.047	$F_{35\%}$
Shortraker rockfish	5	0.0225	F=.75M	0.03	F=M
Other rockfish (“other slope” rockfish)	4, 5[7]	0.053, 0.038-0.075	$F_{40\%}$, F=.75M[7]	0.064, 0.05, 0.10	$F_{35\%}$, F=M[8]
Northern rockfish	3a	0.062	$F_{40\%}$	0.074	$F_{35\%}$
Dusky rockfish[9] (formerly “pelagic shelf” rockfish)	3a	0.098	$F_{40\%}$	0.122	$F_{35\%}$
Demersal shelf rockfish	4	0.02	F=M	0.032	$F_{35\%}$
Thornyhead rockfish	5	0.0225	F=.75M	0.03	F=M
Atka mackerel	6	NA	F_{ABC}[10]	NA	F_{OFL}[11]
Skates	5	0.075	F=.75M	0.10	F=M
Sculpins	5	0.165	F=.75M	0.22	F=M
Squid	6	NA	F_{ABC}[12]	NA	F_{OFL}[13]
Octopus	6	0.3975	F=.75M[14]	0.53	F=M[15]
Sharks	5,6[16]	0.073	F=.75M,F_{ABC}[16]	0.097	F=M,F_{OFL}[17]

1/ Fishing mortality rate corresponding to acceptable biological catch.
2/ Maximum fishing mortality rate allowable under overfishing definition.
3/ F=.75M for Dover sole (Tier 5), ABC=.75 x average catch (1978-1995) for other deepwater flatfish (Tier 6).
4/ F=M for Dover sole (Tier 5), average catch (1978-1995) for other deepwater flatfish (Tier 6).
5/ $F_{40\%}$ for northern and southern rocksole (Tier 3a), F=.75M for remaining shallow water flatfish (Tier 5).
6/ $F_{35\%}$ for northern and southern rocksole (Tier 3a), F=M for remaining shallow water flatfish (Tier 5).
7/ $F_{40\%}$ for sharpchin rockfish (Tier 4), F=.75M for other rockfish species (Tier 5). The other rockfish category (formerly the “other slope” rockfish category now includes widow and yellowtail rockfish.
8/ $F_{35\%}$ for sharpchin (Tier 4), F=M for other species (Tier 5). The other rockfish category (formerly the “other slope” rockfish category now includes widow and yellowtail rockfish.
9/ Dusky rockfish were formerly in the “pelagic shelf” rockfish category which no longer exists. Widow and yellowtail rockfish which were in the former “pelagic shelf” category have been moved to the other rockfish category.
10/ ABC for Atka mackerel is equal to 0.75 x average catch from 1978 to 1995. This maximum permissible ABC is intended for bycatch in other target fisheries and to minimize targeting.
11/ OFL for Atka mackerel is equal to average catch from 1978 to 1995.
12/ ABC for squid is equal to 0.75 x the maximum catch of squid from 1997-2007. This is a modified Tier 6 recommendation.
13/ OFL for squid is equal to the maximum catch of squid from 1997-2007. This is a modified Tier 6 recommendation.
14/ ABC for octopus is equal to F=.75M x the average estimate of biomass from the 2007, 2009, and 2011 surveys. This is a modified Tier 6 recommendation.
15/ OFL for octopus is equal to F=M x the average estimate of biomass from the 2007, 2009, and 2011 surveys. This is a modified Tier 6 recommendation.
16/ F_{ABC} = 0.073 for spiny dogfish (Tier 5), ABC for other sharks is equal to 0.75 x average catch from 1997-2007 (Tier 6). This time frame differs from the standard Tier 6 time frame of 1978-1995.
17/ F=M for spiny dogfish (Tier 5), OFL for other sharks is equal to the average catch from 1997-2007 (which differs from the standard Tier 6 time frame of 1978-1995).

Table 4. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the Plan Team's 2012 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum.

Species	Tier	2012 *Max* F_{ABC}	*Max* ABC	F_{ABC}	2012 ABC
Pollock[1]	3b	0.17	125,560	0.14	105,670
Demersal shelf rockfish	4	0.026	380	0.02	293

1/ The Plan Team recommended 2012 W/C pollock ABC of 105,670 t is reduced by 2,770 t to accommodate the Prince William Sound GHL. For comparisons in this table, the maximum permissible ABC of 125,560 t should be compared with the full ABC 108,440 t.

