FAO-BASED RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The

Alaska Flatfish Commercial Fisheries (200 mile EEZ)

Facilitated By the

Alaska Seafood Marketing Institute (ASMI)

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I. Summary and Recommendations

The Alaska Seafood Marketing Institute (ASMI) requested an assessment of the Alaska Flatfish commercial fisheries according to the FAO Based Responsible Fisheries Management (RFM) Certification Program. The application was originally made in September 2012. After Validation Assessment was completed in July 2013, a full Assessment Team was formed to undertake the assessment and final certification determination was awarded on the 05th December 2013.

This report is the 1st Surveillance Report (ref: AK/FLAT/001.1/2014) for the Alaska Flatfish commercial fisheries. The objective of the Surveillance Report is to monitor for any changes/updates (after 12 months) in the management regime, regulations and their implementation, stock assessment and status, and wider ecosystem considerations since the previous assessment and to determine whether these changes and performance and current practices remain consistent with the overall confidence rating scorings of the fishery allocated during initial certification. In addition, any areas reported as "items for surveillance" or corrective action plans (following identified non-conformance) in the previous assessment are reassessed and a new conclusion on consistency of these items with the Conformance Criteria is given accordingly.

The Unit of Certification is the Alaska flatfish complex distributed in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) and specifically includes: BSAI Alaska plaice (*Pleuronectes quadrituberculatus*), BSAI/GOA arrowtooth flounder (*Atheresthes stomias*), BSAI/GOA flathead sole (*Hippoglossoides elassodon*), BSAI Greenland turbot (*Reinhardtius hippoglossoides*), BSAI Kamchatcka flounder (*Atheresthes evermanni*), BSAI/GOA northern rock sole (*Lepidopsetta polyxystra*), GOA rex sole (*Glyptocephalus zachirus*), GOA southern rock sole (*Lepidopsetta bilineata*) and BSAI yellowfin sole (*Limanda aspera*). The Alaska flatfish complex commercial fisheries employ Alaska flatfish trawl gear and longline gear (Greenland Turbot only) within Alaska's jurisdiction (200 nautical miles EEZ). These fisheries are principally managed by two federal agencies, the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (NPFMC).

The 1995 FAO Code of Conduct for Responsible Fisheries (CCRF) and 2009 FAO Ecolabelling Guidelines for Marine Capture Fisheries were presented to an ISO 65/EN45011 accredited Certification Body, Global Trust Certification, to be used as the Standard for the assessment of Alaska Fisheries. The conformance reference points from the published FAO CCRF and Ecolabelling Guidelines (now referred to as Standard) were converted into the audit checklist criteria [FAO-Based RFM Conformance Criteria (Version 1.2, Sept 2011)] by the ISO 65/EN45011 Certification Body to ensure audit ability and feasibility for accreditation.
The surveillance assessment was conducted according to the Global Trust Certification procedures for FAO – Based Responsible Fisheries Management Certification using the FAO – Based RFM Conformance Criteria V1.2 fundamental clauses as the assessment framework. The assessment was conducted by a team of Global Trust appointed Assessors comprising of one externally contracted fishery expert and Global Trust internal staff. Details of the assessment team are provided in Appendix 1. The main Key outcomes have been summarized in Section 5 "Assessment Outcome Summary"

II. Assessment Team Details

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III. Acronyms

ABC	Allowable Biological Catch
ACL	Annual Catch Limits
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
ANILCA	Alaska National Interest Lands Conservation Act
ASMI	Alaska Seafood Marketing Institute
AWT	Alaska Wildlife Troopers
BOEM	Bureau of Ocean Energy Management, Regulation and Enforcement
BOF	Board of Fisheries
BSAI	Bering Sea and Aleutian Islands
CCRF	Code of Conduct for Responsible Fisheries
CDQ	Community Development Quota
CP	Catcher Processor (vessel)
CPUE	Catch per Unit Effort
CV	Catcher Vessel
DEC	Department of Environmental Conservation
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FAO	Food and Agriculture Organization of the United Nations
FMP	Fishery Management Plan
GOA	Gulf of Alaska
GHL	Guideline Harvest Level
IFQ	Individual Fishing Quota
IPHC	International Pacific Halibut Commission
LLP	License Limitation Program
MFMT	Maximum Fishing Mortality Threshold
MSA	Magnuson-Stevens Act
MSST	Minimum stock size threshold
mt	Metric tons
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act
nm	Nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
OFL	Overfishing Level
OLE	Office for Law Enforcement
OPMP	Office of Project Management and Permitting
PSC	Prohibited Species Catch

RACE	Resource Assessment and Conservation Engineering
REEM	Resource Ecology and Ecosystem Modeling
REFM	Resource Ecology and Fisheries Management
RFM	Responsible Fisheries Management
SAFE	Stock Assessment and Fishery Evaluation (Report)
SSC	Scientific and Statistical Committee
TAC	Total Allowable Catch
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

1. Introduction

This Surveillance Report documents the 1st Surveillance Assessment (2014) of the Alaska flatfish commercial fisheries originally certified in December 2013, and presents the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

The Unit of Certification is the Alaska flatfish complex distributed in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) and specifically includes: BSAI Alaska plaice (*Pleuronectes quadrituberculatus*), BSAI/GOA arrowtooth flounder (*Atheresthes stomias*), BSAI/GOA flathead sole (*Hippoglossoides elassodon*), BSAI Greenland turbot (*Reinhardtius hippoglossoides*), BSAI Kamchatcka flounder (*Atheresthes evermanni*), BSAI/GOA northern rock sole (*Lepidopsetta polyxystra*), GOA rex sole (*Glyptocephalus zachirus*), GOA southern rock sole (*Lepidopsetta bilineata*) and BSAI yellowfin sole (*Limanda aspera*). The Alaska flatfish complex commercial fisheries employ Alaska flatfish trawl gear and longline gear (Greenland Turbot only) within Alaska's jurisdiction (200 nautical miles EEZ). These fisheries are principally managed by two federal agencies, the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (NPFMC).

This 1st Surveillance Report documents the assessment result for the continued certification of commercially exploited Alaska flatfish fisheries to the FAO-Based RFM Certification Program. This is a voluntary program that has been supported by ASMI who wishes to provide an independent, third-party accredited certification that can be used to verify that these fisheries are responsibly managed according to the FAO-Based RFM Program.

The assessment was conducted according to the Global Trust procedures for FAO-Based RFM Certification using the fundamental clauses of the FAO-Based RFM Conformance Criteria Version 1.2 (Sept 2011) in accordance with EN45011/ISO/IEC Guide 65 accredited certification procedures. The assessment is based on the fundamental clauses specified in the FAO-Based RFM Conformance Criteria.

The assessment is based on 6 major components of responsible management derived from the FAO Code of Conduct for Responsible Fisheries (1995) and Guidelines for the Eco-labelling of products from marine capture fisheries (2009); including:

A The Fisheries Management System
B Science and Stock Assessment Activities
C The Precautionary Approach
D Management Measures
E Implementation, Monitoring and Control
F Serious Impacts of the Fishery on the Ecosystem

These six major components are supported by 13 fundamental clauses (+ 1 in case of enhanced fisheries) that guide the FAO-Based RFM Certification Program surveillance assessment.

A summary of the site meetings is presented in Section 4. Assessors included both externally contracted fishery experts and Global Trust internal staff (Appendix 1).

1.1. Recommendation of the Assessment Team

Following this 1st Surveillance Assessment, in 2014, the assessment team recommends that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fisheries, the Alaska flatfish complex distributed in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) – specifically including: BSAI Alaska plaice (*Pleuronectes quadrituberculatus*), BSAI/GOA arrowtooth flounder (*Atheresthes stomias*), BSAI/GOA flathead sole (*Hippoglossoides elassodon*), BSAI Greenland turbot (*Reinhardtius hippoglossoides*), BSAI Kamchatcka flounder (*Atheresthes evermanni*), BSAI/GOA northern rock sole (*Lepidopsetta polyxystra*), GOA rex sole (*Glyptocephalus zachirus*), GOA southern rock sole (*Lepidopsetta bilineata*) and BSAI yellowfin sole (*Limanda aspera*). The Alaska flatfish complex commercial fisheries employ Alaska flatfish trawl gear and longline gear (Greenland Turbot only) within Alaska's jurisdiction (200 nautical miles EEZ). These fisheries are principally managed by two federal agencies, the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (NPFMC).

2. Fishery Applicant Details

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3. Unit of Certification

Unit of Certification				
U.S. ALASKA FLATFISH COMMERCIAL FISHERIES				
	Fish Species (Common & Scientific Name)	**Geographical Location of Fishery**	**Gear Type**	**Principal Management Authority**
1.	**Yellowfin sole, *Limanda aspera***	**Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
2.	**Flathead sole, *Hippoglossoides elassodon***	**Gulf of Alaska, Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
3.	**Northern rock sole, *Lepidopsetta polyxstra***	**Gulf of Alaska, Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
4.	**Southern rock sole, *Lepidopsetta bilineatus***	**Gulf of Alaska**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
5.	**Arrowtooth flounder, *Atheresthes stomias***	**Gulf of Alaska, Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
6.	**Kamchatka flounder, *Atheresthes evermanni***	**Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
7.	**Alaska plaice, *Pleuronectes quadrituberculatus***	**Bering Sea and Aleutian Islands**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**
8.	**Greenland turbot, *Reinhardtius hippoglossoides***	**Bering Sea and Aleutian Islands**	**Non-pelagic Trawl, Longline**	**NOAA NMFS Alaska, NPFMC**
9.	**Rex sole, *Glyptocephalus zachirus***	**Gulf of Alaska**	**Non-pelagic Trawl**	**NOAA NMFS Alaska, NPFMC**

4. Surveillance Meetings

Date	Organization	Public Meeting Themes
December 8th to 12th 2014	North Pacific Fishery Management Council, Hilton Downtown Hotel, Anchorage, Alaska	• VMS Discussion paper: Review • Bering Sea Salmon Bycatch: Initial Review • Observer coverage on small CPs: Discussion paper • Electronic Monitoring: Workgroup report; Discuss alternatives • Pribilof canyon corals: Receive comments on range of alternatives • FMP language LLP exemption housekeeping: Initial/Final Action • Crab Workgroup report on regional delivery framework agreement • OA Skate MRA revisions: Final Action • Final BSAI and GOA Flatfish and all other groundfish harvest specifications: Approve; PT reports (w/data tables of TLAS/AM 80 catch)

5. Assessment Outcome Summary

Fundamental Clauses Summaries

Clause 1: Structured and legally mandated management system
Evidence adequacy rating: High
The Alaska flatfish commercial fisheries are managed by the North Pacific Fishery Management Council (NPFMC) and the NOAA's National Marine Fisheries Service (NMFS) in the federal waters (3-200 nm). In federal waters, the Alaska flatfish fisheries are managed under the NPFMC's Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI) Groundfish Fishery Management Plans (FMPs) written and amended subject to the Magnuson Stevens Act (MSA). The US Coast Guard (USCG), the NMFS Office of Law Enforcement (OLE) enforce fisheries regulations in federal waters.

