APPENDIX B

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

FOR THE GROUNDFISH RESOURCES OF THE GULF OF ALASKA

Compiled by

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with contributions 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 17-21st, 2014 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 (chair), Craig Faunce, Sandra Lowe, Chris Lunsford, Jon Heifetz, Kristen Green, Janet Rumble, Mark Stichart, Mike Dalton, Nancy Friday, Ian Stewart, Paul Spencer, Jim Armstrong and Obren Davis. Leslie Slater was unable to attend

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 (Fig. 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, northern and southern rock sole, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker rockfish, rougheye/blackspotted rockfish, northern rockfish, "other " rockfish, dusky 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.
4) Grenadiers – The grenadier complex (family Macrouridae), also known as "rattails", are comprised of at least seven species of grenadier known to occur in Alaskan waters, but only three are commonly found at depths shallow enough to be encountered in commercial fishing operations or in fish surveys: giant grenadier (*Albatrossia pectoralis*), Pacific grenadier (*Coryphaenoides acrolepis*), and popeye grenadier (*Coryphaenoides cinereus*).

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

In the Fishery	
Target Species[1]	Walleye pollock, Pacific cod, Sablefish, Flatfish (shallow-water flatfish, deep-water flatfish, northern and southern rock sole, rex sole, flathead sole, arrowtooth flounder), Rockfish (Pacific ocean perch, northern rockfish, shortraker rockfish, rougheye/blackspotted rockfish, other rockfish, dusky 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[2]	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)
Grenadiers[5]	Macrouridae family (grenadiers)

[1] TAC for each listing. Species and species groups may or may not be targets of directed fisheries
[2] Must be immediately returned to the sea
[3]Management delegated to the State of Alaska
[4]Management measures for forage fish are established in regulations implementing the FMP
[5] The grenadier complex was added to both FMPs as an Ecosystem Component in 2014

This SAFE report describes stock status of target and non-target species in the fishery. Amendments 100/91 added grenadiers to the GOA and BSAI FMPs. Descriptions and assessments of forage fish and the grenadier complex are provided in Appendices 1 and 2

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 pollock, Pacific cod, sablefish, Pacific ocean perch, flathead sole, rex sole, arrowtooth flounder, northern rockfish, shortraker rockfish, dusky rockfish, 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, 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 no longer exists (for assessment purposes) since 2012. Both shortraker rockfish and "other rockfish" were presented as separate SAFE chapters in 2013. 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. The 2001 through 2015 W/C/WY pollock ABCs have been reduced by the PWS GHL as provided by ADF&G, before area apportionments were made. At the 2012 September Plan Team meeting, ADFG presented a proposal to set the PWS GHL in future years as a fixed percentage of the W/C/WY pollock ABC of 2.5%. That value is the midpoint between the 2001-2010 average GHL percentage of the GOA ABC (2.44%) and the 1996 and 2012 levels (2.55%). The Plan Team accepted this proposal, but noted concern regarding the lack of a biomass-based allocation in PWS. The Team encouraged the State to work with the AFSC in order to provide a biomass-based evaluation for PWS prior to fixing a percentage in regulation. In the interim, the Plan Team will deduct a value for the 2015 and 2016 PWS GHL (equal to 2.5% of the recommended 2015 and 2016 W/C/WY pollock ABCs) from the recommended 2015 and 2016 W/C/WY pollock ABCs (listed in the summary table), before area apportionments are made. It is important to note that the value of the PWS GHL is dependent on the final specified W/C/WY pollock ABC. The values used by the Plan Team to derive the 2015 and 2016 W/C/WY pollock apportioned ABCs are listed in the pollock summary under *Area apportionment*.

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*
     $F_{ABC} \le \mu_H$, *the harmonic mean of the pdf*
   - 1b) Stock status: $\alpha < B/B_{MSY} \le 1$
     $F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     $F_{ABC} \le \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 1c) Stock status: $B/B_{MSY} \le \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
2) Information available: *Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.*
   - 2a) Stock status: $B/B_{MSY} > 1$
     $F_{OFL} = F_{MSY}$
     $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$
   - 2b) Stock status: $\alpha < B/B_{MSY} \le 1$
     $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 2c) Stock status: $B/B_{MSY} \le \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
3) Information available: *Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.*
   - *3a)* Stock status: $B/B_{40\%} > 1$
     $F_{OFL} = F_{35\%}$
     $F_{ABC} \le F_{40\%}$
   - *3b)* Stock status: $\alpha < B/B_{40\%} \le 1$
     $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
     $F_{ABC} \le F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
   - *3c)* Stock status: $B/B_{40\%} \le \alpha$
     $F_{OFL} = 0$
     $F_{ABC} = 0$
4) Information available: *Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.*
   $F_{OFL} = F_{35\%}$
   $F_{ABC} \le F_{40\%}$
5) Information available: *Reliable point estimates of B and natural mortality rate M.*
   $F_{OFL} = M$
   $F_{ABC} \le 0.75 \times M$
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
   $ABC \le 0.75 \times OFL$

Overfished or approaching an overfished condition 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 2014 or 2) above ½ of its MSY level in 2014 and above its MSY level in 2024 under this scenario, then the stock is not overfished.)

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

In 2015 and 2016, 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 2027 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, Dover sole, flathead sole, northern and southern rocksole, arrowtooth flounder, Pacific ocean perch, rougheye and blackspotted rockfish, northern rockfish, and dusky rockfish are above target stock size. The abundances of pollock and sablefish are below target stock size. The target biomass levels for deep-water flatfish (excluding Dover sole), shallow-water flatfish (excluding northern and southern rocksole), rex sole, shortraker rockfish, other rockfish, demersal shelf 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 2014, and recommendations for ABCs and overfishing levels (OFLs) for 2015 and 2016. 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, 1956-2014.

The sum of the preliminary 2015, 2016 ABCs for target species are 685,597 and 731,049 t respectively which are within the FMP-approved optimum yield (OY) of 116,000 - 800,000 t for the Gulf of Alaska. The sum of 2015 and 2016 OFLs are 870,064 and 910,895 t, respectively. The Team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 2015 will be considerably under this upper limit. For perspective, the sum of the 2014 TACs was 499,274 t, and the sum of the ABCs was 640,675 t (and catch through November 8th, 2014 was just below 300,000 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 2013 and 2014 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 2015 and 2016 correspond to the Plan Team recommendations.

(4) The exploitable biomass for 2013 and 2014 that are reported in the following summaries were estimated by the assessments in *those* years. Comparisons of the projected 2015 biomass with previous years' levels should be made with biomass levels from the revised hindcast reported in each assessment.

(5) The catches listed in the following summary tables are those reported by the Alaska Regional Office Catch Accounting System (CAS, http://alaskafisheries.noaa.gov/sustainablefisheries/catchstats.htm) unless otherwise noted.

(6) The values used for 2015 and 2016 were from modified assessments for selected species, rolled over (typically for Tiers 4-6) or based on updated projections. 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 and/or is incorporated in the assessment).

(7) The Plan Team noted that for thornyheads (and a number of other species), it is critically important to the assessment that the GOA trawl surveys continue and that they extend to 1000 m in order to more completely cover deepwater habitat. Full resource assessment surveys have not been completed, and usually the deepest stations are the ones that are omitted.

(8) In general, for all flatfish assessments, the Plan Team recommends that new available maturity information be evaluated and incorporated as appropriate.

Two year OFL and ABC Determinations

Amendment 48/48 to the GOA and BSAI Groundfish FMPs, implemented in 2005, made two significant changes with respect to the stock assessment process. First, annual assessments are no longer required for rockfish, flatfish, and Atka mackerel since new data during years when no groundfish surveys are conducted are limited. Since 2014 is an off-year for the NMFS GOA groundfish trawl survey, only summaries for most of the GOA species were produced.

The second significant change is that the proposed and final specifications are for a period of at least two years. This requires providing ABC and OFL levels for 2015 and 2016 (Table 1). In the case of stocks managed under Tier 3 and for which a modified assessments was produced, 2015 and 2016 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 total year catch levels. For stocks managed under Tiers 3, 4 and 5 for which only a summary was produced, the latest survey data (2013) was reported and for Tier 5 species used for ABC and OFL calculations. Tier 6 stocks may have alternatives based on updated catch information.

The 2016 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2016 because data from the 2015 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 2012-13

The real ex-vessel value of all Alaska domestic fish and shellfish catch, including the estimated value of fish caught almost exclusively by catcher/processors, decreased from $2150.5 million in 2012 to $1924.2 million in 2013. The first wholesale value of 2013 groundfish catch was $2169.9 million. The 2013 total groundfish catch increased by 2.3% while the total first-wholesale value decreased by 14.6% relative to 2012.

In terms of ex-vessel value, the groundfish fisheries accounted for the largest share (45.7%) of the ex-vessel value of all commercial fisheries off Alaska, while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $679.5 million or 35.3% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to $238.4 million or 12.4% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) with $111.5 million or 5.8% of the total for Alaska.

The Economic SAFE report (appendix bound separately) contains detailed information about economic aspects of the groundfish fisheries, including figures and tables, catch share fishery indicators, product price forecasts, a summary of the Alaskan community participation in fisheries, an Amendment 80 fishery economic data report (EDR) summary, 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. 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 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 2009 through 2013, 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. Several series have been discontinued and new price/revenue tables from an alternative source are presented in Appendix A: Ex-vessel Economic Data Tables: alternative pricing based on CFEC fish tickets.

The Economic SAFE report updates the data associated with the market profiles for pollock, Pacific cod, sablefish, and yellowfin sole that display the markets for these species in terms of pricing, volume, supply and demand, and trade. In addition, the Economic SAFE contains links to data on some of the external factors that impact 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 a section that analyzes economic performance of the groundfish fisheries using indices. These indices are created for different sectors of the North Pacific, and relate changes in value, price, and quantity across species, product and gear types to aggregate changes in the market.

The data used to compile the tables from this and past Economic SAFE reports are available online at

http://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/default.php

Decomposition of the change in first-wholesale revenues from 2012-13 in the GOA

The following brief analysis summarizes the overall changes that occurred between 2012-13 in the quantity produced and revenue generated from GOA groundfish. According to data reported in the 2014 Economic SAFE report, the ex-vessel value of GOA groundfish dropped from $242.5 million in 2012 to $180.5 million in 2013 (Fig. 2), and first-wholesale revenues from the processing and production of groundfish in the Gulf of Alaska (GOA) fell from $373.9 million in 2012 to $328.9 million in 2013, a decrease of 12.0% (Fig. 3). At the same time, the total quantity of groundfish products from the GOA decreased from 106.8 thousand metric tons to 99.3 thousand metric tons, a difference of 7.4 thousand metric tons. These changes in the GOA account for part of the change in first-wholesale revenues from Alaska groundfish fisheries overall which decreased by $372.8 million, a relative difference of -14.7% in 2013 compared to 2012 levels.

By species group, a negative quantity effect of $19.6 million for Pacific cod was the largest change in first-wholesale revenues from the GOA for 2012-13 (Fig. 4). Negative price effects of $16.6 million for sablefish and $11.4 million for rockfish were also important. By product group, negative price and quantity effects were concentrated in the whole head & gut category in the GOA first-wholesale revenue decomposition for 2012-13.

In summary, first-wholesale revenues from the GOA groundfish fisheries decreased by $44.9 million from 2012-13. Major drivers of this decrease were a strong negative quantity effect for Pacific cod and negative price effects for sablefish and rockfish concentrated in the whole head & gut product group. In comparison, first-wholesale revenues decreased by $327.8 million from 2012-13 in the BSAI due to an enormous negative price effect for pollock.

Ecosystem Considerations-Gulf of Alaska

The Ecosystem Considerations chapter (appendix bound separately) consists of three sections: executive summary, ecosystem assessment, and ecosystem status and management indicators. The ecosystem assessment section combines information from the stock assessment chapters with the indicators followed in this chapter to summarize the climate and fishery effects on the ecosystem. A new Gulf of Alaska

ecosystem assessment following the procedure and format of the Eastern Bering Sea and Aleutian Island assessments is awaiting final approvals. Until then, we summarize GOA contributions to the ecosystem considerations chapter below. New trends highlighted in the 2014 Ecosystem Considerations chapter include:

Physical

- The upper ocean in this region was fresher than usual with a relatively strong pycnocline.
- The coastal winds were upwelling favorable in an anomalous sense, which helped maintain relatively normal SST along the coast as compared with the much warmer than normal water offshore.
- The sub-arctic front was farther north than usual, which is consistent with the poleward surface currents shown in the Ocean Surface Currents - Papa Trajectory Index.
- Eddy Kinetic Energy (EKE) levels in the western Gulf of Alaska were particularly weak in summer of 2014. Thus, phytoplankton biomass were likely more tightly confined to the shelf in those years and cross-shelf transport of heat, salinity and nutrients were probably weak.
- In the northern Gulf, relatively high eddy kinetic energy was observed in the summer of 2014.
- It now appears the filtered PAPA Trajectory Index may shift back to northerly flow, which would indicate that the recent period of predominantly southern flow (mid-2000s to present) will have been the shortest and weakest in the time series.