Table 5. Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2011.

Year	Pollock	Pacific cod	sablefish	Flat fish	Arrowtooth Flounder	Slope rockfish[a]
1956			1,391			
1957			2,759			
1958			797			
1959			1,101			
1960			2,142			
1961			897			16,000
1962			731			65,000
1963			2,809			136,300
1964	1,126	196	2,457	1,028		243,385
1965	2,749	599	3,458	4,727		348,598
1966	8,932	1,376	5,178	4,937		200,749
1967	6,276	2,225	6,143	4,552		120,010
1968	6,164	1,046	15,049	3,393		100,170
1969	17,553	1,335	19,376	2,630		72,439
1970	9,343	1,805	25,145	3,772		44,918
1971	9,458	523	25,630	2,370		77,777
1972	34,081	3,513	37,502	8,954		74,718
1973	36,836	5,963	28,693	20,013		52,973
1974	61,880	5,182	28,335	9,766		47,980
1975	59,512	6,745	26,095	5,532		44,131
1976	86,527	6,764	27,733	6,089		46,968
1977	112,089	2,267	17,140	16,722		23,453
1978	90,822	12,190	8,866	15,198		8,176
1979	98,508	14,904	10,350	13,928		9,921
1980	110,100	35,345	8,543	15,846		12,471
1981	139,168	36,131	9,917	14,864		12,184
1982	168,693	29,465	8,556	9,278		7,991
1983	215,567	36,540	9,002	12,662		7,405
1984	307,400	23,896	10,230	6,914		4,452
1985	284,823	14,428	12,479	3,078		1,087
1986	93,567	25,012	21,614	2,551		2,981
1987	69,536	32,939	26,325	9,925		4,981
1988	65,625	33,802	29,903	10,275		13,779
1989	78,220	43,293	29,842	11,111		19,002
1990	90,490	72,517	25,701	15,411		21,114
1991	107,500	76,997	19,580	20,068		13,994
1992	93,904	80,100	20,451	28,009		16,910
1993	108,591	55,994	22,671	37,853		14,240
1994	110,891	47,985	21,338	29,958		11,266
1995	73,248	69,053	18,631	32,273		15,023
1996	50,206	67,966	15,826	19,838	22,183	14,288
1997	89,892	68,474	14,129	17,179	16,319	15,304
1998	123,751	62,101	12,758	11,263[I]	12,974	14,402
1999	95,637	68,613	13,918	8,821	16,209	18,057
2000	71,876	54,492	13,779	13,052	24,252	15,683
2001	70,485	41,614	12,127	11,817	19,964	16,479
2002	49,300[I]	52,270	12,246	12,520	21,230	17,128
2003	49,300	52,500	14,345	10,750	23,320	18,678
2004	62,826	43,104	15,630	7,634	15,304	18,194
2005	80,086	35,205	13,997	9,890	19,770	17,306
2006	70b,522	37,792	13,367	14,474	27,653	20,492
2007	51,842	39,473	12,265	15,077	25,364	18,718
2008	51,721	43,481	12,326	16,393	29,293	18,459
2009	42,389	39,397	10,910	17,360	24,937	18,621
2010	75,167	58,003	10,086	13,556	24,334	21,368
2011 [H]	79,805	58,836	11,057	9,929	29,703	19,444

a/ Catch defined as follows: (1) 1961-78, Pacific ocean perch (*S. alutus*) only; (2) 1979-1987, the 5 species of the Pacific ocean perch complex; 1988-90, the 18 species of the slope rock assemblage; 1991-1995, the 20 species of the slope rockfish assemblage.
b/ Catch from Southeast Outside District.
c/ Thornyheads were included in the other species category, and are foreign catches only.
d/ After numerous changes, the other species category was stabilized in 1981 to include sharks, skates, sculpins, eulachon, capelin (and other smelts in the family Osmeridae and octopus. Atka mackerel and squid were added in 1989. Catch of Atka Mackerel is reported separately for 1990-1992; thereafter Atka mackerel was assigned a separate target species.

Table 5. (cont'd) Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2011.