Clause 2: Coastal area management frameworks
Evidence adequacy rating: High
The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. These include decision-making processes and activities relevant to fishery resources and users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users. The NEPA processes provide public information and opportunity for public involvement that are robust and inclusive at both the state and federal levels. With regards to conflict avoidance and resolution between different fisheries, the North Pacific Fishery Management Council (NPFMC) tend to avoid conflict by actively involving stakeholders in the process leading up to decision making. The Agency provides a great deal of information on their website, including agenda of meetings, discussion papers, and records of decisions. The Council actively encourages stakeholder participation, and all their deliberations are conducted in open, public sessions. Effectively, these meetings provide forums for avoidance of potential fisheries conflicts.

Clause 3: Management objectives and plan
Evidence adequacy rating: High
The Magnuson Stevens Fishery Conservation and Management Act (MSA) is the primary domestic legislation governing the management of the nation's marine fisheries. Under the MSA, the NPFMC is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a Fishery Management Plan (FMP) and any necessary amendments, for each fishery under its authority that requires conservation and management. These include Groundfish FMPs for the Gulf of Alaska and the Bering Sea & Aleutian Islands which incorporate the flatfish fisheries in those regions. Both FMPs present long-term management objectives for the Alaska flatfish fisheries.

Clause 4: Fishery data

Evidence adequacy rating: High

Reliable and accurate data required for assessing the status of fisheries and ecosystems - including data on retained catch of fish, by catch, discards and waste are collected (BSAI and GOA surveys, catch data, observer data) routinely. The NMFS collects fishery data and conduct fishery independent surveys to assess the flatfish fisheries and ecosystems in GOA and BSAI areas. GOA and BSAI SAFE documents provide complete descriptions of data types and years collected.

Clause 5: Stock assessment

Evidence adequacy rating: High

In Alaska, there are regular stock assessment activities appropriate for the fishery, its range, flatfish species biology and the ecosystem, undertaken in accordance with acknowledged scientific standards to support its optimum utilization. NMFS conducts stock assessment and biological research in the EEZ off Alaska on FMP species. The AFSC in Seattle and the Kodiak Fisheries Research Center (KFRC) generate the scientific information and analysis necessary for the conservation, management, and utilization of the region's groundfish resources. The NPFMC and NMFS produce annual Stock Assessment & Fishery Evaluation (SAFE) reports for each fishery under federal jurisdiction. The adequacy and appropriateness of the stock assessments are ensured by extensive peer review.

Clause 6: Biological reference points and harvest control rule

Evidence adequacy rating: High

The ASFC SAFE reports consist of three volumes: a volume containing stock assessments, a volume containing economic analysis, and a volume describing ecosystem considerations. The stock assessment volume contains a chapter or sub-chapter for each stock or stock complex in the "target species" category, and a summary chapter prepared by the Groundfish Plan Team. Each chapter contains estimates of all annual harvest specifications except TAC, all reference points needed to compute such estimates, and all information needed to make annual status determinations with respect to "overfishing" and "overfished" conditions.

Clause 7: Precautionary approach

Evidence adequacy rating: High

The process for management of the Alaska flatfish complex includes the specification of objectives, development of limit and target reference points, agreement on management actions and assessment of management performance with respect to the accepted reference points. The management steps for this fishery ensure that target reference points are not exceeded and that the risk of exceeding limit reference points is low. In cases where the species/stock has been overfished target reference points are established which allow recovery in a reasonable time frame supported by projections for the foreseeable future. When new uncertainties arise, research recommendations are made and there is accountability in subsequent years to follow up on related action items. However, these uncertainties do not lead to a postponement for providing advice, in all cases precaution is the rule.

Clause 8: Management measures

Evidence adequacy rating: High

The Alaska flatfish commercial fisheries are managed according to a modern management plan that attempts to balance long-term sustainability of the resources with optimum utilization. For every change/amendment or new development affecting fisheries management and therefore modifying the FMPs, there is an evaluation of alternative conservation and management measures, including considerations of their cost effectiveness and social impact.

Clause 9: Management measures to produce maximum sustainable levels

Evidence adequacy rating: High

There are well defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels. Measures are also introduced to identify and protect depleted resources and those resources threatened with depletion, and to facilitate the sustained recovery of such stocks (MSA). Also, efforts are made to ensure that resources and habitats critical to the wellbeing of such resources (EFH) which have been adversely affected by fishing or other human activities are restored.

Clause 10: Appropriate standards of fisher's competence

Evidence adequacy rating: High

Alaska enhances through education and training programs the education and skills of fishers and, where appropriate, their professional qualifications. Records of fishermen are maintained up to date by the fishery management organizations.

Clause 11: Effective legal and administrative framework

Evidence adequacy rating: High

The Alaska flatfish fishery fleet uses enforcement measures including vessel monitoring systems (VMS) on board vessels, USCG boardings and inspection activities. The U.S. Coast Guard (USCG) and NMFS Office of Law Enforcement (OLE) enforce fisheries laws and regulations. OLE Special Agents and Enforcement Officers conduct complex criminal and civil investigations, board vessels fishing at sea, inspect fish processing plants, review sales of wildlife products on the internet and conduct patrols on land, in the air and at sea. NOAA Agents and Officers can assess civil penalties directly to the violator in the form of Summary Settlements (SS) or can refer the case to NOAA's Office of General Counsel for Enforcement and Litigation (GCEL).

Clause 12: Framework for sanctions

Evidence adequacy rating: High

*The Magnuson-Stevens Act (50CFR600.740 Enforcement policy) provides four basic enforcement remedies for violations: **1)** Issuance of a citation (a type of warning), usually at the scene of the offense, **2)** Assessment by the Administrator of a civil money penalty, **3)** for certain violations, judicial forfeiture action against the vessel and its catch, **4)** Criminal prosecution of the owner or operator for some offenses. In some cases, the Magnuson-Stevens Act requires permit sanctions following the assessment of a civil penalty or the imposition of a criminal fine. The 2011 Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions issued by NOAA Office of the General Counsel – Enforcement and Litigation, provides guidance for the assessment of civil administrative penalties and permit sanctions under the statutes and regulations enforced* *by NOAA. The Alaska Wildlife troopers enforce state water regulations with a number of statutes that enable the government to fine, imprison, and confiscate equipment for violations and restrict an individual's right to fish if convicted of a violation*.

Clause 13: Impacts of the fishery on the ecosystem

Evidence adequacy rating: High

The NPFMC, NOAA/NMFS, and other institutions interested in the North Pacific conduct assessments and research on environmental factors affecting flatfish, other groundfish and associated species and their habitats. Findings and conclusions are published in SAFE documents, annual Ecosystem Considerations documents, and other research reports. The SAFE documents summarize ecosystem considerations for the major flatfish stocks. They include sections for ***1)*** *Ecosystem effects on the stock and* ***2)*** *Effects of the fishery on the ecosystem. Adverse impacts on the fishery on the ecosystem including bycatch and discards, ETP species interactions and gear habitat interactions have been appropriately assessed and effectively addressed. All the flatfish stocks in Alaska appear to be under very light exploitation rate minimizing potentially negative food-web interactions in the ecosystem.*

6. Conformity Statement

Following this 1st Surveillance Assessment, in 2014, the assessment team recommends that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fisheries, the Alaska flatfish complex distributed in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) – specifically including: BSAI Alaska plaice (*Pleuronectes quadrituberculatus*), BSAI/GOA arrowtooth flounder (*Atheresthes stomias*), BSAI/GOA flathead sole (*Hippoglossoides elassodon*), BSAI Greenland turbot (*Reinhardtius hippoglossoides*), BSAI Kamchatcka flounder (*Atheresthes evermanni*), BSAI/GOA northern rock sole (*Lepidopsetta polyxystra*), GOA rex sole (*Glyptocephalus zachirus*), GOA southern rock sole (*Lepidopsetta bilineata*) and BSAI yellowfin sole (*Limanda aspera*). The Alaska flatfish complex commercial fisheries employ Alaska flatfish trawl gear and longline gear (Greenland Turbot only) within Alaska's jurisdiction (200 nautical miles EEZ). These fisheries are principally managed by two federal agencies, the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (NPFMC).

7. FAO-Based Conformance Criteria Fundamental Clauses for Surveillance Reporting

A. The Fisheries Management System

1. There shall be a structured and legally mandated management system based upon and respecting International, National and local fishery laws, for the responsible utilization of the stock under consideration and conservation of the marine environment.

FAO CCRF 7.1.3/7.1.4/7.1.9/7.3.1/7.3.2/7.3.4/7.6.8/7.7.1/10.3.1
FAO Eco 28

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating determination

The Alaska flatfish commercial fisheries are managed by the North Pacific Fishery Management Council (NPFMC) and the NOAA's National Marine Fisheries Service (NMFS) in the federal waters (3-200 nm). In federal waters, the *Alaska flatfish fisheries are managed under the NPFMC's Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI) Groundfish Fishery Management Plans (FMPs*) *written and amended subject to the Magnuson Stevens Act (MSA). The US Coast Guard (USCG), the NMFS Office of Law Enforcement (OLE) enforce fisheries regulations in federal waters.*

The Magnuson-Stevens Fishery Conservation and Management Act (or Magnuson-Stevens Act in short, MSA) provides the primary layer of governance for the federal Alaska flatfish fisheries. The federal agencies involved in flatfish management within Alaska's EEZ (NMFS, NPFMC), and all of their activities and decisions, are subject to the MSA. The MSA, as amended last on January 12th 2007, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851), with which all Fishery Management Plans (FMPs) must be consistent.