Ecosystem

- The highest density of euphausiids was consistently observed in Barnabas Trough during acoustic surveys in 2003, 2005, 2011, and 2013. The highest overall abundance was observed in 2011, with lowest euphausiid abundance in 2003.
- Total Icy Strait zooplankton density was anomalously low for all months during the 2013 summer survey. Density anomalies were mostly negative from 1997-2005, positive in 2006-2009, and negative in 2010-2013.
- Icy Strait zooplankton were numerically dominated by calanoid copepods. In 2013, large calanoids and larvaceans were anomalously high while small calanoids were anomalously low.
- In the Alaskan Shelf region sampled by the continuous plankton recorder, copepod community size and mesozooplankton biomass anomalies became negative in 2013 while large diatom abundance anomalies remained positive.
- Overall catch rates of juvenile pollock in the 2013 smallmesh survey were the highest since 1979, although eulachon, herring, and pink shrimp catches remained low.
- Temporal patterns in sand lance captured by puffins provisioning chicks show that sand lance were most prevalent from the mid 1990s to the mid 2000s in the central and western GOA. In contrast, sandlance were most prevalent in the mid-1990s and have been decreasing since then in the eastern GOA.
- Although the estimated total mature herring biomass in southeastern Alaska has been above the long term (1980-2013) median of 90,495 tons since 2003 through 2013, an apparent decrease in biomass has been observed since the peak in 2011. The most notable drop in biomass was observed in Hoonah Sound.
- The total number of salmon harvested in 2013 was the largest going back to 1962. Marine survival of Prince William Sound hatchery pink salmon does not appear to have shifted after the 1988/89 or the 1998/99 climate regime shifts. Marine survival in 2010 (2008 brood year) was at an all-time high since 1977 but dropped in 2011 and 2012.
- Ecosystem indicators predict a low pink salmon harvest in 2014 of about 30 M fish.
- A new Southeast Alaska Coastal Monitoring project Chinook salmon index is the abundance estimate of ocean age-1 fish sampled in Icy Strait, lagged two years later to their ocean year of recruitment as ocean age-3 fish, the age when most reach legal size. Based on this Chinook index,

June 1-ocean abundance has been below average in 8 of the past ten years. Most recently, Chinook salmon fishery recruitment appears weak in 2014 and 2016, but strong in both 2013, and particularly in 2015.

- Ecosystem indicators predict below average recruitment events for age-2 sablefish in 2013 and 2015, and a slightly above-average recruitment event in 2014.
- Length-weight residuals for most groundfish species were positive in the first two years of the survey (1985-1987). The residuals have been mixed for all species since then, but generally smaller and varying from year to year. Most species were generally in better condition in the Kodiak area, especially southern rock sole. Fish condition was generally worse in the southeastern area than other areas of the GOA.
- ADF&G received no reports of "mushy" halibut during the 2014 fishing season.
- The depth distribution of rockfish in the Gulf of Alaska has remained constant for each species over time with the exception of shortraker rockfish, which have moved toward shallower water. Since 2007, the range of mean-weighted temperatures where rockfish are found has narrowed. In past contributions, a shift in the distribution of rockfish from the eastern and SE areas of the Gulf of Alaska was noted; however, in the 2013 bottom trawl survey data this trend was not significant.
- Arrowtooth flounder, flathead sole, and other flatfish continue to dominate the biomass in the ADF&G trawl survey. A decrease in overall biomass is apparent from 2007 to 2013 from years of record high estimates seen from 2002 to 2005.
- In 2013, overall gadid biomass in the ADF&G trawl survey has slightly increased in offshore area of Barnabus Gully, but decreased in the inshore areas of Kiliuda and Ugak Bays. Below average anomaly values for Tanner crabs, arrowtooth flounder, and flathead sole were recorded for both inshore and offshore areas, while Pacific cod were well above average. Skates and Pacific halibut were above average for offshore areas, while remaining below average inshore.
- The leading principal component of 18 biological time series from the GOA shows a transition to lower-magnitude positive values around 2006. Recent scores show a linear relationship with winter SST, thus reflecting a possible response to recent changes in climate.

Fisheries

- Discarded tons of groundfish have remained relatively stable in the past few years with the exception of fixed gear, in which discard rates jumped from 6% to 21% in 2013. Improved observer coverage on vessels less than 60' long and on vessels targeting IFQ halibut may account for the increase.
- Assorted invertebrates comprise the majority of non-target catch in groundfish fisheries in the GOA. Catches of Schyphozoan jellies have alternated annually between above and below-average since 2007. Catches of HAPC biota and assorted invertebrates have varied little since 2003.

Other Plan Team discussions

The "hot topic" feature of the presentation this year was the "Warm Blob", or the area of abnormally high temperatures in the Gulf of Alaska. In addition, seabird reproduction in the western Gulf was abnormally successful. Birds nested earlier in the year which led to good survival of the offspring possibly due to favorable winter pre-conditioning or summer foraging; murres in the eastern Gulf were less successful.

1. Walleye pollock

Status and catch specifications (t) of pollock and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014. **In contrast to previous years' tables, the GOA-wide and W/C/WYAK ABCs listed in this table do not include reductions for the Prince William Sound GHL**. However, the federal TACs include reductions due to State waters GHL. State waters GHL is presently computed as 2.5% of the total W/C/WYAK ABC.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
GOA	2013	1,029,676	165,183	123,873	121,046	93,733
	2014	1,028,861	228,831	179,139	174,976	139,753
	2015	1,940,031	273,378	203,934		
	2016		337,900	263,449		
W/C/WYAK	2013	981,791	150,817	113,099	110,272	93,733
	2014	972,750	211,998	166,514	162,351	139,752
	2015	1,883,920	256,545	191,309		
	2016		321,067	250,824		
SEO	2013	47,885	14,366	10,774	10,774	0
	2014	56,111	16,833	12,625	12,625	1
	2015	56,111	16,833	12,625		
	2016		16,833	12,625		

Changes from the previous assessment

The age-structured assessment model used for GOA W/C/WYAK pollock assessment implemented several model changes relative to the model used for the 2013 assessment. The 2014 model implemented the following changes, each added to sequential models in a cumulative manner, based on the 2012 CIE review, SSC, and Plan Team comments, and other considerations: 1) starting the model in 1970 rather than 1964 and removing fishery length composition data for 1964-1971, 2) removing summer bottom trawl surveys in 1984 and 1987 and Shelikof Strait acoustic surveys in 1981-1991, 3) estimating summer bottom trawl catchability using a prior rather than fixing catchability and modeling selectivity with an asymptotic curve, 4) using a random walk for changing fishery selectivity parameters rather than time blocks, 5) using an age-specific mortality schedule with higher juvenile mortality, and 6) modeling age-1 and age-2 pollock in the winter acoustic surveys as separate indices. All composition data sets were "tuned" so that input sample sizes were close to the harmonic mean of effective sample size. Many of these changes were implemented following SSC and Plan Team recommendations, including age-specific mortality, removing older data that had been difficult to fit, and estimating summer bottom trawl catchability. To obtain an age-specific natural mortality schedule, an ensemble approach was used which averaged the results for six methods, three multispecies models and three "theoretical empirical" methods, and then rescaled the age-specific values so that natural mortality for fish greater than or equal to age 5 was equal to 0.3, the value of natural mortality used in previous pollock assessments. The Plan Team accepted the authors' recommended final model configuration that incorporated all of these changes.

The authors also explored using a net selectivity correction for acoustic surveys calculated from field experiments using pocket nets. The Team agreed with the authors that additional model exploration was needed before recommending this model. In addition, the method for making the net selectivity correction to the historical surveys needs to be reviewed prior to incorporating the revised estimates in the model.

This year's pollock assessment features the following new data: 1) 2013 total catch and catch-at-age from the fishery, 2) 2014 biomass and age composition from the Shelikof Strait acoustic survey, 3) 2013 age composition from the NMFS bottom trawl survey, 4) 2014 biomass from the ADFG crab/groundfish trawl survey, 5) total catch for all years was re-estimated from original sources, and 6) fishery catch at age and weight at age were re-estimated for 1975-1999. Model fits to fishery age composition data are adequate in most years. The largest residuals tended to be at ages 1-2 of the NMFS bottom trawl survey due to inconsistencies between the initial estimates of abundance and subsequent information about year class size. Model fits to biomass estimates are similar to previous assessments, and general trends in survey time series are fit reasonably well. It is difficult for the age-structured model to fit the rapid increase in the Shelikof Strait acoustic survey and the NMFS survey in 2013. In contrast, the model expectation is close to the ADFG survey in 2013 and 2014. The fit to the age-1 and age-2 acoustic indices appeared adequate though variable. There is an indication of non-linearity in the fit to age-1 index that needs to be explored further.

Spawning biomass and stock trends

The model estimate of spawning biomass in 2015 is 309,869 t, which is 39.7% of unfished spawning biomass (based on average post-1977 recruitment) which is just below the $B_{40\%}$ estimate of 312,000 t.

The 2014 biomass estimate for Shelikof Strait is 842,138 t, which is a 6% decrease from 2013, but is still larger than any other biomass estimate in Shelikof Strait since 1985. The ADFG crab/groundfish survey 2014 biomass estimate is close to the 2013 estimate (2% lower). The estimated abundance of mature fish is projected to remain stable near $B_{40\%}$ or to increase over the next five years. From 2009-2013 the stock has shown an upward trend from 24% to 47% of unfished stock size, but declined to 38% of unfished stock size (spawning biomass) in 2014.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

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). Because the model projection of female spawning biomass in 2015 is below $B_{40\%}$, the W/C/WYAK Gulf of Alaska pollock stock is in Tier 3b. The projected 2015 age-3+ biomass estimate is 1,883,920 t (for the W/C/WYAK areas). Markov Chain Monte Carlo analysis indicated the probability of the stock being below $B_{20\%}$ will be negligible in the near future.

The 2015 ABC for pollock in the Gulf of Alaska west of 140° W lon. (W/C/WYAK) is 191,309 t. This is an increase of 14% from the 2014 ABC. In 2016, the ABC based on an adjusted $F_{40\%}$ harvest rate is 250,824 t. The OFL is 256,545 t in 2015 and 321,067 t in 2016. The 2015 Prince William Sound (PWS) GHL is 4,783 t (2.5% of the 2015 ABC of 191,309 t); the 2016 PWS GHL is 6,271 t (2.5% of the 2016 ABC of 250,824 t).

For pollock in southeast Alaska (East Yakutat and Southeastern areas), the ABC for both 2015 and 2016 is 12,625 t and the OFL for both 2015 and 2016 is 16,833 t. These recommendations are based on a Tier 5 assessment using the estimated biomass in 2015 and 2016 from a random effects model fit to the 1990-2013 bottom trawl survey biomass estimates in Southeast Alaska, and are unchanged from last year.

Status determination

The Gulf of Alaska pollock is not being subjected to overfishing and is neither overfished nor approaching an overfished condition.

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 2.5% of the ABC (4,783 t in 2015 and 6,271 t in 2016) for the State of Alaska managed pollock fishery in Prince William Sound, are tabulated below:

Area apportionments (**with ABCs reduced by Prince William Sound GHL**) for 2015 and 2016 pollock ABCs for the Gulf of Alaska (t).

Year	610	620	630	640	650	
	Western	Central	Central	WYAK	SEO	Total
2015	31,634	97,579	52,594	4,719	12,625	199,151
2016	41,472	127,936	68,958	6,187	12,625	257,178

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014.

Year	Age 0+ biomass	OFL	ABC	TAC	Catch
2013	449,300	97,200	80,800	60,600	51,792
2014	422,000	107,300	88,500	64,738	59,633
2015	583,800	140,300	102,850		
2016		133,100	102,850		

Changes from the previous assessment

The fishery catch data series was updated for 1997-2014 (projected for 2014 expected total year catch) and updated 1997-2012 seasonal and gear-specific catch-at-length. The fishery length composition data were updated for 1997-2014 (preliminary for 2014).