Year	Pelagic Shelf rockfish	Demersal shelf rockfish[b]	Thornyheads[c]	Atka mackerel [e]	Skates[k]	Other species[d]	Total
1956							1,391
1957							2,759
1958							797
1959							1,101
1960							2,142
1961							16,897
1962							65,731
1963							139,109
1964							248,192
1965							360,131
1966							221,172
1967							139,206
1968							125,822
1969							113,333
1970							84,983
1971							115,758
1972							158,768
1973							144,478
1974							153,143
1975							142,015
1976							174,081
1977			0	19,455		4,642	195,768
1978			0	19,588		5,990	160,830
1979			0	10,949		4,115	162,675
1980			1,351	13,166		5,604	202,426
1981			1,340	18,727		7,145	239,476
1982		120	788	6,760		2,350	234,001
1983		176	730	12,260		2,646	296,988
1984		563	207	1,153		1,844	356,659
1985		489	81	1,848		2,343	320,656
1986		491	862	4		401	147,483
1987		778	1,965	1		253	146,703
1988	1,086	508	2,786	-		647	158,411
1989	1,739	431	3,055	-		1,560	188,253
1990	1,647	360	1,646	1,416		6,289	236,591
1991	2,342	323	2,018	3,258		1,577	247,657
1992	3,440	511	2,020	13,834		2,515	261,694
1993	3,193	558	1,369	5,146		6,867	256,482
1994	2,990[f]	540	1,320	3,538		2,752	232,578
1995	2,891	219[g]	1,113	701		3,433	216,585
1996	2,302	401	1,100	1,580		4,302	199,992
1997	2,629	406	1,240	331		5,409	231,312
1998	3,111	552	1,136	317		3,748	246,113
1999	4,826	297	1,282	262		3,858	231,780
2000	3,730	406	1,307	170		5,649	204,396
2001	3,008	301	1,339	76		4,801	182,011
2002	3,318	292	1,125	85		4,040	173,554
2003	2,975	229	1,159	578		6,339	180,173
2004	2,674	260	818	819	2,912	1,559	171,734
2005	2,235	187	719	799	2,710	2,294	185,211
2006	2,446	166	779	876	3,501	3,526	195,594
2007	3,318	250	701	1,453	3,498	2,928	174,887
2008	3,634	149	741	2,109	3,606	2,776	184,149
2009	3,057	138	666	2,222	7,020	2,870	169,604
2010	3,111	128	565	2,417	5,056	2,042	215,833
2011 [H]	2,515	82	609	1,613	4,016	2,135	219,744

e/ Atka mackerel was added to the Other Species category in 1988 and separated out in 1994
f/ PSR includes light dusky, yellowtail, widow, dark, dusky, black, and blue rockfish; black and blue excluded in 1998, dark in 2008, widow and yellowtail in 2012 (note only dusky remains in PSR in 2012)
g/ Does not include at-sea discards.
h/ Catch data reported through November 6th, 2011.
i/ Includes all species except arrowtooth.
j/ Does not include state fisheries
k/ Includes all managed skates species