The FMPs, more specifically, 1) the GOA Groundfish FMP, and 2) the BSAI Groundfish FMP govern the management of the flatfish federal fisheries. Both the GOA and the BSAI FMPs were most recently updates in 2014. In federal waters (3-200 nm), the Alaska flatfish fisheries are managed by the NPFMC and the NMFS Alaska Region. With jurisdiction over the million square mile EEZ off Alaska, the NPFMC has primary responsibility for groundfish management in the GOA and BSAI, including pollock, Pacific cod, flatfish, Atka mackerel, sablefish, and (offshore) rockfish species harvested mainly by trawlers, hook and line, longliners and pot fishermen. The NPFMC submits their recommendations/plans to the NMFS for review, approval, and implementation.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf

The NMFS makes those recommendations available for public review and comment (partly by publication) before taking final action by issuing legally binding Federal regulations. In addition, the NMFS Alaska Fisheries Science Center conducts biological studies, annual stock surveys and publishes annual stock assessment reports. The NMFS is also charged with carrying out the federal mandates of the U.S. Department of Commerce with regard to commercial fisheries such as approving and implementing FMPs and FMP amendments recommended by the NPFMC. The US Coast Guard (USCG) is responsible for enforcing FMP regulations at sea, in conjunction with NMFS Office of Law Enforcement (OLE) enforcement ashore. Also, the USCG enforces laws to protect marine mammals and endangered species, international fisheries agreements (i.e. UN High Seas Driftnet Moratorium in the North Pacific), and foreign encroachment.

http://www.npfmc.org/
http://www.uscg.mil/d17/
http://alaskafisheries.noaa.gov/sustainablefisheries/default.htm

New in 2014

C9 Bering Sea Canyons Motion – North Pacific Fishery Management Council April 13, 2014

The purpose of the Bering Sea Canyons Motion adopted in April 2014 is to determine whether and how the Council should recommend amendment of the BSAI Groundfish and Crab FMPs to protect known, significant concentrations of deep-sea corals in the Pribilof Canyon and the adjacent slope from fishing impacts under the appropriate authorities of the MSA.

This action may identify a discrete area or areas of significant abundance of deep sea corals in, and directly adjacent to, the Pribilof canyon, assess the potential for fishing impacts on the identified area or areas of significant coral abundance, evaluate the historical and current patterns of fishing effort and fish removals in and adjacent to the Pribilof Canyon, consider the types of management measures that would be appropriate to conserve discrete areas of significant coral abundance while minimizing impacts on established fishing activity, and identify the appropriate authority under which the Council may take action.

The NPFMC has taken significant steps to protect coral and coral habitats in the Aleutian Islands and Gulf of Alaska. Recent models and data have shown that Pribilof Canyon and some areas along the Bering Sea slope may also contain deep sea coral. Results of surveys planned for summer 2014 should further refine the understanding of coral occurrence within the canyons and slope habitats, and this information will be useful in refining alternatives developed in response to this purpose and need.

There is historical fishing activity that occurs within and around the Pribilof Canyon. Deep sea corals may be important habitat for several commercially important fish species managed by the Council, and may provide important ecosystem services for the maintenance of healthy Bering Sea ecosystems. Consistent with the Council's adopted policy for incorporating the Ecosystem Approach to fisheries management and the authorities of the MSA, the Council intends to initiate action to investigate where and how to protect coral in the Pribilof Canyon and directly adjacent slope (http://www.npfmc.org/bering-sea-canyons/).

2014 Steller Sea Lion Biological Opinion

Section 7 Consultation Biological Opinion – Authorization of Alaska groundfish fisheries under the Proposed Revised Steller Sea Lion Protection Measures, April 2014.

NOAA Fisheries stated that proposed changes to fishing restrictions in the Aleutian Islands are not likely to jeopardize the continued existence of the endangered western population of Steller sea lions or adversely modify Steller sea lion critical habitat, according to a biological opinion issued on April 2nd 2014 under the Endangered Species Act. The agency estimates that the proposed fishery management changes would relieve roughly two-thirds of the economic burden imposed on Aleutian Islands' fishermen by sea lion protection measures that took effect in 2011. Fishermen could see new regulations in place by January 2015.
The agency's previous biological opinion on the effects of fisheries, issued in 2010, found that the ongoing groundfish fisheries in the western and central Aleutian Islands were likely to jeopardize the continued existence of Steller sea lions and adversely modify their critical habitat. This led NOAA Fisheries to develop a "Reasonable and Prudent Alternative" under the ESA, which closed the Atka mackerel and Pacific cod fisheries (that are prosecuted in conjunction with the flatfish fisheries) in the western Aleutians in 2011, and further restricted these fisheries in the central Aleutians. The 2010 opinion underwent two external reviews—one commissioned by NOAA and undertaken by the Center for Independent Experts, and a second provided by the states of Alaska and Washington. NOAA Fisheries conducted several new analyses in response to the reviews, which are incorporated into the new 2014 opinion.

The new biological opinion was developed based on the best available scientific information and notes that considerable changes have occurred in the Aleutian Islands fisheries, coupled with new data and analyses that help give the agency a better picture of the potential for commercial fisheries to compete with sea lions for Pacific cod, Atka mackerel and pollock. Beginning in 2014, NOAA and the North Pacific Fishery Management Council split the total allowable catch for Pacific cod between the Bering Sea fishing grounds and the Aleutian Islands, resulting in far less allowable Pacific cod harvest in the Aleutians. Additional changes that are being considered would limit the amount, timing and location of Atka mackerel, Pacific cod and pollock harvests inside Steller sea lion critical habitat in the Aleutians. NOAA Fisheries remains concerned that large fishery harvests from important areas in the Aleutians over a short amount of time has the potential to deplete concentrations of fish that Steller sea lions depend upon. However, the proposed measures would limit and spread out the catch enough to meet the requirements of the Endangered Species Act, and are consistent with NOAA Fisheries' views on dispersing the harvest in space and time to avoid localized depletion of fish that are prey species for Steller sea lions.

NOAA Fisheries is completing an environmental impact statement on the new fishery management measures, and expects to implement the new regulations in January 2015.

http://alaskafisheries.noaa.gov/newsreleases/2014/ssl040214.htm

2. Management organizations shall participate in coastal area management institutional frameworks, decision-making processes and activities related to the fishery and its users, in support of sustainable and integrated resource use, and conflict avoidance.

FAO CCRF 10.1.1/10.1.2/10.1.4/10.2.1/10.2.2/10.2.4

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination

The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. These include decision-making processes and activities relevant to fishery resources and users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users. The NEPA processes provide public information and opportunity for public involvement that are robust and inclusive at both the state and federal levels. With regards to conflict avoidance and resolution between different fisheries, the North Pacific Fishery Management Council (NPFMC) tend to avoid conflict by actively involving stakeholders in the process leading up to decision making. The Agency provides a great deal of information on their website, including agenda of meetings, discussion papers, and records of decisions. The Council actively encourages stakeholder participation, and all their deliberations are conducted in open, public sessions. Effectively, these meetings provide forums for avoidance of potential fisheries conflicts.

NEPA and ACMP

The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. These include decision-making processes and activities relevant to fishery resources and users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users. The state of Alaska is a cooperating agency in the NEPA process for federal actions, giving it a seat at the table for federal actions. The NEPA process is essentially a biological/environmental, and socio-economic impact assessment where proposed options for significant developments and/or changes in current management practices are evaluated, before a final decision is taken. One of the latest NEPA analyses has seen the restructuring of the observer program to cover the previously unobserved vessels less than 60 feet LOA participating in groundfish and halibut harvest. This change affected particularly the fishing fleets in the Gulf of Alaska, given that those vessels are generally smaller than those operated in the BSAI.
http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2013.pdf

The NEPA processes provide public information and opportunity for public involvement that are robust and inclusive at both the state and federal levels. Fisheries are relevant to the NEPA process in two ways. Firstly, each NPFMC fisheries package must go through the NEPA review process.

Secondly, any project that could impact fisheries (i.e., oil and gas, mining, coastal construction projects, etc.,) that is either on federal lands, in federal waters, receives federal funds or requires a federal permit, must go through the NEPA process. In this manner, both fisheries and non-fisheries projects that have a potential to impact fisheries have a built in process by which concerns of the NPFMC, NMFS, state agencies, industry, other stakeholders or the public must be accounted for.

DEC

The Alaska Department of Environmental Conservation (DEC) implements statutes and regulations affecting air, land and water quality. DEC is the lead state agency for implementing the federal Clean Water Act and its authorities provide considerable opportunity to maintain high quality fish and wildlife habitat through pollution prevention (http://dec.alaska.gov/).

ADFG

ADFG protects estuarine and marine habitats primarily through cooperative efforts involving other state and federal agencies and local governments. ADFG has jurisdiction over the mouths of designated anadromous fish streams and legislatively designated state special areas (critical habitat areas, sanctuaries and refuges). Some marine species also receive special consideration through the state Endangered Species program.

DNR

The Alaska Department of Natural Resources (DNR) manages all state-owned land, water and natural resources except for fish and game. This includes most of the state's tidelands out to the three mile limit and approximately 34,000 miles of coastline. DNR authorizes the use of log-transfer sites, access across state land and water, set-net sites for commercial gill net fishing, mariculture sites for shellfish farming, lodge sites and access for the tourism industry, and water rights and water use authorizations. DNR also uses the state Endangered Species Act to preserve natural habitat of species or subspecies of fish and wildlife that are threatened with extinction (http://dnr.alaska.gov/).

USFWS

The U.S. Fish and Wildlife Service (USFWS) is a bureau within the Department of the Interior. Its objectives include 1) Assisting in the development and application of an environmental stewardship ethic, based on ecological principles, scientific knowledge of fish and wildlife, and a sense of moral responsibility; 2) Guide the conservation, development, and management of the US's fish and wildlife resources. 3) Administer a national program to provide the public opportunities to understand, appreciate, and wisely use fish and wildlife resources. The USFWS functions include enforcement of federal wildlife laws, protection of endangered species, management of migratory birds, restoration of nationally significant fisheries, conservation and restoration of wildlife habitat such as wetlands, help of foreign governments with their international conservation efforts, and distribution of hundreds of millions of dollars, through the Wildlife Sport Fish and Restoration program, in excise taxes on fishing and hunting equipment to State fish and wildlife agencies (http://www.fws.gov/help/about_us.html).

ANILCA

The Alaska National Interest Lands Conservation Act (ANILCA) directs federal agencies to consult and coordinate with the state of Alaska. State agencies responsible for natural resources management, tourism, and transportation work as a team to provide input throughout federal planning processes (http://dnr.alaska.gov/commis/opmp/anilca/).