The 2014 GOA Pacific cod assessment evaluated four models. Model 1 is identical to the final model configuration from 2013. Model 2 is identical to Model 1 but uses the recruitment variability multiplier. The two new models (S1a and S1b) also use the recruitment variability multiplier. In addition, these models treat the bottom trawl survey as a single source of data instead of splitting the sub 27 and 27-plus data for lengths and ages, include survey age data as conditional age-at-length data. Instead of incorporating 12 blocks of logistic survey selectivity, Model S1a uses 3 blocks of non-parametric survey selectivity and Model S1b uses cubic spline based survey selectivity.

Spawning biomass and stock trends

According to Model S1a, $B_{40\%}$ for this stock is estimated to be 126,600 t, and projected spawning biomass in 2015 is 155,400 t. Estimated age-0 recruitment has been relatively strong since 2005 with the 2008 and 2012 year classes being the strongest over the entire time series since 1978. Stock abundance is expected to be stable in the near term.

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

Models S1a and S1b were preferred over Models 1 and 2 because S1a and S1b used all the survey data instead of only the 27 plus portion. Model S1a was selected by the author as the preferred model

primarily because it fit the data better than S1b. The Plan Team accepted the author's recommendation to use Model S1a as the preferred model.

Since 2015 spawning biomass is estimated to be greater than $B_{40\%}$, this stock is in Tier 3a. The estimates of $F_{35\%}$ and $F_{40\%}$ are 0.626 and 0.502, respectively.

The maximum permissible ABC estimate (117,200 t) is a 32% increase from the 2014 ABC. The Plan Team recommends that a value lower than the maximum permissible be used for 2015 for the following reasons:

- Additional age-composition data (2013 GOA bottom trawl survey) was provided after the assessment was completed and a comparative analysis was done by the author to evaluate the impact of these data on results. When incorporated, these data reduced the estimated abundance at age (~ 8% of biomass) relative to the selected model in the assessment without the 2013 survey age data.
- A retrospective pattern indicates a consistent downward adjustment for the recent years as more data are added. This suggests that estimates tend to be biased high.

Therefore, as an intermediate step, the Team recommends that ABC for 2015 be set at a value half way between the maximum permissible ABC in the assessment and the 2014 ABC which is 102,850 t. The approximate F_{ABC} at this level is 0.441.

Status determination

The stock is not being subjected to overfishing and is neither overfished nor approaching an overfished condition.

Area apportionment

In the 2013 assessment, the random effects model (which is similar to the Kalman filter approach, and was recommended in the Survey Average working group report which was presented to the Plan Team in September 2013) was used; this method was used for the ABC apportionment for 2014. The SSC concurred with this method in December 2013. Using this method with the trawl survey biomass estimates through 2013, the area-apportioned ABCs are:

Year	Western	Central	Eastern	Total
2015	38,702	61,320	2,828	102,850
2016	38,702	61,320	2,828	102,850

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014.

Year	Age 4+ biomass	OFL	ABC	TAC	Catch
2013	167,000	14,780	12,510	12,510	11,945
2014	149,000	12,500	10,572	10,572	10,375
2015	130,000	12,425	10,522		
2016		11,293	9,558		

Changes from the previous assessment

There are no changes in the 2015 assessment model relative to 2014. New data for 2015 includes relative abundance and length data from the 2012 longline survey, relative abundance and length data from the 2011 longline and trawl fisheries, age data from the 2011 longline survey and fixed gear fishery, updated catch from 2005-2013 and new 2014-2016 catch estimates. The fishery abundance index decreased 13% from 2012 to 2013. The longline survey abundance index increased 15% from 2013 to 2014 following a 25% decrease from 2011 to 2013.

Spawning biomass and stock trends

Female spawning biomass increased from a low of 32% of unfished biomass in 2002 to 35% of unfished biomass projected in 2015. Spawning biomass is projected to decrease in the near future, and then stabilize. The 1997 year class has been an important contributor to the population; however, it is predicted to comprise less than 7% of the 2015 spawning biomass. The 2000 year class appears to be at 16% of the spawning biomass in 2015 and may be the largest contributing year class to the population. The 2008 year class will comprise 10% of spawning biomass in 2015 though it is only 60% mature.

Tier determination/Plan Team discussions and resulting ABCs and OFLs

$B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from this assessment are 104,908 t (combined across the EBS, AI, and GOA), 0.095, and 0.112, respectively. The projected 2015 female spawning biomass (combined areas) is 91,183 t (88% of $B_{40\%}$), placing sablefish in Tier 3b. The maximum permissible value of F_{ABC} under Tier 3b is 0.082, which results in a 2015 ABC (combined areas) of 13,657 t. The OFL fishing mortality rate is 0.098 which translates into a 2015 OFL (combined areas) of 16,128 t. The Team accepted the authors' recommended model and corresponding OFL and ABC values.

Status determination

The Alaska-wide sablefish stock is not overfished and is not approaching an overfished condition.

Area apportionment

Apportioned based on a 5-year exponential weighting of the survey and fishery abundance indices. The same method is used to apportion the 2015 and 2016 ABC and OFL.

	2014				2015		2016	
Region	OFL	ABC	TAC	Catch*	OFL	ABC	OFL	ABC
W	--	1,480	1,480	1,195	--	1,474	--	1,338
C	--	4,681	4,681	4,706	--	4,658	--	4,232
**WYAK	--	1,574	1,574	1,655	--	1,708	--	1,552
SEO	--	2,837	2,837	2,818	--	2,682	--	2,436
GOA	12,500	10,572	10,572	10,375	12,425	10,522	11,293	9,558
BS	1,584	1,339	1,339	315	1,575	1,333	1,431	1,211
AI	2,141	1,811	1,811	817	2,128	1,802	1,934	1,637
Total	16,225	13,722	13,772	11,507	16,128	13,657	14,658	12,406

* Catch through November 8th 2014.

** 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 2015 and 2016. The shallow water complex is comprised of northern rock sole, southern rock sole, yellowfin sole, butter sole, starry flounder, English sole, sand sole and Alaska plaice. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	433,869	55,680	45,484	37,077	5,519
2014	384,134	50,007	40,805	33,679	4,389
2015	287,534	54,207	44,205		
2016		48,407	39,205		

Changes from the previous assessment

An executive summary for shallow water flatfish was presented which included updated 2013 catch and the partial 2014 catch as well as projections using the updated results from the northern and southern rock sole assessment. The Team noted that 2014 catches of southern rock sole were substantially lower than catches in 2013.

Changes to the rock sole assessment model input data included updating the fishery catches for 2013 and 2014, including catch-at-length for 2014, adding GOA bottom trawl survey age compositions data from 2013 and compiled survey age data by length to accommodate the option for model fitting based on conditional age-at-length. The fishery catch data was portioned 50% to each of the northern and southern analyses (rather than 60% for both assessment models in 2013).

Several changes were made to the technical implementations of the rock sole stock assessment models in response to SSC and Team recommendations from 2013. These included estimation of natural mortality rates separately for males (females were fixed at 0.2), a change in both models from using selectivity-at-length to selectivity-at-age and using the number of trips or hauls as the primary input sample size (rather than the number of fish). Both models internally estimated the growth and selectivity parameters.

Spawning biomass and stock trends

The rock sole species assessment model estimates are used for trend and spawning biomass estimates whereas the remaining species in this complex are based on the NMFS bottom trawl surveys. The most recent survey was 2013. Survey abundance estimates for the entire shallow-water complex were lower in 2013 compared to 2011; decreasing by 35,156 t. Model estimates of northern and southern rock sole spawning biomass have also shown slight declines in recent years.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Northern and southern rock sole are in Tier 3a while the other species in the complex are in Tier 5. An updated projection model for northern and southern rock sole was run this year; the remaining shallow water flatfish biomass estimates are from the 2013 survey. The Team noted that changes in the growth parameter estimates (relative to the externally estimated values used in the previous assessment) led to large changes in the *F* reference points for northern rock sole, as well as the total biomass in the southern rock sole assessment.

For the shallow water flatfish complex, ABC and OFL for southern and northern rock sole are combined with the ABC and OFL values for the rest of the shallow water flatfish complex. This yields a combined ABC of 44,205 t and OFL of 54,207 t for 2015. For 2016, the combined ABC is 39,205 t and the OFL is 48,407 t.

The GOA Plan Team agrees with authors' recommended ABC for the shallow water flatfish complex which was equivalent to maximum permissible ABC.

Status determination

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.

Area apportionment

The recommended apportionment percentages based on the 2013 survey biomass abundances by area were unchanged for 2014.

Year	Western	Central	WYAK	SEO	Total
2015	22,074	19,297	2,209	625	44,205
2016	19,577	17,115	1,959	554	39,205

5. Deepwater flatfish complex (Dover sole and others)

Status and catch specifications (t) of deepwater flatfish (Dover sole and others) and projections for 2015 and 2016. Biomass for each year is for Dover sole only and corresponds to the model estimate associated with the ABC for that year. Catch data in this table are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	77,531[a]	6,834	5,126	5,126	242
2014	182,727[b]	16,159	13,472	13,472	348
2015	182,160[b]	15,993	13,334		
2016		15,803	13,177		

[a] In 2013 Dover sole biomass was based on Tier 5 calculations.

[b] For 2014 and 2015, Dover sole biomass is based on the author's preferred model and assigned to Tier 3a.

Changes from the previous assessment

The deepwater flatfish complex is comprised of Dover sole, Greenland turbot, and deepsea sole. This complex is assessed on a biennial schedule to coincide with the timing of survey data. This year is an off-year thus an executive summary of the assessment was presented. Dover sole are assessed as a Tier 3a species and the projection model was run using updated 2013 catch and new estimated catches for 2014-2016. Greenland turbot and deepsea sole fall under Tier 6. ABCs and OFLs for Tier 6 species are based on historical catch levels and therefore these quantities are not updated. ABCs and OFLs for the individual species in the deepwater flatfish complex are determined as an intermediate step and then summed for the purpose of calculating complex-level OFLs and ABCs.

Spawning biomass and stock trends

The model estimate of 2015 spawning stock biomass for Dover sole is 67,156 t, which is well above $B_{40\%}$ (28,218 t). Spawning stock biomass and total biomass are expected to remain stable through 2016. Stock trends for Greenland turbot and deepsea sole are unknown.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Starting in 2013, the Dover sole stock has been assessed using an age-structured model and is determined to be in Tier 3a. Both Greenland turbot and deepsea sole are determined to be in Tier 6. The 2015 and 2016 Dover sole ABCs are 13,151 t and 12,994 t, respectively. The Tier 3a 2015 and 2016 OFLs are 15,749 t and 15,559 t, respectively. The Tier 6 calculation (based on average catch from 1978–1995) for the remaining species in the deepwater flatfish complex ABC is 183 t and the OFL is 244 t for 2015 and 2016. The GOA Plan Team agrees with the authors' recommendation to use the combined ABC and OFL for the deepwater flatfish complex for 2015 and 2016. This equates to a 2015 ABC and OFL of 13,334 t and 15,993 t respectively for deepwater flatfish. The ABC is equivalent to the maximum permissible ABC.

Status determination

Gulf of Alaska Dover sole is not being subjected to overfishing and is neither overfished nor approaching an overfished condition. Information is insufficient to determine stock status relative to overfished criteria for Greenland turbot and deepsea sole. Catch levels for this complex remain well below the TAC and below levels where overfishing would be a concern.

Area apportionment

Area apportionments of deepwater flatfish are based on the relative abundance (biomass) of each species in the stock complex in each management area.

Area apportionments of deepwater flatfishABCs for 2015 and 2016 are based on the fraction of the 2013 survey biomass in each area for Dover sole, Greenland turbot, and deepsea sole.

Year	Western	Central	WYAK	SEO	Total
2015	301	3,689	5,474	3,870	13,334
2016	299	3,645	5,409	3,824	13,177

6. Rex Sole

Status and catch specifications (t) of rex sole and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	86,684	12,492	9,560	9,560	3,706
2014	84,702	12,207	9,341	9,341	3,507
2015	82,972	11,957	9,150		
2016		11,733	8,979		

Changes from the previous assessment

Rex sole are assessed on a biennial schedule to coincide with the timing of survey data. This year is an off-year thus an executive summary of the assessment was presented. The projection model was run using updated 2013 catch and new estimated total year catches for 2014-2016. Additionally, new apportionments were computed based on the 2013 NMFS bottom trawl survey biomass distributions.