Figures

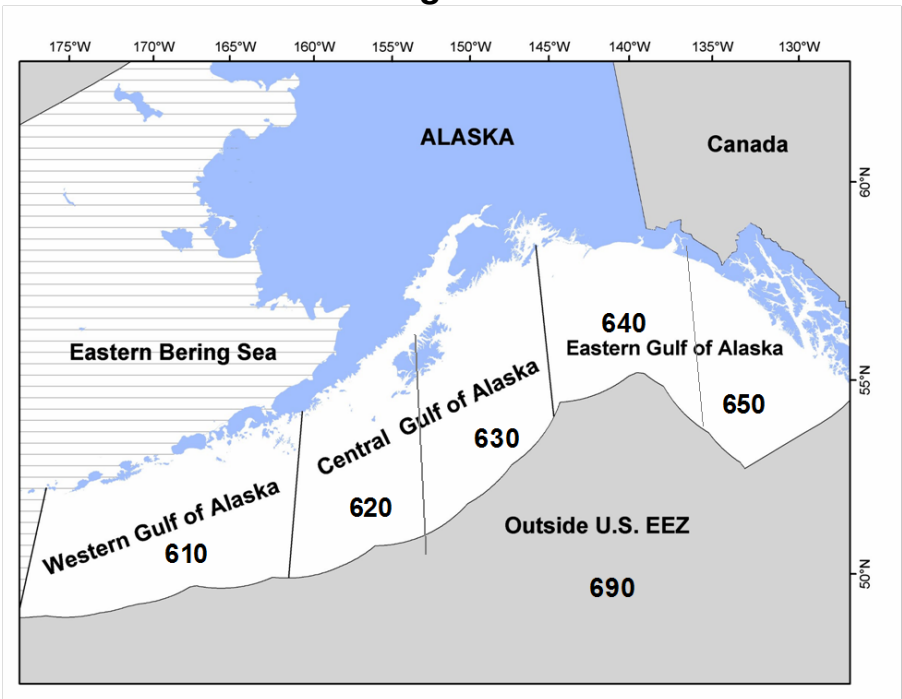


Figure 1. Gulf of Alaska statistical and reporting areas.

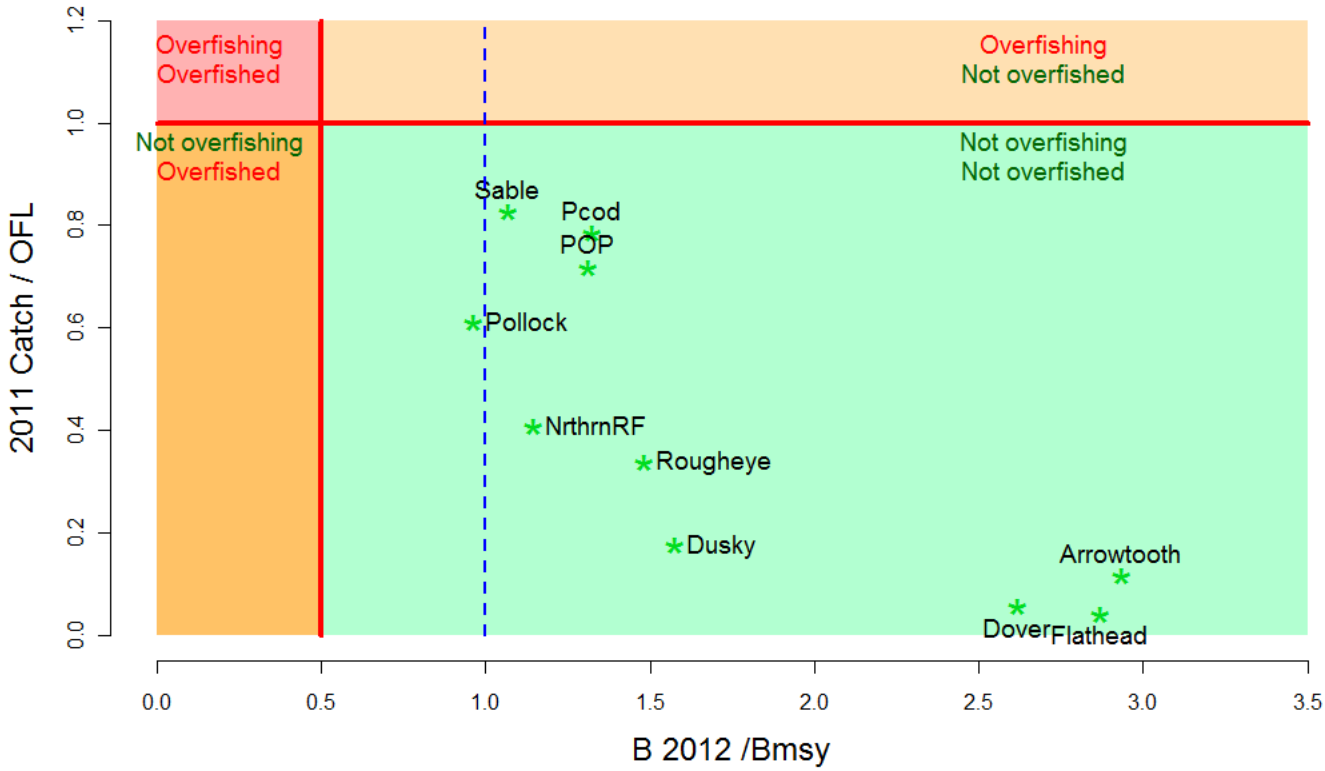
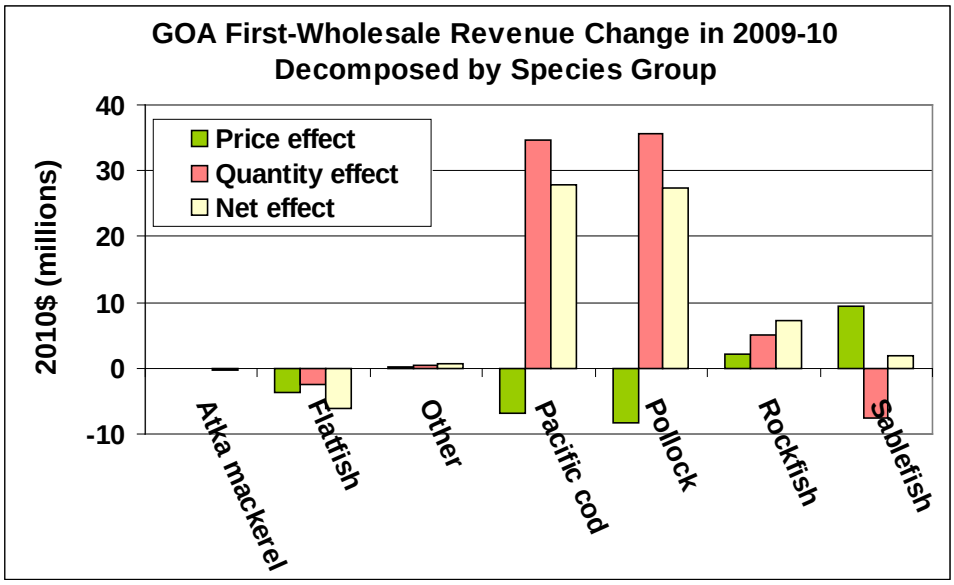