BOEM

The Bureau of Ocean Energy Management (BOEM) (previously Minerals and Management) is responsible for managing environmentally and economically responsible development and provide safety and oversight of the offshore oil and gas leases. The activities of BOEM and the process for application and approval of oil exploration permits overlaps extensively with evaluations by ADNR, ADFG and ADEC given the potential impacts of such activities on anadromous and other marine resources and their habitat. An example of this is provided by the *Cook Inlet Offshore Oil & Gas Exploration Permit Application & Approval Process* available at:
http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis_Flowchart_CookInletOffshore_Draft.pdf

OPMP

The Department of Natural Resources (DNR) Office of Project Management and Permitting (OPMP) coordinates the review of larger scale projects in the state. Because of the complexity and potential impact of these projects on multiple divisions or agencies, these projects typically benefit from a single primary point of contact. A project coordinator is assigned to each project in order to facilitate interagency coordination and a cooperative working relationship with the project proponent. The office deals with a diverse mix of projects including transportation, oil and gas, mining, federal grants, ANILCA coordination, and land use planning. Every project is different and involves a different mix of agencies, permitting requirements, statutory responsibilities, and resource management responsibilities (http://dnr.alaska.gov/commis/opmp/).

The assessment team considers that collectively: the NEPA process, existing agencies and processes (e.g. ADFG, ADEC, DNM, USFWS, ANILCA OPMP, and BOEM), and the existing intimate and routine cooperation between federal and state agencies managing Alaska's coastal resources is capable of planning and managing coastal developments in a transparent, organized and sustainable way.

Conflict avoidance in the fisheries sector

With regards to conflict avoidance and resolution between different fisheries, the NPFMC tend to avoid conflict by actively involving stakeholders in the process leading up to decision making. The NPFMC also has a standing joint committee that meets to resolve management and allocation issues. The Council provides a great deal of information on their websites, including meeting agendas, discussion papers, and records of decisions. The Council actively encourages stakeholder participation, and all their deliberations are conducted in open, public sessions. Effectively, these meetings provide forums for avoidance and resolution of potential fisheries conflicts. Alternatively courts of law provide resolution centers for any legal dispute. In addition, stakeholders may review and submit written comments to the NMFS on proposed rules published in the Federal Register. The Council as part of their process assesses economic, social and cultural value of the fishery resources in order to assist decision-making, allocation and use.

In 2005, the AFSC compiled baseline socioeconomic information about Alaskan fishing communities in the first edition of *Community Profiles for North Pacific Fisheries – Alaska* (NOAA-TM-AFSC-160). Between 2010 and 2011, AFSC went through the process of updating the profiles (NOAA-TM-AFSC-230). A total of 195 communities have now been profiled. The new profiles add a significant amount of new information to help provide a better understanding of each community's reliance on fishing. The profiles include information collected from communities in the Alaska Community Survey, which was conducted during summer 2011, and the Processor Profiles Survey, which was conducted in fall 2011. The community profiles are available at the following url: http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/CPU.php and the latest report at the following url: http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-230.pdf.

3. Management objectives shall be implemented through management rules and actions formulated in a plan or other framework.

FAO CCRF 7.3.3/7.2.2

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination

The Magnuson Stevens Fishery Conservation and Management Act (MSA) is the primary domestic legislation governing the management of the nation's marine fisheries. Under the MSA, the NPFMC is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a Fishery Management Plan (FMP) and any necessary amendments, for each fishery under its authority that requires conservation and management. These include Groundfish FMPs for the Gulf of Alaska and the Bering Sea & Aleutian Islands which incorporate the flatfish fisheries in those regions. Both FMPs present long-term management objectives for the Alaska flatfish fisheries.

The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. 1851), with which all fishery management plans must be consistent. Under the direction of the NPFMC, the GOA and BSAI FMPs define nine management and policy objectives that are reviewed annually. They are:

1) Prevent Overfishing;
2) Promote Sustainable Fisheries and Communities;
3) Preserve Food Webs;
4) Manage Incidental Catch and Reduce Bycatch and Waste;
5) Avoid Impacts to Seabirds and Marine Mammals;
6) Reduce and Avoid Impacts to Habitat;
7) Promote Equitable and Efficient Use of Fishery Resources;
8) Increase Alaska Native Consultation and;
9) Improve Data Quality, Monitoring and Enforcement.

The national standards and management objectives defined in GOA and BSAI FMPs provide adequate evidence to demonstrate the existence of long-term objectives clearly stated in these management plans. Both FMPs present long-term management objectives for the Alaska flatfish fisheries. These include sections that describe a Summary of Management Measures and Management and Policy Objectives. The BSAI and GOA FMPs define specific management measures to avoid excess fishing capacity and maintain stocks that are economically viable for the fishing communities and industry to harvest and process. Management objectives take into account the interests of subsistence, small-scale, and artisanal fisheries, define three management objectives to conserve biodiversity of aquatic habitats and protect endangered species; and describe management measures to assess environmental impacts from human activities.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmp.pdf

B. Science and Stock Assessment Activities

4.	**There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.** ***FAO CCRF 7.1.9/7.4.4/7.4.5/7.4.6/8.4.3/12.4*** ***ECO 29.1-29.3***

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating determination

Reliable and accurate data required for assessing the status of fisheries and ecosystems - including data on retained catch of fish, by catch, discards and waste are collected (BSAI and GOA surveys, catch data, observer data) routinely. The NMFS collects fishery data and conduct fishery independent surveys to assess the flatfish fisheries and ecosystems in GOA and BSAI areas. GOA and BSAI SAFE documents provide complete descriptions of data types and years collected.

The annual assessment used to determine stock status and harvest recommendations for BSAI and GOA flatfish species incorporates data collected from commercial landings and transshipment reports, port and at-sea observers; as well as Catch per Unit Effort (CPUE), sex, length and age data from fishery independent surveys in the EBS, the AI and the GOA. The Resource Assessment and Conservation Division (RACE) of the Alaskan Fisheries Science Center (AFSC) are responsible for federally managed fisheries (3-200 nm) while the ADFG undertake coastal surveys and gather and collect data from state managed fisheries (0-3 nm). It is noted that the overall data collection program is probably one of the most extensive in the world. At-sea (processor and catcher-processor vessels) are legally required to report commercial and non-commercial catch data on a daily basis, while catch and auxiliary information from a very extensive observer program, in many cases covering 100% of the fleet activity (e.g. in the EBS, but significantly less in the GOA) is also transmitted on a daily basis.

The Fisheries Monitoring and Analysis Division (FMA) of the NMFS monitor groundfish fishing activities in the US EEZ. FMA is responsible for the biological sampling of commercial fishery catches, estimation of catch and bycatch mortality, and analysis of fishery-dependent survey data. The Division is responsible for training and oversight of at-sea observers who collect catch data onboard fishing vessels and at onshore processing plants. Data and analysis are provided to the Sustainable Fisheries Division of the Alaska Regional Office for the monitoring of quota uptake and for stock assessment, ecosystem investigations and research programs.

The overall data collection program at NMFS is one of the most extensive in the world. At-sea (processor and catcher-processor vessels) are legally required to report commercial and non-commercial catch data on a daily basis, while catch and auxiliary information from a very extensive observer program, are transmitted on a daily basis. Landings data from shore based processing facilities are also transmitted on a daily basis and the processing facilities subject to a high level of observer coverage. The size of the groundfish stock area necessitates an extensive survey program http://www.afsc.noaa.gov/RACE/groundfish/survey_data/data.htm. Many of the commercial groundfish fisheries are managed with limited entry. In-season management monitors TAC uptake on a daily basis to ensure that the TAC is not exceeded. http://www.fakr.noaa.gov/2013/2013.htm.

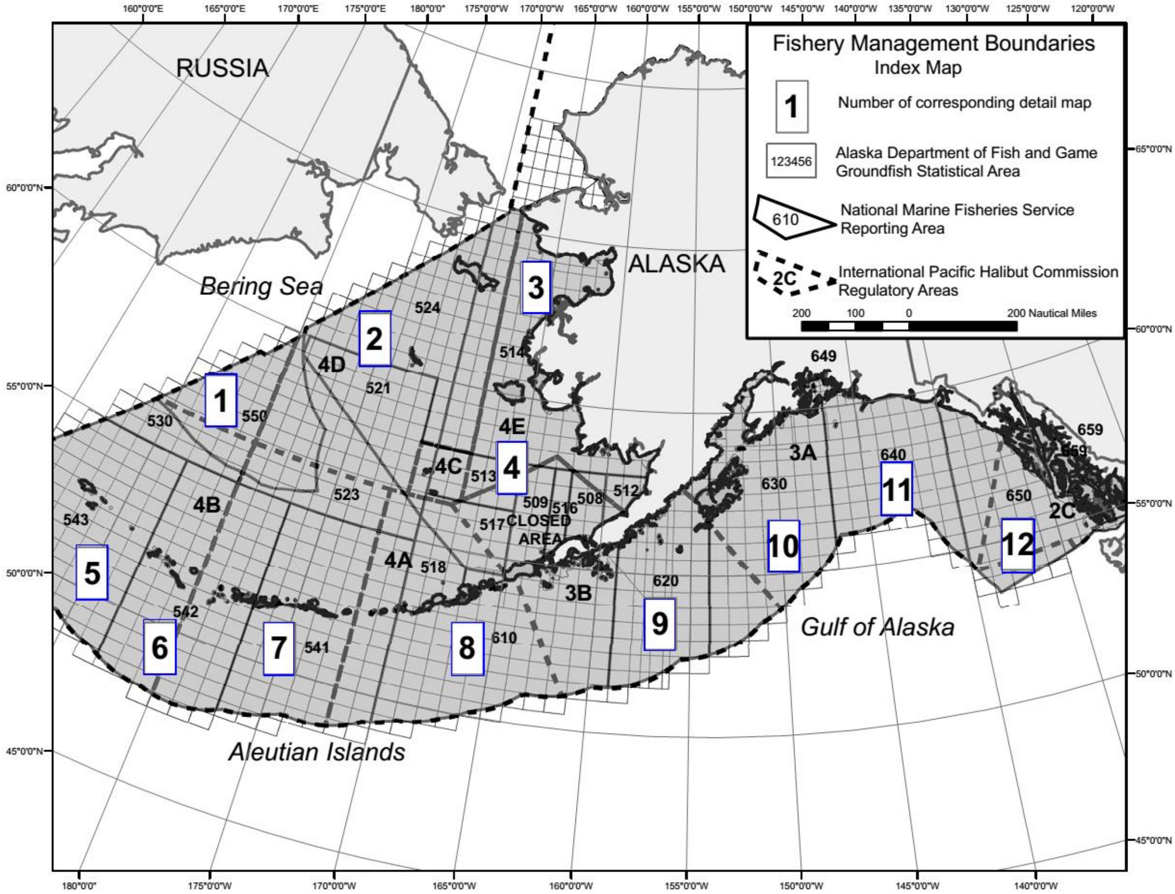


Figure 1. State and Federal groundfish reporting areas in the BSAI and the GOA.
Source: http://alaskafisheries.noaa.gov/maps/reporting_areas/index.pdf

Fishery Dependent Data

North Pacific Fishery Observer Program

Data gathered under the auspices of the North Pacific Groundfish Observer Program (NPGOP) covers all biological information associated with commercial fisheries, including catch weights (landings and discards), catch demographics (species composition, length, sex and age) and interactions with sharks, rays, seabirds, marine mammals and other species with limited or no commercial value. Beginning in 2013, Amendment 86 to the FMP of the BSAI and Amendment 76 to the FMP of the GOA establish the new North Pacific Groundfish and Halibut Observer Program. All vessels fishing for groundfish in federal waters are required to carry observers, at their own expense, for at least a portion of their fishing time.