Spawning biomass and stock trends

The model estimate of female spawning biomass in 2015 is 49,804 t, which is a 6% decline from 2014, but well above $B_{40\%}$ (22,159 t). The assessment model total biomass estimates (age 3+) decreased from 84,702 t in 2014 to 82,972 t in 2015 and a projected decrease into 2016 is expected.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

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 $F_{35\%}$. ABCs and OFLs are calculated using the catch equation applied to beginning year biomass values estimated by the age structured model. Using $F_{ABC} = 0.75M = 0.128$ results in a 2015 ABC of 9,150 t. The 2015 OFL using $F_{OFL} = M = 0.17$ is 11,957 t. The Plan Team concurs with the author's recommended maximum permissible ABCs for 2015 and 2016.

Status determination

The Gulf of Alaska rex sole is not being subjected to overfishing and is neither overfished nor approaching an overfished condition. Catches are well below TACs and below levels where overfishing would be a concern.

Area apportionment

Area apportionments of rex sole ABC's for 2015 and 2016 are based on the fraction of the 2013 GOA bottom trawl survey biomass in each area.

Year	Western	Central	WYAK	SEO	Total
2015	1,258	5,816	772	1,304	9,150
2016	1,234	5,707	758	1,280	8,979

7. Arrowtooth flounder

Status and catch specifications (t) of arrowtooth flounder and projections for 2015 and 2016. 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 8th, 2014.

Year	Biomass[1]	OFL	ABC	TAC	Catch
2013	2,055,560	247,196	210,451	103,300	21,620
2014	1,978,340	229,248	195,358	103,300	35,026
2015	1,957,970	226,390	192,921		
2016		217,522	185,352		

[1] Age 3+ biomass from the age-structured projection model.

Changes from the previous assessment

There were no changes in assessment methodology since this was an off-cycle year. Parameter values from the previous year's assessment model, projected catch for 2014, and updated 2013 catch were used to make projections for ABC and OFL estimates.

Spawning biomass and stock trends

Female spawning biomass in 2015 was estimated at about 2 million t and is expected to decrease slightly in 2016. The 2014 catch of arrowtooth was the highest on record. This is partially due to recent changes to regulations (Amendment 95) of the halibut trawl prohibited species catch (PSC) limits. For the Amendment 80 fleet in the GOA, unused halibut PSC limits are now allowed to be rolled from one season to the next, which allows catcher processors to spend more time targeting arrowtooth flounder without constraints due to halibut PSC. In addition, new regulations have moved the deep-water flatfish fishery closure date later in the year for all trawl vessels. These changes will likely result in continued higher arrowtooth flounder catches than previous years, similar to the current year.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Arrowtooth flounder is estimated to be in Tier 3a. Projections are based on an estimated 2014 catch (39,744 t) that is also used for 2015 and 2016. The 2015 ABC (F40%=0.172) is 192,921 t, which is a slight decrease from the 2014 ABC of 195,358 t. The 2015 OFL (F35%=0.204) is 226,390 t. The 2016 ABC is 185,352 t and OFL is 217,522 t. The Plan Team agrees with the authors' recommended ABC.

Status determination

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.

Area apportionment

The recommended area apportionment percentages are identical to last year because there was no new survey information. Area apportionments of arrowtooth flounder for 2015 and 2016 based on the fraction of the 2013 survey biomass in each area:

Year	Western	Central	WYAK	East Yakutat/SE	Total
2015	30,752	114,170	36,771	11,228	192,921
2016	29,545	109,692	35,328	10,787	185,352

8. Flathead sole

Status and catch specifications (t) of flathead sole and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	236,745	61,036	48,738	30,496	2,816
2014	252,361	50,664	41,231	27,746	2,497
2015	254,602	50,792	41,349		
2016		50,818	41,378		

Changes from the previous assessment

Flathead sole are assessed on a biennial schedule to coincide with the timing of survey data. This year is an off-year thus an executive summary of the assessment was presented. The projection model was run using updated 2013 catch and new estimated total year catches for 2014-2016.

Spawning biomass and stock trends

The 2015 spawning biomass estimate (83,818 t) is above $B_{40\%}$ (35,532 t) and projected to be stable through 2016. Total biomass (3+) for 2015 is 254,602 t and is projected to slightly increase in 2016.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Flathead sole are determined to be in Tier 3a. For 2015 the Plan Team concurred with the authors' recommendation to use the maximum permissible ABC of 41,349 t from the updated projection. The F_{OFL} is set at $F_{35\%}$ (0.61) and gives an OFL of 50,792 t.

Status determination

The Gulf of Alaska flathead sole stock is not being subjected to overfishing and is neither overfished nor approaching an overfished condition. Catches are well below TACs and below levels where overfishing would be a concern.

Area apportionment

Area apportionments of flathead sole ABCs for 2015 and 2016 are based on the fraction of the 2013 GOA bottom trawl survey biomass in each area.

Year	Western	Central	WYAK	SEO	Total
2015	12,767	24,876	3,535	171	41,349
2016	12,776	24,893	3,538	171	41,378

9. Pacific ocean perch

Status and catch specifications (t) of Pacific ocean perch and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current as of November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	345,260	18,919	16,412	16,412	13,183
2014	410,712	22,319	19,309	19,309	17,368
2015	416,140	24,360	21,012		
2016		24,849	21,436		

Changes from the previous assessment

Pacific ocean perch (POP) are assessed on a biennial schedule to coincide with the timing of survey data. During on-cycle (odd) years, a full assessment model with updated assessment and projection model results are presented. However, a full age-structured model was provided in 2014 that incorporates new and historical maturity data within the assessment model. Changes in the input data include updated weight-at-age and an updated size-at-age conversion matrix, updated catch for 2013, and new catch estimates for 2014-2016.

Spawning biomass and stock trends

The 2015 spawning biomass estimate (142,029 t) is above $B_{40\%}$ (113,326 t) and is projected to increase in 2016. Total biomass has been increasing since the early 1980s.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The GOA Pacific ocean perch stock was determined to be in Tier 3a. The Team accepted the author recommended model resulting in an estimated maximum permissible ABC of 21,012 t (with $F_{ABC} = F_{40\%}$ of 0.119). The F_{OFL} is specified to be equal to the $F_{35\%}$ estimate (0.139) and results in an OFL of 24,360 t.

Status determination

The stock is not overfished, nor is it approaching an overfished condition.

Area apportionment

From 1996 to 2014 apportionment of ABCs was based on a weighted average of biomass distribution for each area using the three most recent trawl survey estimates. The random effects model proposed by the survey averaging working group was used to apportion 2015 ABCs. Using the random effects model, estimates of survey biomass the apportionment results in 11.0% for the Western area, 75.5% for the Central area, and 13.5% for the Eastern area. The recommended 2015 ABC's are 2,302 t for the Western area, 15,873 t for the Central area, and 2,837 t for the Eastern area based on the random effects model.

Amendment 41 prohibited trawling in the Eastern area east of 140° W longitude. Since POP 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, the Team recommends that a separate ABC continue to be set for POP in WYAK using the weighted average of the upper 95% confidence interval for W. Yakutat. This results in the proportion of biomass in the W. Yakutat area (between 140° W and 147° W) being 0.71, up from the 0.48 estimate used in 2011 and 2012. This corresponds to a 2015 ABC of 2,014 t for WYAK and 823 t for the eastern area (East Yakutat/Southeast Outside area).

POP are determined to be in Tier 3a ($F_{OFL} = F_{35\%}$=0.139) and OFL is equal to 24,360 t. In 2012, area OFLs were combined for the Western, Central, and West Yakutat (W/C/WYAK) areas, while the East

Yakutat/Southeast (SEO) OFL was separated due to stock structure concerns. The 2012 OFL apportionment method is recommended for 2015 resulting in overfishing levels for W/C/WYAK area of 23,406 t (96%) and 954 t (4%) in the SEO area.

Area apportionment of 2015-2016 ABC and OFL for POP in the Gulf of Alaska:

Year		Western	Central	WYAK	SEO	Total
2015	ABC	2,302	15,873	2,014	823	21,012
2016	ABC	2,358	16,184	2,055	839	21,436

Year		Western/Central/WYAK	SEO	Total
2015	OFL	23,406	954	24,360
2016	OFL	23,876	973	24,849

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014. Note that for management purposes, the northern EGOA ABC is combined with other rockfish. The ABC for 2015 and 2016 listed below deducts that value (1 t).

Year	Age 2+ biomass	OFL	ABC	TAC	Catch
2013	99,089	6,124	5,130	5,130	4,880
2014	102,893	6,349	5,322	5,322	4,212
2015	98,409	5,961	4,999		
2016		5,631	4,722		

Changes from the previous assessment

Rockfish are assessed on a biennial stock assessment schedule to coincide with the availability of new survey data. For Gulf of Alaska rockfish in alternate (even) years an executive summary is provided to recommend harvest levels for the next two years. New data added to the projection model included updated 2013 catch and new estimated total year catches for 2014-2016.

Spawning biomass and stock trends

The 2015 spawning biomass estimate (39,838 t) is above $B_{40\%}$ (30,073 t) and projected to decrease to 37,084 t in 2016.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Northern rockfish are estimated to be in Tier 3a. The Plan Team agreed with the authors' recommendation to use the maximum permissible 2015 ABC and OFL values of 4,999 t and 5,961 t, respectively.

Status determination

The stock is not overfished, nor is it approaching an overfished condition.

Area apportionment

Apportionment of the 2015 and 2016 ABC is based on the same method used last year (3 survey weighted average) resulting in the following percentage apportionments by area: Western 24.52%, Central 75.45% and Eastern 0.03%. Note that the small northern rockfish ABC apportionments from the Eastern Gulf are combined with other rockfish for management purposes. Northern rockfish area apportionments for ABCs in 2015-2016:

Year	Western	Central	Eastern	Total
2015	1,226	3,772	1	4,999
2016	1,158	3,563	1	4,722

11. Shortraker rockfish

Status and catch specifications (t) of shortraker rockfish and projections for 2015 and 2016. Biomass estimates are based on the average of the 3 most recent trawl surveys (2009, 2011, and 2013). The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current as of November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	48,048	1,441	1,081	1,081	730
2014	58,797	1,764	1,323	1,323	649
2015	58,797	1,764	1,323		
2016		1,764	1,323		

Changes from the previous assessment

Shortraker rockfish are assessed on a biennial stock assessment schedule to coincide with the availability of new survey data. No new assessment information was available in this off-survey year, therefore the 2013 estimates are rolled over for the next two years. Catches were updated for 2013 and 2014.

Spawning biomass and stock trends

Averaging the biomass estimates from the last three Gulf of Alaska trawl surveys (2009, 2011, and 2013) results in an exploitable biomass of 58,797 t for shortraker rockfish.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Shortraker rockfish are Tier 5 species for specifications where $F_{ABC} = 0.75M = 0.0225$, and $F_{OFL} = 0.03$. Applying this definition to the exploitable biomass of shortraker rockfish results in a 2015 ABC of 1,323 t and an OFL of 1,764 t.

Status determination

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.

Area apportionment

The apportionment percentages are the same as in the 2013 assessment (3 survey weighted average). The following table shows the recommended apportionment for 2015 and 2016.

Western	Central	Eastern	Total
6.98%	29.94%	63.08%.	**100%**
92	397	834	1,323

12. Dusky rockfish

Status and catch specifications (t) of dusky rockfish and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014.

Year	Age 4+ biomass	OFL	ABC	TAC	Catch
2013	63,515	5,746	4,700	4,700	3,159
2014	69,371	6,708	5,486	5,486	3,050
2015	66,629	6,246	5,109		
2016		5,759	4,711		

Changes in assessment methods and data

Dusky rockfish are assessed on a biennial stock assessment schedule to coincide with the availability of new survey data. The 2014 "off-year" assessment consists of updating the catch data and re-running the projection model from the 2013 assessment. There have been no changes in the assessment methods.

New data added to the projection model included updated 2013 catch of 3,158 t, and estimated 2014-2016 total year catches of 3,106 t, 3,379 t, and 3,124 t, respectively. The authors noted recent changes in the seasonal fishing patterns in the western GOA and made appropriate adjustments in providing catch estimates for 2014.