Figure 2. Summary status of age-structured GOA species relative to 2011 catch levels (vertical axis) and projected 2012 spawning biomass relative to B_{msy} levels. Note that the 2011 MSY level is defined as the 2011 catch at F_{OFL}.



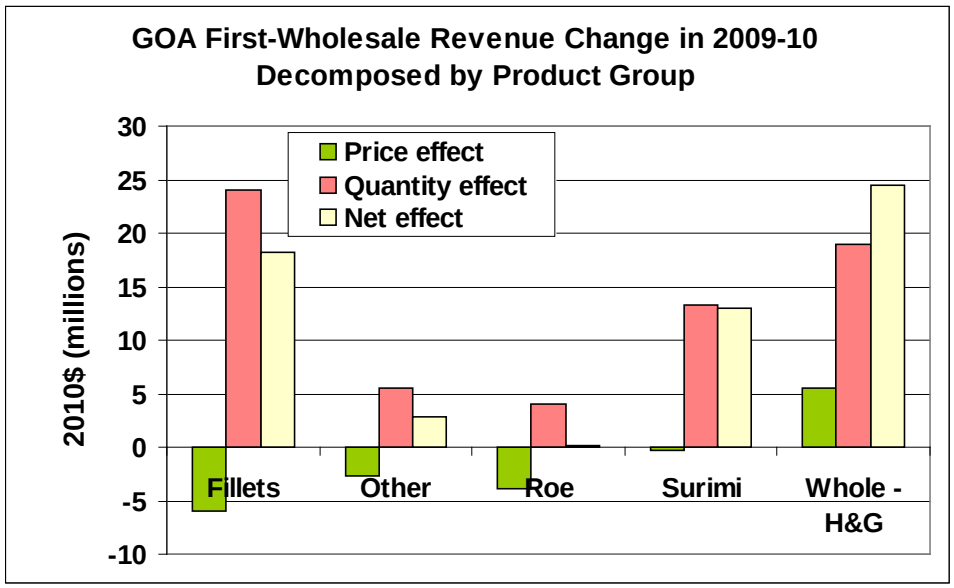


Figure 3. Decomposition of the change in first-wholesale revenues from 2009-10 in the GOA area. The first decomposition is by the species groups used in the Economic SAFE report, and the second decomposition is by product group. The price effect refers to the change in revenues due to the change in the first-wholesale price index (2010 dollars per metric ton) for each group. The quantity effect refers to the change in revenues due to the change in production (in metric tons) for each group. The net effect is the sum of price and quantity effects.