Observer data is collated and utilized for the following:

1) to monitor target catch and bycatch;
2) to understand the population status and trends of fish stocks and protected species, as well as the interactions between them;
3) to determine the quantity and distribution of net benefits derived from living marine resources;
4) to predict the biological, ecological, and economic impacts of existing management actions and management actions proposed. http://www.npfmc.org/observer-program/

The NMFS collects the necessary information from a number of sources to conserve and manage the groundfish and halibut fisheries in the Gulf of Alaska (GOA) and the Bering Sea and Aleutian Islands (BSAI) management areas. Data collected by well-trained, independent observers are a cornerstone of management of the Federal fisheries off Alaska. These data are needed by the North Pacific Fishery Management Council (Council) and NMFS to comply with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Marine Mammal Protection Act, the Endangered Species Act, and other applicable Federal laws and treaties.

Approximately 300 observers are deployed annually. Observers are employed by six NMFS-permitted private companies and training is provided by the Observer Training Center of the University of Alaska Anchorage. The Fisheries Monitoring and Analysis (FMA) division of NOAA provide oversight, quality assurance analysis, briefings and trip de-briefings to the observer training and operational programs. Data collection methods and standardized techniques are described in detail in the NPGOP sampling manual. Data is quality controlled through a rigorous training program with competency checks throughout, standardized collection methods, and one on one debriefing with a NMFS trained de-briefer at the end of each deployment. The debriefer presents an error report of the data recorded by the observer and performs data checks. The main purpose of the computer error check is to compare data between form types, search for missing data, and flag questionable entries. This report will be reviewed during the interview and all corrections will be made at that time. In addition, all forms will be checked and compared with the electronic data.
http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2013.pdf

The FMA division also deploys staff to monitor landings at shore-based facilities and collect demographic biological data (species, length/age, sex etc…) which is subsequently provided to the Alaska Fisheries Science Center for stock assessment purposes.
http://www.npfmc.org/observer-program/

Observer report for 2013 (published in 2014)

Fees and budget

Federal start-up funding was sufficient to pay for observer coverage until fees were collected and available for use. NMFS successfully implemented the ex-vessel based fee collection program recommended by the Council to fund observer coverage in the partial coverage category. Cooperation by processors and fishermen in the first year was instrumental to the success of the fee collection program. A total of $4,251,452 in observer fees was collected for 2013. The breakdown in contribution to the observer fee by species is: 38% halibut, 31% sablefish, 19% Pacific cod, 10% pollock, and 2% all other groundfish species.

Deployment Performance Review

The 2013 Observer Report presents a review of the deployment of observers in 2013 relative to the intended sampling plan and goals of restructured observer program. One goal of the observer program restructuring action was to address longstanding concerns about statistical bias of observer collected data. In evaluating the 2013 sampling plan for the deployment of observers, the review identified situations where bias may exist and recommendations for further evaluation were provided, including improvements to the deployment process that could be considered by NMFS for the 2015 Annual Deployment Plan.

Where the anticipated deployment goals met?

Evaluation of the deployment performance was conducted at the stratum level. Each stratum is defined by the sampling unit (i.e., vessels or trips) and/or rate of sampling. There were two strata under partial coverage: vessel selection and trip selection (the selection unit being vessels or trips, respectively).

Trip Selection

- The realized rates of coverage for 2013 met the anticipated coverage goals for all trip selection strata.
- The Observer Declare and Deploy System performed as expected throughout the year and was unaffected by the government shutdown in October.

Vessel Selection

- Coverage levels in vessel selection were less than expected values during the first five selection periods (January - October). The random selection of vessels for observer coverage was abandoned and all eligible vessels were selected during the last period (November-December). During this selection period coverage levels achieved the anticipated number of vessels specified in the 2013 ADP.
- Vessels were selected for sampling based on whether they fished within a particular selection period in 2012. This meant that any vessels that did not fish in 2012 but did fish in 2013 were not part of the selection pool. This discrepancy between the selection list (sampling frame), and the list of vessels that actually fished (target frame), resulted in some vessels within the vessel selection stratum having no probability of selection. The number of vessels that fished in 2013, but not in 2012, ranged between 9 (January-February) and 49 (July-August) vessels. This problem was evident in all six vessel selection periods. The percent of non-response (vessels that were selected and fished, but were not observed, largely because of conditional releases) ranged between 13% and 71% with peak values between May and July.
- The combination of the conditional releases and a poorly defined list of vessels resulted in

NMFS having to select a greater number of vessels in each selection period than desired to reach anticipated selection goals in 2013, decreased the sampling efficiency of the selection.

Dockside Sampling

- Coverage rates for dockside sampling did not meet the objective of deploying observers to complete salmon sampling during all pollock offloads in the Gulf of Alaska. The Observer Program sampled 91% of pollock deliveries. The sampling plan presented several challenges for obtaining a census of deliveries: notifications were not always made, observers were not always available when and where a pollock delivery was made, salmon held by the processing plant may not have represented a census of all salmon from which the observer obtained his or her systematic sample.

Was the Coverage Representative?

Trip Selection

- No large differences in temporal patterns were apparent in the actual number of observed trips versus the anticipated number of observed trips throughout the year. Although small deviations from the anticipated number of observed trips were evident at the start and end of the year.
- Spatial analysis across federal reporting areas showed the anticipated coverage rates generally were as expected (e.g., consistent spatial patterns of extreme values).
- The OSC evaluated whether observed and unobserved trips had similar characteristics. The empirical distributions showed no large differences in trip length, weight of landed catch per trip, number of NMFS areas fished, or diversity of species caught during a trip. However, small sample sizes during some periods made determining inconsistencies difficult.
- No obvious pattern in trip duration for tender versus non-tender trips was apparent, but the number of observed tender trips was too low to examine on a fine temporal or spatial scale.

Vessel Selection

- The impact of non-response (i.e., a vessel that was selected to be observed but was not) on the spatial distribution of observer coverage on vessel-selected trips was large. In total, 52% of the vessels, and 50% of the trips resulting from these vessels were expected to be observed, but were not due to conditional releases. This high level of non-response, coupled with a low sample size and using vessels as a selection unit likely resulted in systematic spatial coverage issues, with coverage levels being consistently different than expected in Federal reporting area 650 (Southeast Outside District) for much of the year (March and October).
- The small sample sizes per selection period made distinguishing differences in trip attributes between observed and unobserved portions of the fleet difficult. With this caveat in mind, NMFS did not observe large differences in trip duration or landed catch weight. They did observe differences in the number of NMFS areas visited per trip and the diversity of species

in landed catch (observed trips had landings with higher diversity).

Sample Size Metrics

- As expected, reporting areas and gear types that had more fishing effort had higher probabilities of having observer data in that gear/area/stratum combination. There were differences in the probability of an observed trip between gear types, with trawl generally having a higher probability of observation due to concentrated fishing in fewer areas (e.g. more trips in any given area) whereas hook-and-line was more disperse (e.g., fewer trips in an area) and more areas/stratum combinations had a higher probability of zero observer coverage.

Observer Availability

- With few exceptions, observers for the partial coverage category were available to deploy on vessels in the trip and vessel selection pools. The restructured program resulted in observer coverage on many vessels less than 60 feet that had not previously been observed, and the contracted observer provider company was able to successfully deploy observers to many remote port locations.

Compliance and Enforcement

- During 2013, AKD agents and officers engaged with industry and the Observer Program in 731 hours of observer related outreach, education, and compliance assistance. Agents and officers in all AKD field offices responded to industry questions and potential observer related violations and participated in industry outreach and Agency meetings.
- Outreach and a collaborative agency response resulted in good industry awareness of the restructured Observer Program and an overall high level of compliance.

A measure of observer coverage for catch in the flatfish fisheries has been provided for the BSAI and GOA fleets in the tables below.

Table 1. Total catch (retained and discard) of groundfish species and halibut (in metric tons) caught in the Gulf of Alaska in 2013.

Sector	Species Caught	Trip Disposition	Hook and Line Retained	Hook and Line Discard	Jig Retained	Jig Discard	Non-Pelagic Trawl Retained	Non-Pelagic Trawl Discard	Pot Retained	Pot Discard	Pelagic Trawl Retained	Pelagic Trawl Discard
Catcher/ Processor	Deepwater Flatfish	Observed	16	47			8,837	3,400				
		Total	17	49			8,837	3,400				
	Halibut	Observed		308				547				
		Total		309				547				
	Other groundfish	Observed	38	337			1,031	889				
		Total	39	345			1,031	889				
	Pacific cod	Observed	3,110	98			1,068	760				
		Total	3,128	99			1,068	760				
	Pollock	Observed	4	6			1,156	1,335				
		Total	4	6			1,156	1,335				
	Rockfish	Observed	65	129			11,271	1,522				
		Total	79	129			11,271	1,522				
	Sablefish	Observed	536	11			393	47				
		Total	649	11			393	47				
	Shallow-water flats	Observed		4			1,219	34				
		Total		4			1,219	34				
Catcher Vessel	Deepwater Flatfish	Observed	<1	31			2,698	429		<1	75	1
		Total	1	417			12,946	1,972	<1	1	546	29
	Halibut	Observed	677	746				186		1		19
		Total	10,947	11,613	1			1,262		89		30
	Other groundfish	Observed	50	370			259	210	5	8	34	6
		Total	550	5,825	<1		1,528	1,071	207	244	309	36
	Pacific cod	Observed	960	118			1,992	159	329	1	113	<1
		Total	7,712	1,899	476		17,576	1,524	16,749	109	740	3
	Pollock	Observed	15	3			1,137	164	<1	<1	12,906	60
		Total	90	34	17		8,556	602	12	8	81,471	359
	Rockfish	Observed	78	90			6,898	115		<1	1,913	10
		Total	957	898	27		7,394	209	<1	8	2,129	64
	Sablefish	Observed	1,187	56			344	<1		<1	<1	<1
		Total	9,871	566			404	<1		<1	1	<1
	Shallow-water flats	Observed	<1	2			609	16		<1	<1	<1
		Total	<1	16	<1		3,987	179	<1	2	73	2

Table 2. Total catch (retained and discard) of groundfish species and halibut (in metric tons) caught by catcher/processors in the BSAI in 2013.