Spawning biomass and stock status trends

The 2015 projected spawning biomass estimate (27,345 t) is above $B_{40\%}$ (20,906 t) and projected to decrease slightly to 25,344 t in 2016.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Dusky rockfish are in Tier 3a. The Plan Team agreed with the authors' recommendation of maximum permissible ABC and OFL of 5,109 t and 6,246 t for 2015. This ABC is 7% lower than the 2014 ABC of 5,486 t but similar to the ABC of 5,081 t projected for 2015 in the 2014 assessment.

Status determination

Dusky rockfish are not being subjected to overfishing and is neither overfished nor approaching an overfished condition.

Area apportionment

The methodology for apportioning the dusky rockfish ABC among areas was unchanged from the 2013 assessment model (3 survey weighted average):

			Eastern		
Year	Western	Central	WYAK	SEO	Total
	5.8%	65.3%	25.2%	3.7%	100%
2015	296	3,336	1,288	189	5,109
2016	273	3,077	1,187	174	4,711

13. Rougheye and blackspotted rockfish

Status and catch specifications (t) of rougheye and blackspotted rockfish and projections for 2015 and 2016. Biomass for each year corresponds to the projections given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current as of November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	42,883	1,482	1,232	1,232	574
2014	42,810	1,497	1,244	1,244	733
2015	36,584	1,345	1,122		
2016		1,370	1,142		

Changes from the previous assessment

Rockfish are typically assessed on a biennial stock assessment schedule to coincide with the timing of new survey data. During on-cycle (odd) years, a full assessment model with updated assessment and projection model results is typically presented but last year there was a lapse, hence a full assessment was compiled this year. Three assessment models were evaluated. Model 0 is the last full assessment base model from 2011. Model 1 is an intermediate model which uses new and updated data but keeps the previous longline survey abundance index. Model 2 uses new and updated data, a new longline survey abundance index, and the updated conversion matrices. The authors and Plan Team recommend Model 2 for the 2014 assessment based on improved overall model fit to the data and the recommendation from the 2009 sablefish CIE to use the RPN index for the longline survey.

New and updated data in the 2014 assessment included updated catch estimates (2011-2013), new catch estimates (2014-2016), new fishery ages (2009 and 2012), new fishery lengths (2011), a new trawl survey estimate (2013), updated trawl survey ages (2009), new trawl survey ages (2011), and revised longline survey abundance estimates and length frequencies. The assessment also included relative population numbers (RPNs) rather than relative population weights (RPWs) to represent the longline survey abundance. New biological data on growth and aging error were also used to update the weight-at-age estimates, the size-at-age conversion matrix, and the aging error matrix.

Spawning biomass and stock status trends

Female spawning biomass (12,480 t) is above $B_{40\%}$ (8,980 t) and projected to remain stable. The 2013 trawl survey estimate was the lowest of the time series at 40% below average. The 2014 longline survey RPN (and abundance index), was above the long-term average for that series and increased from 2013.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The rougheye/blackspotted complex qualifies as a Tier 3a stock. For the 2015 fishery, the Plan Team accepts the authors' recommended maximum permissible ABC of 1,122 t ($F_{ABC} = F_{40\%} = 0.038$) and OFL ($F_{OFL}=F_{35\%} = 0.045$) of 1,345 t.

Status determination

The stock is not overfished, nor is it approaching an overfished condition.

Area apportionment

The 2015 apportionment values are based on a three survey weighted average approach used in previous assessments. A random effects model for RE/BS rockfish was evaluated for 2015. In general, the random effects model fits the area-specific survey biomass in the Western and Eastern GOA reasonably well although the model failed to estimate any process error for the Central GOA which contains the bulk of

the biomass and has the smallest sampling error. The random effects model will be further evaluated and considered for future assessments.

The 2015 apportionment values for rougheye and blackspotted rockfish ABCs are: Western area, 10.3%; Central area, 56.3%; and Eastern area, 33.4%.

Year	Western	Central	Eastern	Total
2015	115	632	375	1,122
2016	117	643	382	1,142

14. Demersal shelf rockfish

Status and catch specifications (t) of demersal shelf rockfish and projections for 2015 and 2016. Biomass for each year corresponds to the survey biomass estimates given in the SAFE report issued in the preceding year(s). The 2014 catch data are current as of November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	14,588	487	303	303	218
2014	13,274	438	274	274	104
2015	10,933	361	225		
2016		361	225		

Changes from the previous assessment

Harvest specifications are set based on the most recent ROV and submersible density estimates of yelloweye rockfish in each management area using historical methods with one exception. Authors decided to remove NSEO data and use 2012 CSEO density as a proxy. Catch information and average weights from the commercial fishery were updated. Surveys in 2014 were cancelled due to weather problems. State funding for this project is expected to end in 2015. An initial exploration of an age-structured model for yelloweye rockfish in southeast outside Alaska waters was presented as an appendix. See Plan Team minutes for further discussion of the age-structured model.

Spawning biomass and stock trends

Biomass trends for yelloweye rockfish have been declining.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Under Tier 4, $F_{ABC} \leq F_{40\%}$ and $F_{OFL}=F_{35\%}$. The overfishing level (OFL) was set using $F_{35\%}=0.032$; which was 361 t for 2015 compared to 438 for 2014. The maximum ABC for 2015 is 293 t. The authors recommend an $F=M$ harvest rate lower than the maximum permissible and the Plan Team concurred. Due to decreases in average body weight (based on fishery data) and updated biomass projections, the recommended ABC is 225 t for 2015, down slightly from that recommended for 2014. For subsistence use, 8 t was deducted from the ABC for DSR caught resulting in 217 t. This was then divided among sport and commercial fisheries (84:16) according to a Board of Fish decision. This resulted in 182 t for commercial fisheries and 35 t allocated to sport fisheries.

Status determination

The DSR stock complex in the southeast outside district of the Gulf of Alaska is not being subjected to overfishing. Information is insufficient to determine stock status relative to overfished criteria as estimates of spawning biomass are unavailable.

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 2014 are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	73,990	2,220	1,665	1,665	1,153
2014	81,816	2,454	1,841	1,841	1,121
2015	81,816	2,454	1,841		
2016		2,454	1,841		

Changes from previous assessment

Thornyheads are assessed on a biennial schedule to coincide with the timing of survey data. In this off-cycle year, estimates from 2013 are rolled over for the next two years. An executive summary was presented. New catch information includes updated 2013 and estimated 2014 catch.

Spawning biomass and stock trends

Estimates of spawning biomass are unavailable for thornyheads. The 2013 GOA bottom trawl survey covered depths shallower than 701 m, similar to what was done in 2011. To correct for this, the 2013 survey biomass estimate was inflated to account for the lack of sampling in the 701-1000 m depth stratum, identical to the method used in the 2011–2013 assessments. This results in a total estimated biomass of 81,816 t. Trends appear to be stable.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Gulf-wide catch of thornyheads increased 50% from 2013, but still was only 61% of the ABC. Thornyhead rockfish are in Tier 5. The Plan Team concurred with the author's recommendation for OFL and ABC for 2015 and 2016. The 2015 (and 2016) ABC recommendation (F_{ABC} =0.0225) is 1,841 t and the OFL (F_{OFL} =0.03) is 2,454 t.

Status determination

The thornyhead complex is not being subjected to overfishing. Information is insufficient to determine stock status relative to overfished criteria as estimates of spawning biomass are unavailable. Catch levels for this stock remain below the TAC and below levels where overfishing would be a concern.

Area apportionment

Area apportionments for this assessment and are based upon the relative distribution of biomass by area from the 2013 GOA bottom trawl survey. Area apportionments of the 2015-2016 ABC for thornyhead rockfish are:

Western	Central	Eastern	Total
235	875	731	1,841

16. Other rockfish

Status and catch specifications (t) of other rockfish. In 2013, the seven species of DSR rockfish were included in the WGOA and CGOA areas. Biomass estimates are based on the three most recent trawl survey estimates. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014. Note that 1 t of northern rockfish has been added for management purposes to "other rockfish" in the EGOA.

Year	Survey biomass	OFL	ABC	TAC	Catch
13	85,774	05	,045	,080	819
14	83,383	47	,081	,811	,030
15	83.383	47	,080		
16		47	,080		

Changes from the previous assessment

There were no changes in assessment inputs or methodology since this was an off-cycle year.

Spawning biomass and stock trends

The estimated biomass of 83,383 t is based on an average from the three most recent GOA trawl surveys. Surveys indicate stability for this complex.

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

GOA other rockfish are managed as a Tier 4/5 stock complex. Sharpchin rockfish are Tier 4, the other rockfish are Tier 5. The Plan Team agreed with the authors' recommendation of an OFL of 5,347 t and a maximum permissible ABC of 4,080 t for 2015 and 2016 (including the 1 t from the northern rockfish category).

Status determination

The "other rockfish" complex is not being subjected to overfishing. Information is insufficient to determine stock status relative to overfished criteria as estimates of spawning biomass are unavailable. Catch levels for this stock remain below the TAC and below levels where overfishing would be a concern.

Area apportionment

The Plan Team again recommends a single ABC for the combined WGOA and CGOA areas to address concerns about the ability to manage smaller ABCs in the WGOA. The recent overages in the WGOA prior to 2014 have not been viewed as a conservation concern because the catch in this region has consisted primarily of harlequin rockfish, which generally occur in untrawlable grounds. Thus, the biomass in this area is likely underestimated due to lack of sampling in untrawlable areas. The apportionments recommended for 2015 and 2016 are:

Other Rockfish	W/C GOA	E GOA WYAK	E GOA EYAK/SE	Total
ABC (t)	1,031	580	2,469*	4,080
OFL (t)				5,347

*Note for management purposes this includes 1 t of northern rockfish from the northern rockfish stock EGOA allocation.

17. Atka mackerel

Status and catch specifications (t) of Atka mackerel in recent years. Atka mackerel are managed under Tier 6 because reliable estimates of biomass are not available. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	-	6,200	4,700	2,000	1,277
2014	-	6,200	4,700	2,000	981
2015	-	6,200	4,700		
2016	-	6,200	4,700		

Changes from the previous assessment

Atka mackerel are assessed on a biennial schedule to coincide with the timing of survey data. The last full assessment was in 2011. New information includes updated 2013 and 2014 catches. Since the 2013 stock assessment, ages from the 2013 survey and 2013 fishery have become available and are comprised mostly of fish from the 2006 and 2007 year classes which are also prevalent in the Aleutian Islands. There are no changes to the methodology used to assess GOA Atka mackerel.

Spawning biomass and stock trends

Estimates of spawning biomass are not available for Gulf of Alaska Atka mackerel. The very patchy distribution of GOA Atka mackerel results in highly variable estimates of abundance. Therefore survey biomass estimates are not considered reliable indicators of absolute abundance or indices of trend.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Since 1996, the maximum permissible ABC has been 4,700 t under Tier 6 and the OFL has been 6,200 t. The Plan Team continues to recommend that GOA Atka mackerel be managed under Tier 6. The Plan Team recommends a 2015 ABC for GOA Atka mackerel equal to the maximum permissible value of 4,700 t. The 2015 OFL is 6,200 t under Tier 6.

Due to concerns over uncertainty with the ABC estimates using Tier 6, a low TAC is recommended to provide for anticipated incidental catch needs of other fisheries, principally for Pacific cod, rockfish and pollock fisheries.

Status determination

Information is insufficient to determine stock status relative to overfished criteria. Catches are below ABC and below levels where overfishing would be a concern.

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8th, 2014.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Big Skate	2013	50,229	5,023	3,767	3,767	2,504
	2014	50,155	5,016	3,762	3,762	1,379
	2015	43,398	4,340	3,255		
	2016		4,340	3,255		
Longnose Skate	2013	34,995	3,500	2,625	2,625	1,777
	2014	38,349	3,835	2,876	2,876	1,418
	2015	42,911	4,291	3,218		
	2016		4,291	3,218		
Other Skates	2013	27,061	2,706	2,030	2,030	1,879
	2014	26,518	2,652	1,989	1,989	1,559
	2015	29,797	2,980	2,235		
	2016		2,980	2,235		

Changes from the previous assessment

Skates are normally assessed on a biennial schedule, with full assessments presented in odd years to coincide with the timing of survey data; however, a full assessment was conducted this year.

New this year was the 2013 survey biomass estimates and the use of the random effects model to estimate biomass for 2015 and 2016. These model results were compared to the survey estimates and the 3-survey average estimates. The Team concurred with the author that the random effects model characterized the biomass information well and should be used.

Spawning biomass and stock trends

The 2013 survey biomass estimates for longnose skate and "other skates" increased substantially relative to the 2011 estimate. The estimate for longnose skates is the highest in the 1984-2013 time series. The 2013 survey biomass estimate for big skate was down considerably from 2011.

Catches have been below Gulf-wide ABC for all skate species, however, the ABC for big skate in the CGOA was exceeded from 2010 to 2013, and in 2014, big skate in the CGOA was closed to retention early in the season, and the catch did not exceed the 2014 ABC.

Catch estimates for longnose skates have exceeded ABC in the WGOA in 4 of the years since 2005 but these ABC's and catches are significantly lower than the CGOA.

Estimates of incidental catches increased substantially for longnose skates and "other skates" in 2013, mainly in the IFQ halibut target fishery. For longnose skates, most of the increased catch occurred in the EGOA. For "other skates" the increased catches occurred in the CGOA and EGOA. It is likely that this increased level of catch is due to the increased catch reporting from the halibut IFQ fishery as a result of increased observer coverage in 2013.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Skates are managed in Tier 5. Applying M=0.1 and 0.75M to the estimated biomass from the random effects models for each stock component, gives stock specific OFLs and ABCs. Note that while it has little or no effect presently, the 2001 survey was omitted from the computation because the EGOA was not surveyed in that year. The Team concurred with this approach which differs from the previous method based on simple 3-survey average biomass.

Status determination

Catch as currently estimated does not exceed any gulf-wide OFLs, and therefore, is not subject to overfishing. It is not possible to determine the status of stocks in Tier 5 with respect to overfished status.

Area apportionment

The Team concurred with the use of the random effects model for estimating proportions by area. Big and longnose skates have area-specific ABCs and gulf-wide OFLs; other skates have a gulf-wide ABC and OFL.

		ABC				
Year	**Species**	**Western**	**Central**	**Eastern**	**Total**	**OFL**
2015 and 2016	Big skate	731	1,257	1,267	3,255	4,340
2015 and 2016	Longnose skate	152	2,090	976	3,218	4,291
2015 and 2016	other skates				2,235	2,980

19. Sculpins

Status and catch specifications (t) of GOA sculpins and projections for 2015 and 2016. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data for 2014 are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	34,732	7,614	5,884	5,884	1,959
2014	33,550	7,448	5,569	5,569	1,075
2015	33,550	7,448	5,569		
2016		7,448	5,569		

Changes from the previous assessment

GOA sculpins are assessed on a biennial stock assessment schedule to coincide with the timing of the NMFS bottom trawl survey. An executive summary is presented in this SAFE Report with last year's key assessment parameters and projections for 2015 and 2016. New information includes catch data updated for 2013 and partial data for 2014, by target fishery and area. The OFL and ABC recommendations were adjusted slightly from last year reflecting updates and corrections to the data.

There were no changes to the Tier 5 approach used in 2013. The biomass estimate was based on the average biomass estimate of the last four NMFS bottom trawl surveys in 2007, 2009, 2011, and 2013.

Spawning biomass and stock trends

The stock trends appear to be stable based on survey data.

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, and the authors' recommendations for ABC and OFL. Based on the Tier 5 approach the

Gulfwide OFL and ABC for the sculpin complex in 2015 and 2016 are 7,448 t and 5,569 t respectively.

Status determination

There is insufficient data to determine if the sculpin complex is in an overfished condition. Recent catches of sculpins have been well below the ABC first established for the sculpin complex in 2011 hence the sculpin complex is not currently being subjected to overfishing.

Area apportionment

The GOA sculpins are managed gulf-wide.

20. Sharks

Status and catch specifications (t) of the GOA shark complex. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data for 2014 are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	76,979	8,037	6,028	6,028	2,166
2014	76,452	7,986	5,989	5,989	1,188
2015	76,452	7,986	5,989		
2016		7,986	5,989		

Changes from the previous assessment

There was no change in assessment methodology. The GOA shark complex (spiny dogfish, Pacific sleeper shark, salmon shark, and other/unidentified sharks) are assessed on a biennial stock assessment schedule to coincide with the timing of the NMFS bottom trawl survey. The biomass estimates were updated to include the 2013 GOA biennial trawl survey data. The total catch for GOA sharks from 2003 through 2014 was updated, including catch data through November 8, 2014. The last full shark assessment was done in 2011.

Spawning biomass and stock trends

Reliable total biomass estimates for the shark complex are unavailable, and little is known about spawning biomass or stock status trend.

Status determination

Sharks are caught incidentally in other target fisheries. Catches of sharks from 1992 through 2014 have been well below the ABC first established for the shark complex in 2011.

As a Tier 6 stock complex, there are insufficient data to determine if the shark complex is in an overfished condition or being subject to overfishing, and therefore the status is unknown.

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

For ABC/OFL estimates, a Tier 5 approach was used for the spiny dogfish component while the other components were treated as Tier 6 species. The Team concurred with the authors' recommendation to continue with this approach.

Area apportionment

GOA sharks are managed Gulf-wide.

21. Squid

Status and catch specifications (t) of GOA squid. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data for 2014 are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	-	1,530	1,148	1,148	321
2014	-	1,530	1,148	1,148	92
2015	-	1,530	1,148		
2016		1,530	1,148		

Changes from the previous assessment

There were no changes to the modified Tier 6 assessment method used since 2011. This method uses maximum historical catch during 1997-2007 as the basis for OFL and ABC calculations. An executive summary was presented in this SAFE report.

Spawning biomass and stock trends

Reliable estimates of spawning biomass and stock trends are unavailable.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Since reliable estimates of biomass do not exist, the squid complex is in Tier 6. 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 x OFL (1,148 t).

Total squid catches for years which data are available, from 1990 through 2014, 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). There is no directed fishery for squid and historically the majority of squid catch has usually occurred as incidental catch in the pollock fishery. Most of the catch in recent years has occurred in NMFS Area 620.

Status determination

As a Tier 6 stock, there is insufficient data to determine if the squid complex is in an overfished condition or being subject to overfishing and therefore the status is unknown.

Area apportionment

GOA squid are managed Gulf-wide.

22. Octopus

Status and catch specifications (t) of GOA octopus. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data for 2014 are current through November 8th, 2014.

Year	Biomass	OFL	ABC	TAC	Catch
2013	-	1,941	1,455	1,455	421
2014	-	2,009	1,507	1,507	1,057
2015	-	2,009	1,507		
2016		2,009	1,507		

Changes from the previous assessment

The GOA octopus stock complex consists of at least seven species of octopus. GOA octopuses continue to be on a biennial stock assessment schedule to coincide with the timing of the NMFS bottom trawl survey. However, a full assessment was provided this year including 2013 survey biomass data. Catch data were updated for 2013 and partial data reported for 2014. There are no proposed changes in assessment methodology.

Spawning biomass and stock trends

The estimated survey biomass of all octopus species for the GOA in 2013 was 2,686 t, 90% of which was identified as *E. dofleini*. This biomass is lower than seen in the 2009 and 2011 surveys, but similar to other historical surveys. Biomass estimates for this stock complex are generally unreliable but survey data are used as a "minimum" estimate.

Octopuses are taken as incidental catch in trawl, longline, and pot fisheries. The highest octopus catch rates are from Pacific cod pot fisheries in the CGOA and WGOA.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The status quo assessment method is a modified Tier 6 approach that includes a conservative natural mortality estimate (0.53) and a minimum biomass estimate using the average of the last three surveys. Using a Tier 5-like calculation of OFL, average minimum B×M (3,791 t × 0.53 = 2,009 t) and the ABC equal to 0.75 × OFL (1,507 t) is estimated.

Status determination

As reliable total biomass estimates for octopuses do not exist, there can be no determination of spawning biomass or stock status trends. There is insufficient data to determine whether the complex is being subjected to overfishing, is currently overfished, or is approaching a condition of being overfished.

Additional Plan Team recommendations

The Plan Team continues to recommend that a stock structure template be completed by next September.

Area apportionment

The GOA octopus complex is currently managed Gulf-wide.

Appendix 1: Grenadiers

An abbreviated stock assessment of grenadiers is provided in Appendix 1. Amendments 100/91 to the BSAI and GOA FMPs placed grenadiers in the FMPs as an ecosystem component (EC). As an EC component, ABCs and OFLs are not required.

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.

The estimated annual catches of grenadiers in Alaska for the years 1997-2013 ranged between 11,000-21,300 t. The 2013 catch was 15,500 t. Thus far in 2014 the catch is 7,860 t. Highest catches have consistently been in the GOA. By region, annual catches have ranged between 5,600 -14,700 t in the GOA, 1,600-5,000 t in the EBS, and 1,300-4,600 t in the AI. By region estimated biomass for 2015 is 524,600 t in the GOA and 1,286,700 t in the BSAI. As an indication of stock status and potential conservation concern, the catches are substantially below unofficial Tier 5 values for ABC and OFLs.

The Team recommends that an abbreviated assessment be produced every other year (even years) for both regions (BSAI, GOA)

Appendix 2. Forage fish

An assessment for forage fish in the Gulf of Alaska is provided in Appendix 2. The forage fish category in the Gulf of Alaska 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 it is likely that the FMP forage species list is not comprehensive and the exact number and types of all GOA forage fish is uncertain. Species in the forage fish category have been identified as having ecological importance as prey, and directed fishing is prohibited for the group. Beginning in 2011, forage fishes in the GOA are designated as "Ecosystem Components" in the GOA FMP; as such, they are outside of the specification process and stock assessments are not conducted for this category.

The Plan Team continues to recommend maintaining the forage fish chapter as a SAFE appendix to be updated similar to groundfish stock assessments as new information becomes available in the off year, or in the interim as new information and issues arise, noting that forage fish are essential ecosystem components, important to seabirds, marine mammals and commercially important groundfish.

Tables

Table 1. Gulf of Alaska groundfish 2015 - 2016 OFLs and ABCs, 2014 TACs, and 2014 catch (reported through November 8th, 2014).

Species	Area	2014 OFL	2014 ABC	2014 TAC	2014 Catch	2015 OFL	2015 ABC	2016 OFL	2016 ABC
Pollock	W(61)	-	36,070	36,070	13,318		31,634		41,472
	C(62)	-	81,784	81,784	83,049		97,579		127,936
	C(63)	-	39,756	39,756	42,068		52,594		68,958
	WYAK	-	4,741	4,741	1,317		4,719		6,187
	Subtotal	211,998	162,351	162,351	139,752	256,545	191,309	321,067	250,824
	EYAK/SEO	16,833	12,625	12,625	1	16,833	12,625	16,833	12,625
	Total	228,831	174,976	174,976	139,753	273,378	203,934	337,900	263,449
Pacific Cod	W		32,745	22,922	20,910		38,702		38,702
	C		53,100	39,825	38,429		61,320		61,320
	E		2,655	1,991	294		2,828		2,828
	Total	107,300	88,500	64,738	59,633	140,300	102,850	133,100	102,850
Sablefish	W		1,480	1,480	1,195		1,474		1,338
	C		4,681	4,681	4,706		4,658		4,232
	WYAK		1,716	1,716	1,655		1,708		1,552
	SEO		2,695	2,695	2,819		2,682		2,436
	Total	12,500	10,572	10,572	10,375	12,425	10,522	11,293	9,558
Shallow-Water Flatfish	W		20,376	13,250	243		22,074		19,577
	C		17,813	17,813	4,144		19,297		17,114
	WYAK		2,039	2,039	1		2,209		1,959
	EYAK/SEO		577	577	1		625		554
	Total	50,007	40,805	33,679	4,389	54,207	44,205	48,407	39,205
Deep-Water Flatfish	W		302	302	68		301		299
	C		3,727	3,727	271		3,689		3,645
	WYAK		5,532	5,532	5		5,474		5,409
	EYAK/SEO		3,911	3,911	4		3,870		3,824
	Total	16,159	13,472	13,472	348	15,993	13,334	15,803	13,177
Rex Sole	W		1,270	1,270	124		1,258		1,234
	C		6,231	6,231	3,382		5,816		5,707
	WYAK		813	813	1		772		758
	EYAK/SEO		1,027	1,027	-		1,304		1,280
	Total	12,207	9,341	9,341	3,507	11,957	9,150	11,733	8,979
Arrowtooth Flounder	W		31,142	14,500	1,875		30,752		29,545
	C		115,612	75,000	33,085		114,170		109,692
	WYAK		37,232	6,900	50		36,771		35,328
	EYAK/SEO		11,372	6,900	16		11,228		10,787
	Total	229,248	195,358	103,300	35,026	226,390	192,921	217,522	185,352
Flathead Sole	W		12,730	8,650	212		12,767		12,776
	C		24,805	15,400	2,284		24,876		24,893
	WYAK		3,525	3,525	1		3,535		3,538
	EYAK/SEO		171	171	-		171		171
	Total	50,664	41,231	27,746	2,497	50,792	41,349	50,818	41,378