Sector	Species Caught	Trip Disposition	Hook and Line Retained	Hook and Line Discard	Jig Retained	Jig Discard	Non-Pelagic Trawl Retained	Non-Pelagic Trawl Discard	Pot Retained	Pot Discard	Pelagic Trawl Retained	Pelagic Trawl Discard
Catcher/ Processor	Atka Mackerel	Observed	2	23			20,750	658	<1	<1	1	<1
		Total	2	23			20,750	658	<1	<1	1	<1
	Flatfish	Observed	4	1,818			224,539	14,507	<1	295	6,351	2,281
		Total	4	1,854			224,562	14,508	<1	295	6,351	2,281
	Halibut	Observed	36	5,617				3,036		10		217
		Total	36	5,704				3,036		10		217
	Other groundfish	Observed	6	1,149			60	3,894	3	46	89	78
		Total	6	1,159			60	3,895	3	46	89	78
	Pacific cod	Observed	120,207	3,068			38,587	1,216	6,789	26	4,971	4
		Total	122,032	3,090			38,592	1,216	6,789	26	4,972	4
	Pollock	Observed	4,446	608			34,623	3,375	1	4	566,988	36
		Total	4,500	612			34,623	3,375	1	4	567,093	36
	Rockfish	Observed	104	172			31,066	722	<1	<1	265	60
		Total	129	175			31,066	722	<1	<1	265	60
	Sablefish	Observed	318	15			187	2			<1	
		Total	481	15			187	2			<1	
	Turbot	Observed	728	636			24,010	3,379	<1	1	270	121
		Total	751	652			24,010	3,379	<1	1	270	121
	Skates	Observed	5,687	14,441			1,176	2,925			592	705
		Total	5,730	14,645			1,176	2,927			592	705
	Sharks	Observed	<1	41			<1	5			1	15
		Total	<1	41			<1	5			1	15

Table 3. Total catch (retained and discard) of groundfish species and halibut (in metric tons) caught by catcher vessels in the BSAI in 2013.

Sector	Species Caught	Trip Disposition	Hook and Line		Jig		Non-Pelagic Trawl		Pot		Pelagic Trawl	
			Retained	Discard	Retained	Discard	Retained	Discard	Retained	Discard	Retained	Discard
Catcher Vessel	Atka Mackerel	Observed		0			<1	1		<1	60	9
		Total		0			<1	2	<1	3	60	9
	Flatfish	Observed		1			8	262	<1	<1	1,067	8
		Total		15			10	382	<1	6	1,101	8
	Halibut	Observed	233	78				318		1		26
		Total	2,256	513	25			416		17		27
	Other groundfish	Observed		3			2	158	0	10	111	1
		Total	<1	49			2	217	40	376	113	1
	Pacific cod	Observed	13	26			27,953	173	760	4	2,354	1
		Total	1,039	361	15		36,423	240	23,369	73	2,392	1
	Pollock	Observed		0			1,320	805		<1	539,680	221
		Total	<1	0			1,578	1,033	1	1	548,741	224
	Rockfish	Observed	3	15			<1	10		<1	224	48
		Total	38	78			<1	15	<1	6	225	48
	Sablefish	Observed	42	2				0	4	<1	<1	
		Total	569	14				0	438	1	<1	
	Turbot	Observed		20			2	159		<1	206	<1
		Total	<1	96			2	209	<1	31	211	<1
	Skates	Observed		58			1	145			179	61
		Total	1	297			1	189			185	62
	Sharks	Observed		1			<1	<1			1	19
		Total		19			<1	<1		<1	1	19

Source: http://alaskafisheries.noaa.gov/sustainablefisheries/observers/annualrpt2013.pdf

Table 4. Coverage in trip units for full and trip selection; vessels for vessel selection.

Stratum	Date		Trips (#)		Vessels (#)		Coverage (%)		95% percentile		Meets or exceeds expected?
	Start	End	Total	Observed	Total	Observed	Actual	Expected	Lower	Upper	
Full Coverage											
Regulatory	Jan. 1	Dec. 31	4,485	4,482	173	170	99.9	100.00			Yes
Voluntary			353	353	35	35	100.0				Yes
Total Full	Jan. 1	Dec. 31	4,840	4,835	178	175	99.9	100.00			
Partial Coverage: Trip Selection											
CV 1	Jan. 1	Jun. 21	2,375	386	267	151	16.2	14.8	13.3	16.2	Yes
CP 1			confidential				18.8		0.0	31.2	Yes
CV 2	Jun. 22	Aug. 16	250	23	69	15	9.2	11.1	7.6	15.2	Yes
CP 2			confidential				7.1		0.0	28.6	Yes
CV 3	Aug. 17	Dec. 31	1,308	177	206	96	13.5	14.8	12.9	16.7	Yes
CP 3			confidential				0.0		0.0	35.7	Yes
Total Trip	Jan. 1	Dec. 31	3,977	590	302	187	14.8	14.5[11]			

Partial Coverage: Vessel Selection											
1	Jan. 1	Feb. 28	262	16	51	3	5.9	13.7			**No**
2	Mar. 1	Apr. 30	453	45	146	13	8.9	11.6			**No**
3	May 1	Jun. 30	549	22	212	9	4.2	11.8			**No**
4	Jul. 1	Aug. 31	384	15	151	6	4.0	12.5			**No**
5	Sep. 1	Oct. 31	483	29	164	12	7.3	12.8			**No**
6	Nov. 1	Dec. 31	118	27	47	7	14.9	14.9			**Yes**
Total Vessel	Jan. 1	Dec. 31	2,249	154	388	41	10.6	11.0			
Partial Coverage: No Selection											
NMFS Do Not Deploy	Jan. 1	Dec. 31	3,040	0	610	0	0	0			**Yes**
Dockside											
Pollock	Jan. 1	Dec. 31	2,695[12]	2,972[3]			90.7	100.0			**No**

[11] Calculated from (sum(r_i*N_i))/ sum (N_i).
[12] Represents landings, not trips.

http://alaskafisheries.noaa.gov/sustainablefisheries/observers/annualrpt2013.pdf

Annual Deployment Plan for 2015

On September 2014, the Council approved the Annual Deployment Plan for 2015 with the following recommendations:

- Use trip selection strata to assign vessels in 2015.
- Using two selection strata for 2015: small vessel trip selection and large vessel trip selection.
- Use 12% selection probability for the small vessel trip selection stratum and 24% selection probability for the large vessel stratum.
- Allow conditional releases in 2015 for vessels in the small vessel trip selection stratum that: 1) do not have sufficient life raft capacity to accommodate an observer, and/or 2) to assist in addressing bunk space limited vessels, have been selected for two consecutive trips (e.g., the third consecutive trip is released).
- Vessels selected by NMFS to participate in EM Cooperative Research will be in the no selection pool while participating in such research.
- Trawl vessels that fish for Pacific cod (and flatfish) in the BSAI will be given the opportunity to opt-in to full observer coverage and carry an observer at all times while fishing in the BSAI using the same approach as 2014.
- The Annual Report will include information to evaluate a sunset provision, including information on the potential for bias that could be introduced through life raft conditional release, the costs to an individual operator of upgrading to a larger life raft, and the enforcement disincentives from downgrading one's life raft.

http://www.npfmc.org/observer-program/ (see C1 Observer ADP Council Motion – FINAL 10/9/14)

Electronic monitoring

NMFS and the Council have developed an Electronic Monitoring (EM) Strategic Plan to integrated video monitoring into the Observer Program. Pacific States Marine Fisheries Commission (PSMFC) launched the Electronic Monitoring (EM) program in 2012 in anticipation of the Pacific Fishery Management Council (PFMC) considering EM as a compliance monitoring tool in the newly implemented Pacific Trawl Rationalization Program. In 2014, PSMFC expanded its EM program to work with the National Marine Fisheries Service - Electronic Monitoring Cooperative Research and Implementation Program which "has been developed to be responsive both to the NPFMC EM Strategic Plan, and to Senate language included in the 2014 NMFS appropriations bill, which directed NMFS to work with the small boat fixed gear fleet to implement a program designed to test the functionality of available electronic monitoring systems." (NMFS 2014)

Multiple research tracks are being undertaken as part of this cooperative research. At the February 2014 EM workshop in Juneau, a draft EM monitoring approach (EM approach 1) for deploying standard EM cameras was presented by industry members based on information needs outlined in a NOAA memo delivered to the EM workgroup. EM approach 1 identified fishery specific data elements, priority species, operator responsibilities and other operational factors to be tested in order to identify and inform decision points for NPFMC consideration. The 2014 field work that resulted from EM workgroup discussion had two initial objectives. The first was to collect field data to define, evaluate and verify assumptions associated with specific information requirements for technology based monitoring of Alaskan fixed gear fleets. Tasks under this objective include; evaluating the ability of EM reviewers to identify species grouping suggested by the NOAA memo, testing the ability of EM review to determine halibut release methods and injury codes, and evaluating logbook effort data needed to support an EM program. The second objective involved testing operational components of an EM program in order to identify field service needs and develop local support capacity.

Tasks under this objective include; evaluating camera configurations, testing handling procedures such as full retention of rockfish to aid in the identification of cryptic species, identifying field support services needed to ensure data quality, and evaluating the role of dockside monitoring in validating handling procedures and/or improving data quality. Also included in this objective was collecting cost data and identifying decision points related to cost factors.