Table 1 (continued)

Species	Area	2014 OFL	2014 ABC	2014 TAC	2014 Catch	2015 OFL	2015 ABC	2016 OFL	2016 ABC
Pacific ocean perch	W		2,399	2,399	2,063		2,302		2,358
	C		12,855	12,855	13,434		15,873		16,184
	WYAK		1,931	1,931	1,871		2,014		2,055
	W/C/WYAK	19,864		17,185	17,368	23,406		23,876	
	SEO	2,455	2,124	2,124	-	954	823	973	839
	E(subtotal)					-	-	-	-
	Total	22,319	19,309	19,309	17,368	24,360	21,012	24,849	21,436
Northern Rockfish*	W		1,305	1,305	802		1,226		1,158
	C		4,017	4,017	3,410		3,772		3,563
	E		-		-		0*		0*-
	Total	6,349	5,322	5,322	4,212	5,961	4,998	5,631	4,721
Shortraker Rockfish	W		92	92	73		92		92
	C		397	397	323		397		397
	E		834	834	253		834		834
	Total	1,764	1,323	1,323	649	1,764	1,323	1,764	1,323
Dusky Rockfish	W		317	317	134		296		273
	C		3,584	3,584	2,825		3,336		3,077
	WYAK		1,384	1,384	87		1,288		1,187
	EYAK/SEO		201	201	4		189		174
	Total	6,708	5,486	5,486	3,050	6,246	5,109	5,759	4,711
Rougheye and Blackspotted Rockfish	W		82	82	25		115		117
	C		864	864	536		632		643
	E		298	298	172		375		382
	Total	1,497	1,244	1,244	733	1,345	1,122	1,370	1,142
Demersal shelf rockfish	Total	438	274	274	104	361	225	361	225
Thornyhead Rockfish	W		235	235	237		235		235
	C		875	875	666		875		875
	E		731	731	218		731		731
	Total	2,454	1,841	1,841	1,121	2,454	1,841	2,454	1,841
Other rockfish (Other slope)*	C		-				-		-
	W/C		1,031	1,031	940		1,031		1,031
	WYAK		580	580	53		580		580
	EYAK/SEO		2,470	200	37		2,469		2,469
	Total	5,347	4,081	1,811	1,030	5,347	4,080	5,347	4,080
Atka mackerel	Total	6,200	4,700	2,000	981	6,200	4,700	6,200	4,700
Big Skate	W		589	589	135		731		731
	C		1,532	1,532	1,150		1,257		1,257
	E		1,641	1,641	94		1,267		1,267
	Total	5,016	3,762	3,762	1,379	4,340	3,255	4,340	3,255
Longnose Skate	W		107	107	51		152		152
	C		1,935	1,935	1,031		2,090		2,090
	E		834	834	336		976		976
	Total	3,835	2,876	2,876	1,418	4,291	3,218	4,291	3,218
Other Skates	Total	2,652	1,989	1,989	1,559	2,980	2,235	2,980	2,235
Sculpins	GOA-wide	7,448	5,569	5,569	1,075	7,448	5,569	7,448	5,569
Sharks	GOA-wide	7,986	5,989	5,989	1,188	7,986	5,989	7,986	5,989
Squids	GOA-wide	1,530	1,148	1,148	92	1,530	1,148	1,530	1,148
Octopuses	GOA-wide	2,009	1,507	1,507	1,057	2,009	1,507	2,009	1,507
Total		790,468	640,675	499,274	292,544	870,064	685,597	910,895	731,049

*Note 1 t of moved from the northern rockfish stock EGOA allocation to EGOA "other rockfish" category

Table 2. Gulf of Alaska 2015 ABCs, biomass, and overfishing levels (t) for Western, Central, Eastern, Gulfwide, West Yakutat, and Southeast Outside regulatory areas.

		2015		
Species/Assemblage	**Area**	**ABC**	**Biomass**	**OFL**
Pollock	W(61)	*31,634* [a]		
	C(62)	*97,579* [a]		
	C(63)	*52,594* [a]		
	WYAK	*4,719* [a]		
	Subtotal	191,309	1,883,920	256,545
	EYAK/SEO	12,625	56,111	16,833
	Total	203,934	1,940,031	273,378
Pacific Cod	W	38,702		
	C	61,320		
	E	2,828		
	Total	102,850	583,800	140,300
Sablefish	W	1,474		
	C	4,658		
	WYAK	1,708		
	EY/SEO	2,682		
	Total	10,522	130,000	12,425
Shallow water Flatfish	W	22,074		
	C	19,297		
	WYAK	2,209		
	EYAK/SEO	625		
	Total	44,205	287,534	54,207
Deepwater Flatfish	W	301		
	C	3,689		
	WYAK	5,474		
	EYAK/SEO	3,870		
	Total	13,334	182,160	15,993
Rex sole	W	1,258		
	C	5,816		
	WYAK	772		
	EYAK/SEO	1,304		
	Total	9,150	82,972	11,957
Arrowtooth Flounder	W	30,752		
	C	114,170		
	WYAK	36,771		
	EYAK/SEO	11,228		
	Total	192,921	1,957,970	226,390
Flathead sole	W	12,767		
	C	24,876		
	WYAK	3,535		
	EYAK/SEO	171		
	Total	41,349	254,602	50,792

[a] The Prince William Sound GHL (2.5% of ABC; 4,783 t) is deducted from these area apportioned ABCs.

Table 2. Continued…

		2015		
Species/Assemblage	**Area**	**ABC**	**Biomass**	**OFL**
Pacific ocean perch	W	2,302		
	C	15,873		23,406
	WYAK	2,014		
	EY/SEO	823		954
	Total	21,012	416,140	24,360
Northern rockfish	W	1,226		
	C	3,772		
	E	0[1]		
	Total	4,998	98,409	5,961
Shortraker	W	92		
	C	397		
	E	834		
	Total	1,323	58,797	1,764
Dusky rockfish	W	296		
	C	3,336		
	WYAK	1,288		
	EYAK/SEO	189		
	Total	5,109	66,629	6,246
Rougheye/blackspotted rockfish	W	115		
	C	632		
	E	375		
	Total	1,122	36,584	1,345
Demersal shelf rockfish	Total	225	10,933	361
Thornyhead rockfish	Western	235		
	Central	875		
	Eastern	731		
	Total	1,841	81,816	2,454
Other rockfish	W/C	1,031		
	WYAK	580		
	EY/SEO	2,469[1]		
	Total	4,080	83,383	5,347
Atka mackerel	Total	4,700	-	6,200
Big skates	W	731		
	C	1,257		
	E	1,267		
	Total	3,255	43,398	4,340
Longnose skates	W	152		
	C	2,090		
	E	976		
	Total	3,218	42,911	4,291
Other Skates	Total	2,235	29,797	2,980
Sculpins		5,569	33,550	7,448
Sharks		5,989	76,452	7,986
Squid		1,148	-	1,530
Octopus		1,507	-	2,009
Total		685,597	6,232,408	870,064

[1]For management purposes 1t of northern rockfish are moved into "other rockfish" in the eastern GOA.

Table 3. Summary of fishing mortality rates and overfishing levels for the Gulf of Alaska, 2014.

Species	Tier	F_{ABC}[1]	Strategy	F_{OFL}[2]	Strategy
Pollock (W/C/WYAK)	3b	0.20	F_{ABC}	0.28	$F_{35\%}$
(SEO)	5	0.225	F=0.75M	0.30	F=M
Pacific cod	3a	0.441	F_{ABC}	0.626	$F_{35\%}$
Sablefish	3b	0.082	$F_{40\%}$ adjusted	0.098	$F_{35\%\ adjusted}$
Deepwater flatfish	3a, 6[3]	0.10	$F_{40\%}$, F_{ABC}[3]	0.12	$F_{35\%}$, F_{OFL}[4]
Rex sole	5	0.128	F=0.75M	0.17	F=M
Flathead sole	3a	0.47	$F_{40\%}$	0.61	$F_{35\%}$
Shallow water flatfish (excl. rocksoles)	5	0.15	F=0.75M	0.20	F=M
Northern rocksole	3a	0.374	$F_{40\%}$	0.452	$F_{35\%}$
Southern rocksole	3a	0.204	$F_{40\%}$	0.243	$F_{35\%}$
Arrowtooth	3a	0.172	$F_{40\%}$	0.204	$F_{35\%}$
Pacific ocean perch	3a	0.119	$F_{40\%}$	0.139	$F_{35\%}$
Rougheye and blackspotted rockfish	3a	0.038	$F_{40\%}$	0.045	$F_{35\%}$
Shortraker rockfish	5	0.0225	F=0.75M	0.03	F=M
Other rockfish (“other slope” rockfish)	4, 5[5]	0.065, 0.0015-0.075	$F_{40\%}$, F=0.75M[5]	0.079, 0.02-, 0.10	$F_{35\%}$, F=M[6]
Northern rockfish	3a	0.061	$F_{40\%}$	0.073	$F_{35\%}$
Dusky rockfish[7] (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=0.75M	0.03	F=M
Atka mackerel	6	NA	F_{ABC}[8]	NA	F_{OFL}[9]
Skates	5	0.075	F=0.75M	0.10	F=M
Sculpins	5	0.166	F=0.75M	0.222	F=M
Squid	6	NA	F_{ABC}[10]	NA	F_{OFL}[11]
Octopus	6	0.3975	F=0.75M[12]	0.53	F=M[13]
Sharks	6[14]	0.073	F=0.75M,F_{ABC}[14]	0.097	F=M,F_{OFL}[15]

1/ Fishing mortality rate corresponding to acceptable biological catch.
2/ Maximum fishing mortality rate allowable under overfishing definition.
3/ $F_{40\%}$ for Dover sole (Tier 3a), ABC=0.75 x average catch (1978-1995) for other deepwater flatfish (Tier 6).
4/ $F_{35\%}$ for Dover sole (Tier 3a), average catch (1978-1995) for other deepwater flatfish (Tier 6).
5/ $F_{40\%}$ for sharpchin rockfish (Tier 4), F=0.75M for other rockfish species (Tier 5). The other rockfish category (formerly the “other slope” rockfish category now includes widow and yellowtail rockfish.
6/ $F_{35\%}$ 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.
7/ 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.
8/ 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.
9/ OFL for Atka mackerel is equal to average catch from 1978 to 1995.
10/ ABC for squid is equal to 0.75 x the maximum catch of squid from 1997-2007. This is a modified Tier 6 recommendation.
11/ OFL for squid is equal to the maximum catch of squid from 1997-2007. This is a modified Tier 6 recommendation.
12/ ABC for octopus is equal to F=0.75M x the average estimate of biomass from the 2009, 2011, and 2013 surveys. This is a modified Tier 6 recommendation.
13/ 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.
14/ F_{ABC} = 0.073 for spiny dogfish (Tier 6). While spiny dogfish are a Tier 6 species, a Tier 5 approach is used. They are not a Tier 5 because the trawl survey biomass is not considered reliable for the species. 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.
15/ F=M for spiny dogfish (Tier 6). While spiny dogfish are a Tier 6 species, a Tier 5 approach is used. They are not a Tier 5 because the trawl survey biomass is not considered reliable for the species. 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 2015 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum.

Species	Tier	2015 *Max* F_{ABC}	*Max* ABC	F_{ABC}	2015 ABC
Pollock[1]	3a	0.24	222,774	0.20	191,309
Pacific cod	3a	0.502	117,200	0.441	102,850
Demersal shelf rockfish	4	0.026	293	0.02	225

1/ The Plan Team recommended 2015 W/C pollock ABC of 191,309 t listed here, has not been reduced as in past years' tables, to accommodate the Prince William Sound (PWS) GHL. The 2015 PWS GHL value is 2.5% of the W/C pollock ABC (0.025 x 191,309 = 4,783 t). This value is deducted from 191,309 t for apportionments which are listed in the pollock summary.

Table5. Groundfish landings (metric tons) in the Gulf of Alaska,1956-2012.

Year	Pollock	Pacific cod	sablefish	Flatfish	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[J]	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	70,522	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	79,789	62,475	11,148	10,043	30,890	19,612
2012	101,356	56,520	11,914	8,909	20,714	22,334
2013	93,733	51,792	11,945	12,283	21,620	19,367
2014[H]	139,753	59,633	10,375	10,741	35,026	22,962

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/Other species category 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.

Table5. (cont'd) Groundfish landings (metric tons) in the Gulf of Alaska,1956-2012.

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	2,531	82	612	1,615	4,437	2,362	225,596
2012	4,012	178	746	1,187	4,107	1,940	233,927
2013	3,978	218	1,153	1,277	6,160	6,766	230,292
2014[H]	4,080	104	1,121	981	4,356	4,971	294,103

e/Atka mackerel was added to the Other Species categoryin1988andseparatedoutin1994
f/PSR includes lightdusky, 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 since 2012)
g/Does not include at-sea discards.
h/Catch data reported through November 8th,2014.
i/Includes all species except arrowtooth.
j/Does not include state fisheries
k/Includes all managed skates species

Figures

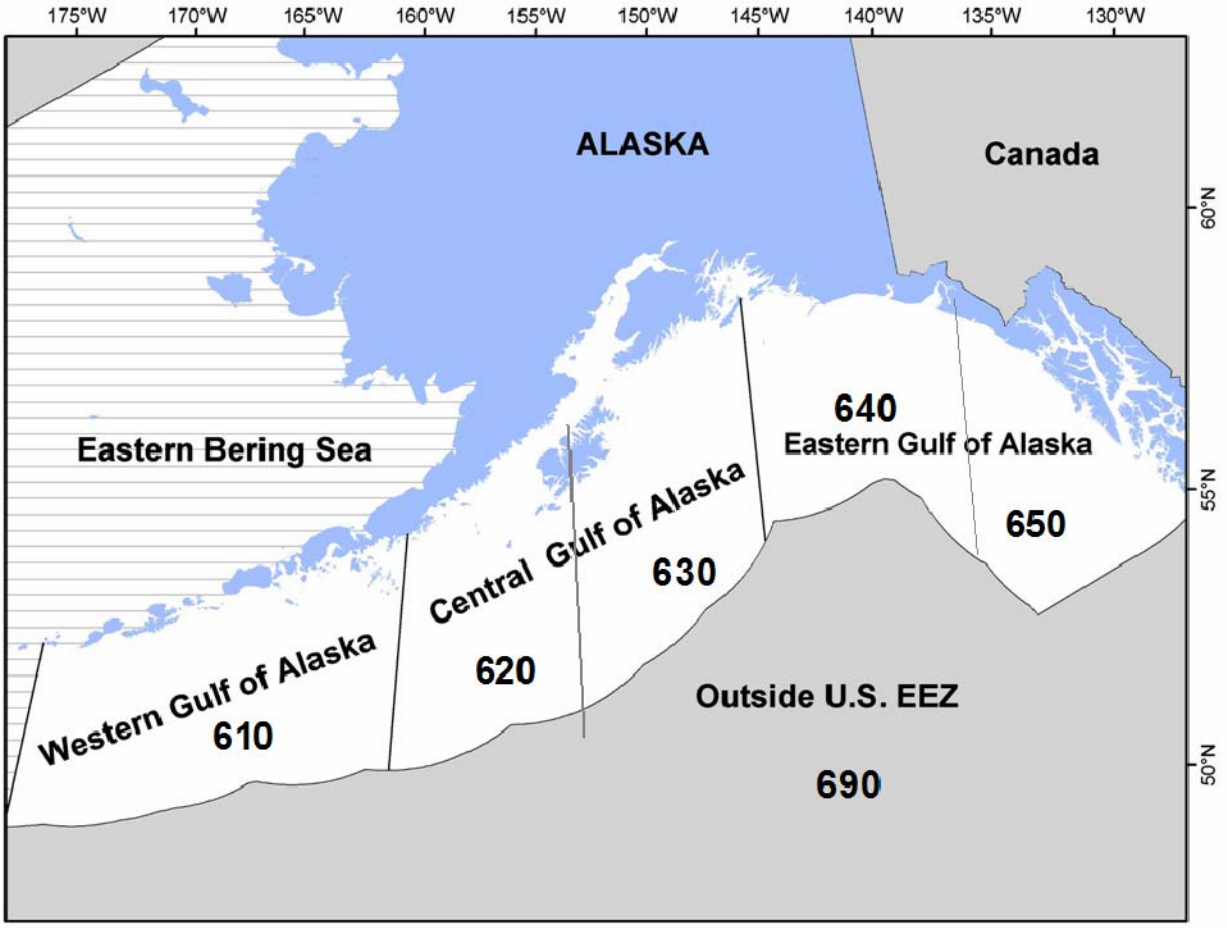

Figure 1. Gulf of Alaska statistical and reporting areas.

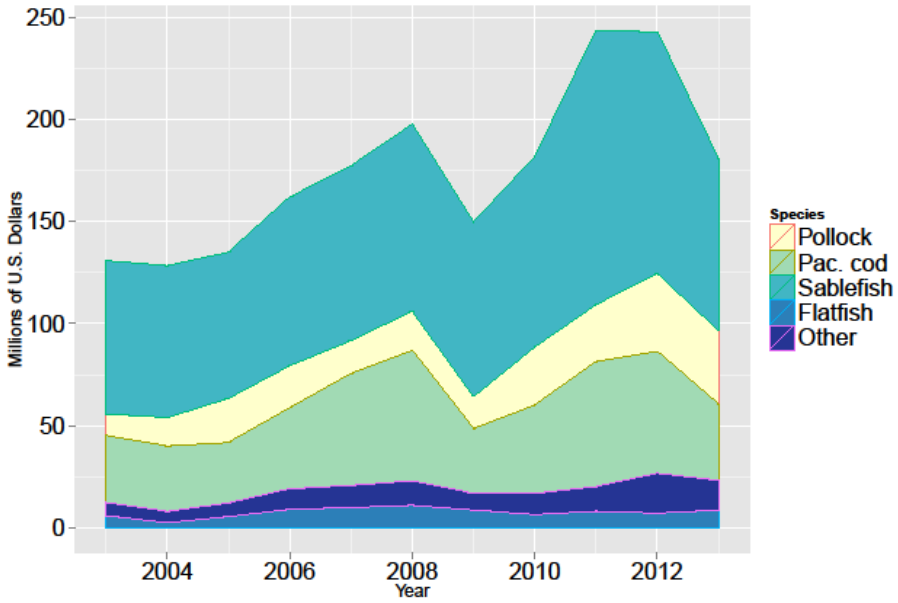

Fig. 2. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries in the GOA area by species, 2003-2013 (base year = 2013).

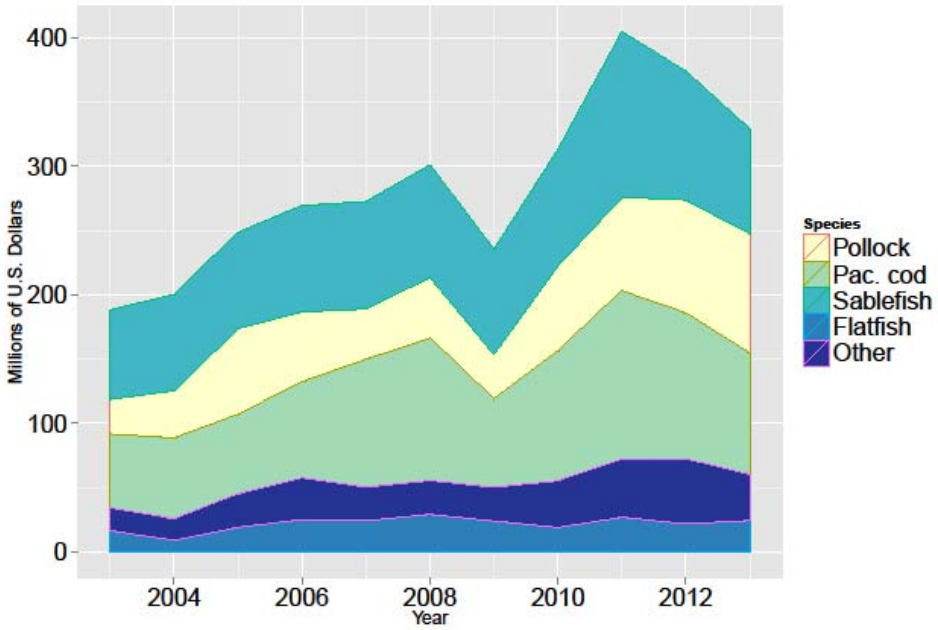

Figure 3. Real gross product value of the groundfish catch in the GOA area by species, 2003-2013 (base year = 2013).

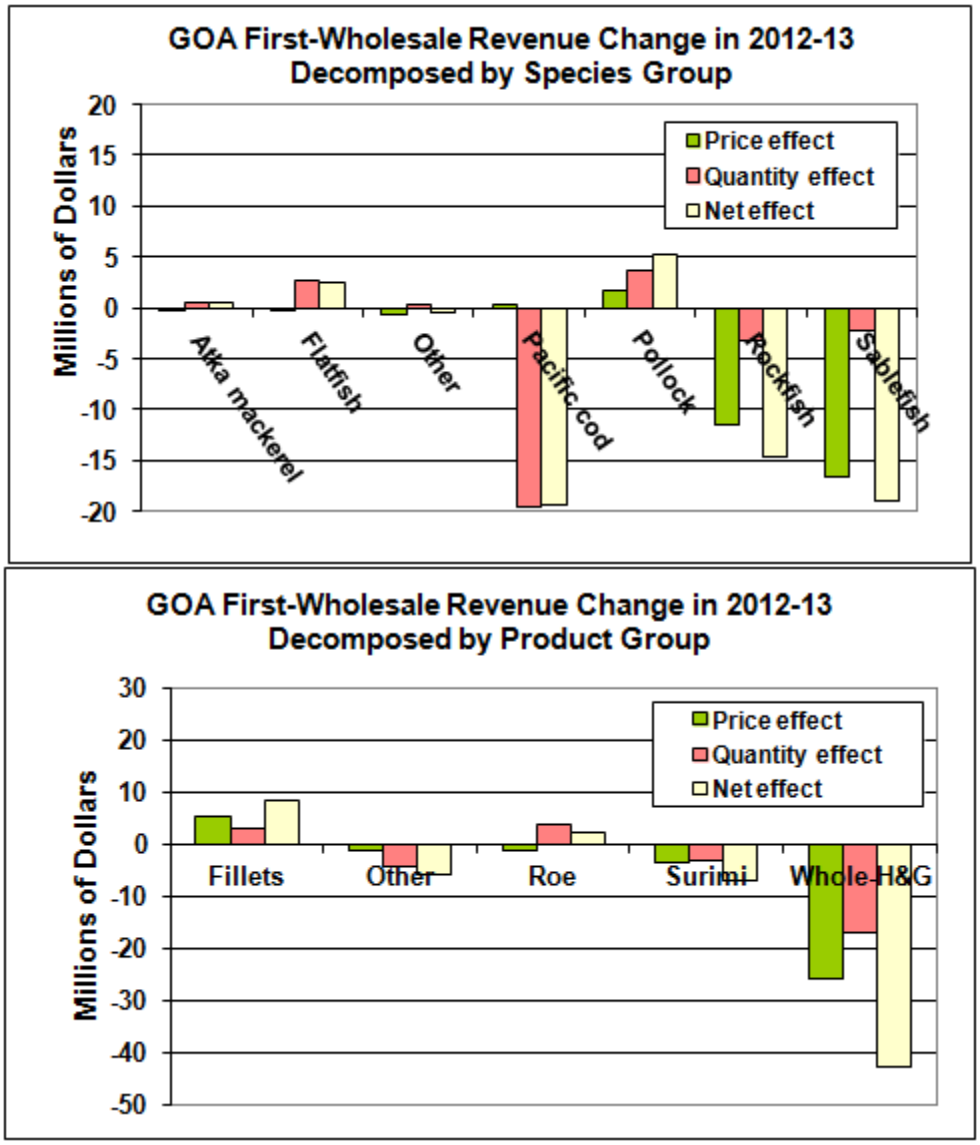

Figure 4. Decomposition of the change in first-wholesale revenues from 2012-13 in the GOA area. The first decomposition is by the species groups used in the Economic SAFE report, and the second decomposition is by product group. The price effect refers to the change in revenues due to the change in the first-wholesale price index (current 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. Year to year changes in the total quantity of first-wholesale groundfish products include changes in total catch and the mix of product types (e.g., fillet vs. surimi).

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