Track 1 began in spring 2014 with deployment of EM systems on nine vessels in two home ports. The vessels were all longline vessels targeting sablefish (*Anoplopoma fimbria*) and/or Pacific halibut (*Hippoglossus stenolepis*). Forty eight trips were monitored using systems from Archipelago Marine Research Ltd (AMR) and Saltwater, Inc. (Saltwater) before the end of June when host vessels transitioned to other fisheries. The interim funding for the track 1 effort also ended in June. Overall, the 2014 field work helped provide a better understanding of field operation requirements in an Alaskan setting. It also created a controlled setting for deployment of EM technology and enabled industry to gain familiarity with EM systems. Technicians were trained and EM systems were

deployed on vessels as a part of the field testing. Therefore, the basic operational elements are in place to carry out technology based monitoring on a limited scale, experiment with different approaches, and develop procedures that inform program design and facilitate future scaling to other ports. PSMFC will be analyzing data sets from trips where the EM data are complete and where dockside monitoring information could be used to assess rockfish species identification. Both service providers were tasked to document their respective efforts and provide a summary of lessons learned. Data from the 2014 field work will continue to be evaluated and used to inform recommendations for the 2015 field season.
http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-276.pdf
http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/PSMFC_EMProgram.pdf

Catch data

The Alaska Regional office of NOAA Fisheries oversees fisheries that occur in US waters, covering 842,000 square nautical miles off the coast of Alaska. The office provides up to date catch reports for Fisheries Management.

Table 5. Gulf of Alaska catch report, including flatfish, through December 13, 2014 (catch is in mt).

Central Gulf

Seasons	Account	Total Catch	Quota	Remaining Quota	% Taken	Last Week Catch
	Arrowtooth Flounder	34,137	75,000	40,863	46%	89
	Deep Water Flatfish	278	3,727	3,449	7%	0
	Shallow Water Flatfish	4,448	17,813	13,365	25%	71
	Flathead Sole	2,297	15,400	13,103	15%	23
	Rex Sole	3,440	6,231	2,791	55%	8
	Pacific Ocean Perch	13,693	12,855	-838	107%	1
	Rougheye Rockfish	539	864	325	62%	0
	Shortraker Rockfish	324	397	73	82%	0
	Dusky Rockfish	2,830	3,584	754	79%	0
	Northern Rockfish	3,417	4,017	600	85%	0
	Thornyhead Rockfish	667	875	208	76%	0
	Pacific Cod	39,866	39,825	-41	100%	435
	Sablefish (Hook-and-Line)	3,976	3,745	-231	106%	1
	Sablefish (Trawl)	747	936	189	80%	4
	Big Skate	1,356	1,532	176	89%	72
	Longnose Skate	1,124	1,935	811	58%	22

Western and Central Gulf

Seasons	Account	Total Catch	Quota	Remaining Quota	% Taken	Last Week Catch
	Other Rockfish	887	1,031	144	86%	0

Eastern Gulf

Seasons	Account	Total Catch	Quota	Remaining Quota	% Taken	Last Week Catch
	Rougheye Rockfish	173	298	125	58%	0
	Shortraker Rockfish	282	834	552	34%	0
	Thornyhead Rockfish	219	731	512	30%	0
	Pacific Cod	318	1,991	1,673	16%	0
	Big Skate	102	1,641	1,539	6%	0
	Longnose Skate	363	834	471	43%	0

http://alaskafisheries.noaa.gov/2014/car110_goa.pdf

Table 6. BSAI catch report through December 13, 2014 (catch data shown in mt).

Bering Sea Aleutian Islands

Seasons	Account	Total Catch	Quota	Remaining Quota	% Taken	Last Week Catch
	Alaska Plaice (includes CDQ)	19,449	20,825	1,376	93%	0
	Arrowtooth Flounder	18,426	21,250	2,824	87%	19
	Arrowtooth Flounder CDQ	677	2,675	1,998	25%	0
	Flathead Sole	15,787	21,879	6,092	72%	5
	Flathead Sole CDQ	726	2,622	1,896	28%	0
	Kamchatka Flounder (includes CDQ)	6,460	7,100	640	91%	1
	Northern Rockfish (includes CDQ)	2,342	2,405	63	97%	0
	Other Flatfish (includes CDQ)	4,391	4,500	109	98%	0
X	Pacific Cod, Catcher Processor (AFA)	4,427	5,465	1,038	81%	0
X	Pacific Cod, Catcher Processor (Amendment 80)	27,712	33,631	5,919	82%	0
X	Pacific Cod, Catcher Vessel (Trawl)	42,085	43,107	1,022	98%	0
X	Pacific Cod, Catcher Processor (Hook-and-Line)	108,061	111,516	3,455	97%	1,790
X	Pacific Cod, Catcher Vessel (Hook-and-Line >= 60 ft)	0	25	25	0%	0
X	Pacific Cod, Catcher Processor (Pot)	5,513	5,889	376	94%	0
X	Pacific Cod, Catcher Vessel (Pot >= 60 ft)	11,170	14,476	3,306	77%	134
X	Pacific Cod (Jig)	2	101	99	2%	0
	Pacific Cod (Hook-and-Line and Pot < 60 ft)	12,558	12,018	-540	104%	504
	Pacific Cod, Incidental Catch (Hook-and-Line and Pot)	313	500	187	63%	0
	Rock Sole	48,125	75,905	27,780	63%	0
	Rock Sole CDQ	3,821	9,095	5,274	42%	0
	Shortraker Rockfish (includes CDQ)	197	370	173	53%	0
	Yellowfin Sole	141,272	164,312	23,040	86%	4
	Yellowfin Sole CDQ	15,523	19,688	4,165	79%	0
	Octopus (includes CDQ)	422	425	3	99%	13
	Sculpin (includes CDQ)	4,860	4,888	28	99%	17
	Shark (includes CDQ)	137	225	88	61%	1
	Skate (includes CDQ)	27,527	26,600	-927	103%	244
	Squid (includes CDQ)	1,678	1,764	86	95%	0
Total:		**1,916,200**	**1,998,351**	**82,151**	**96%**	**2,940**

http://alaskafisheries.noaa.gov/2014/car110_bsai_with_cdq.pdf
http://www.afsc.noaa.gov/REFM/stocks/plan_team/ecosystem.pdf

All the catches of flatfish species part of this unit of certification appear to be well within TAC limits as of December 13th 2014.

To facilitate reporting of commercial catch from both state and federally managed fisheries, data from a wide range of sources is gathered in the Catch Accounting System (CAS), a multi-agency (NMFS, IPHC and ADFG) system that centrally collates landings data from shore based processing and landings operations as well as retained catch observations from individual vessels. The CAS system also provides a centralized data platform for the collation of catch (landings and discards) data from the extensive observer program.

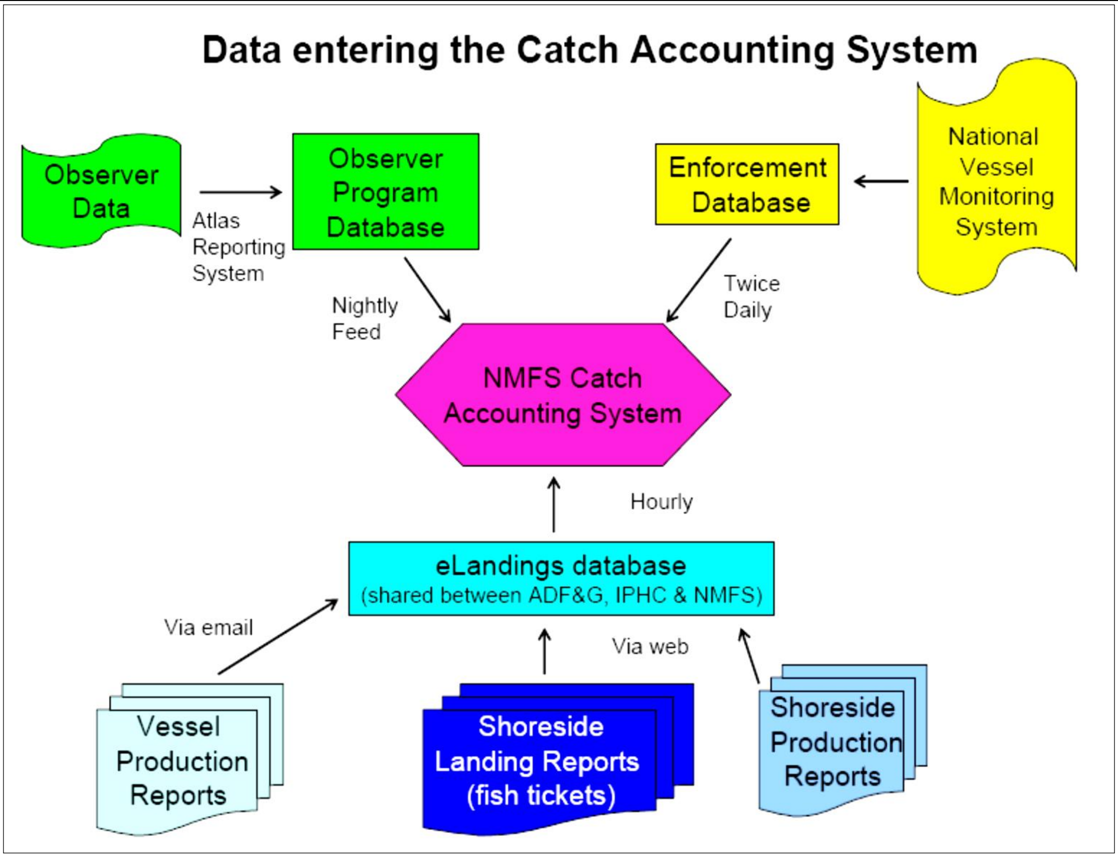


Figure 2. Schematic of the inter-agency Catch Accounting System (CAS).

A detailed description of the catch sampling and catch estimation procedures used for groundfish fisheries of Alaska can be found at:
http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-205.pdf

The 2014 observer sampling manual can be found at:
http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2014_2.pdf

Socio-economic data
Socio-economic data is also collected from the fishery. The Regulatory Flexibility Act (RFA) requires federal agencies (NPFMC and NMFS) to consider the impact of their rules (Fishery Management Plans, Fishing Regulations) on small entities (fishermen communities). Data collected for these analyses include: 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. In addition, Economic SAFE reports are published every year for the groundfish and crab fisheries off Alaska. These reports detail the key economic conditions and performance of these fisheries.
http://www.afsc.noaa.gov/REFM/Docs/2014/economic.pdf

Ecosystem data

Just like in the Economic SAFE, specific ecosystem data detailing the state of the ecosystems in the Gulf of Alaska and the Bering Sea Aleutian Islands in relation to the salmon, groundfish and crab fisheries is also published once a year and is available at the AFSC website.
http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf

Fishery Independent Data

Geographical distribution and management of the flatfish complex

The GOA and BSAI flatfish stocks are both considered and managed as different stocks and separate from other Pacific stocks further south along the west coast of North America and West across Russia and Asia. In terms of both the fisheries and the groundfish resources, the BSAI and the GOA form distinct management areas.

The history of fishery development, target species and species composition of the commercial catch, bathymetry, and oceanography are all much different in the GOA than in the adjacent BSAI management area or British Columbia to California regions. Although many species occur over a broader range than the GOA management area, with only a few exceptions, stocks of common species in this region are believed to be different from those in the adjacent BSAI Region.

Flatfish species are found on both sides of the U.S.-Russia Federation line. Russian flatfish fisheries are managed by the setting of TACs. Catch totals from Russia waters, including the western Bering Sea, appear to be below their respective TAC limits. The Russian government sets the total allowable catch (TAC) levels for fish and seafood annually. In general, the TAC for most species has been relatively stable from year to year. Stocks that may straddle to some degree the U.S./ Russia Federation line are managed conservatively by Alaska's management agencies and appear to be under very light pressure in the Western Bering Sea. Flatfish complex species are also caught in the Central and Western GOA. The Eastern Gulf of Alaska, bordering British Columbia (BC) at its southern tip, is completely closed to bottom trawling. Flatfish is therefore not caught in this area. Potential issues of stock overlap and harvest between Southeastern Alaska and BC are not significant and buffered by this large, year round, area closure.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmp.pdf
http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Fish%20and%20Seafood%20Production%20and%20Trade%20Update_Moscow_Russian%20Federation_6-11-2013.pdf

Surveys conducted in the BSAI and GOA

The NOAA Groundfish survey data is collected by RACE Division and used for the assessment of flatfish in Alaska waters. Three independent surveys are conducted: Eastern Bering Sea (EBS), Aleutian Islands (AI) and Gulf of Alaska (GOA). The EBS survey is conducted annually, while the GOA and the AI surveys are conducted biannually, alternating with each other. Data collected include catch per unit effort data, demographic data (length and age) and stomach content data for potential use in multi-species assessment models.

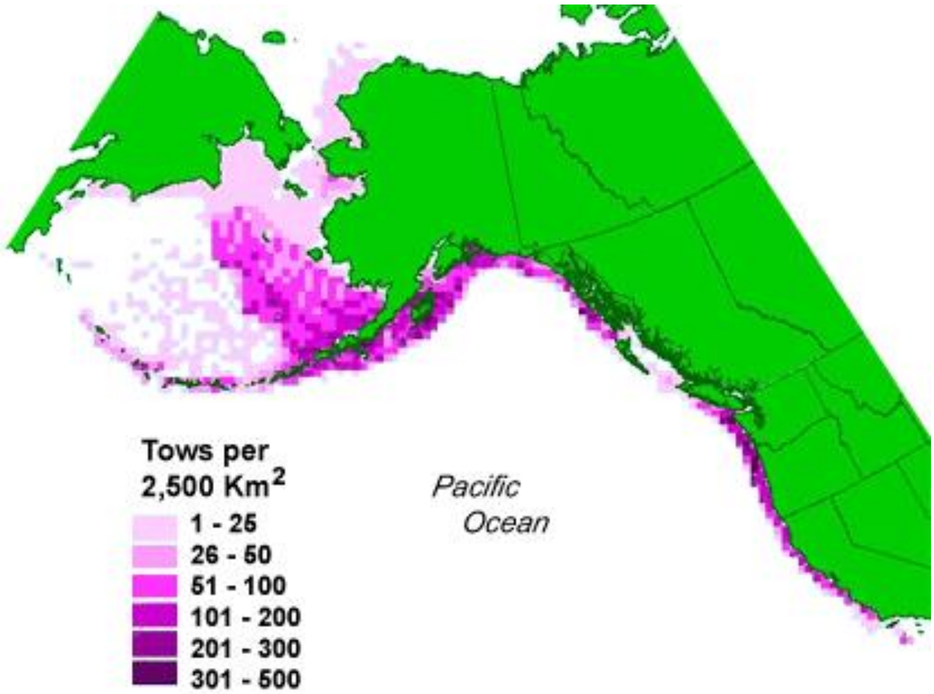


Figure 3. Tow density for the EBS, AI and GOA trawl surveys conducted by AFSC RACE Division.
http://www.afsc.noaa.gov/RACE/groundfish/gfprof_coverage.htm

The annual EBS survey follows systematic stratified design with two geographic strata: NW (arctic area) and SE (sub-arctic area) three depth strata (inner shelf < 50 m; mid-shelf between 50 and 200 m; and outer shelf > 200 m). On average 376 survey stations are completed annually in the EBS survey, with tow duration of 30 minutes at a speed of 3 knots. The nominal survey abundance index is standardized with the area swept. The GOA survey follows the same stratification as the EBS survey, a random stratified survey design. The survey is biennial, with the NOAA survey schedule alternating each year between the GOA and the AI survey area. For each survey year, on average 825 stations are surveyed by three boats in the GOA, and 420 stations are surveyed by two boats in the AI.

The annual EBS shelf groundfish trawl survey (shelf and slope components are surveyed separately) and biennial AI trawl survey data are used in the assessments for the BSAI flatfish complex. The biennial GOA groundfish trawl survey data is used for the assessment for flatfish species in the GOA. Data from the NOAA Auke Bay Lab's annual longline survey is utilized in the BSAI Greenland turbot assessment. The Bering Sea shelf survey encompasses 492,897.5 km^2. Sampling stations are established randomly based on a 37.04 km (20 nm) square grid. The survey area is divided into strata corresponding to 0 – 50 m, 50 – 100 and > 100 m. The "standard" survey area has been sampled annually since 1982, while a "northwest extension" has been sampled since 1987.

The Bering Sea slope survey is conducted over a range of 200 to 1,200 m on the eastern Bering Sea slope from Unalaska and Akutan Island in Alaska (54° N) to the U.S-Russian border at 61° N. Sampling was stratified by six subareas running south to north and by five depth strata within each subarea. Stations are chosen randomly and target sampling density is proportional to the area (km^2) in each subarea and depth stratum. Mean sampling density is approximately one tow per 204 km^2.

The Aleutian Island survey area is divided into 45 area-depth strata based on bathymetry. Survey depth strata include: 1-100 m, 101-200 m, 201-300 m, and 301-500 m. Stations are allocated randomly without replacement within each stratum using a 5 by 5 km grid. A minimum of two stations are allocated to any given stratum. Assigned sample densities are highest in the 101-200 m and 201-300 m depth intervals at about 9 tows per 1,000 km_2. The overall sample density for the survey is 6.5 tows per 1,000 km^2.

The GOA survey includes the entire continental shelf and upper portion of the continental slope to a depth of 1,000 m. The total area the survey represents is approximately 320,000 km^2. Depths shallower than 200 m make up about 79% of the total area. Gullies intrude into the shelf and make up about 16% of the total survey area. The survey covers six INPFC (International North Pacific Fisheries Commission) areas.

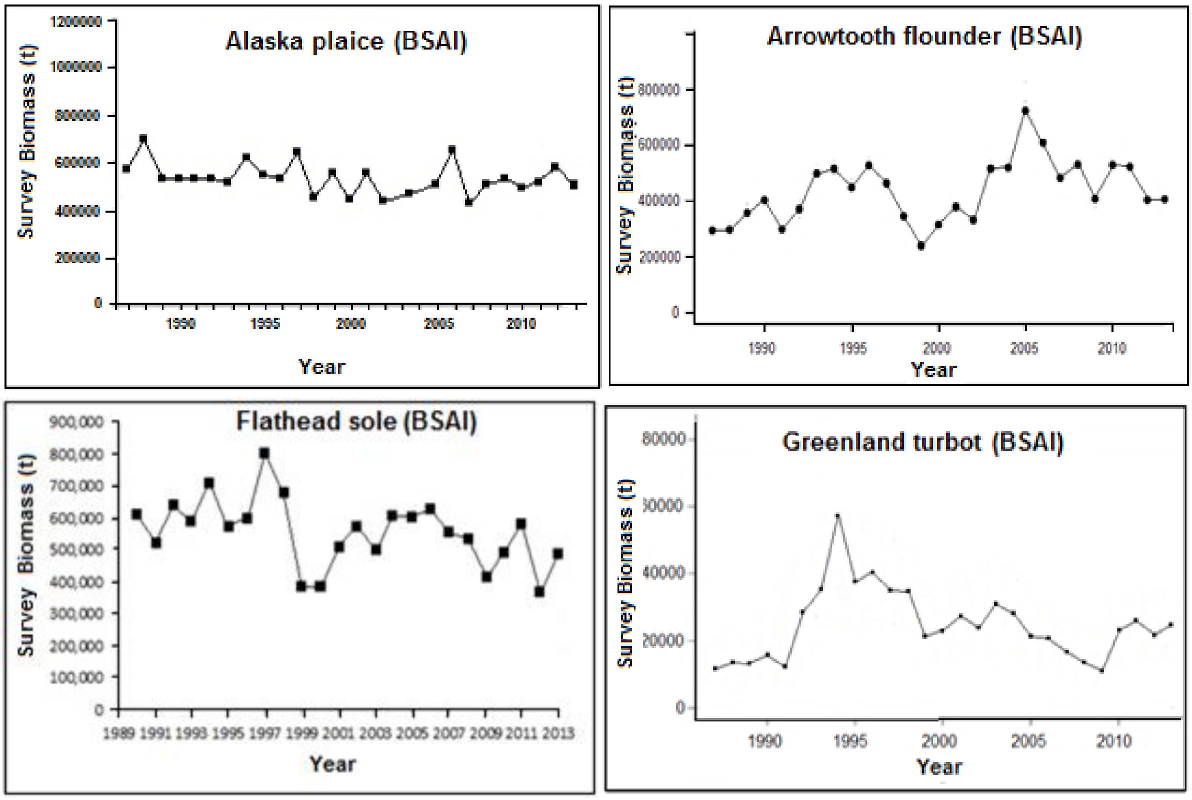
In addition to the trawl surveys, the Marine Ecology and Stock Assessment group at Auke Bay Laboratory conducts a longline survey in the Eastern Bering Sea. Those stations have been sampled in odd years since 1997. These data are used in the Greenland Turbot stock assessment.

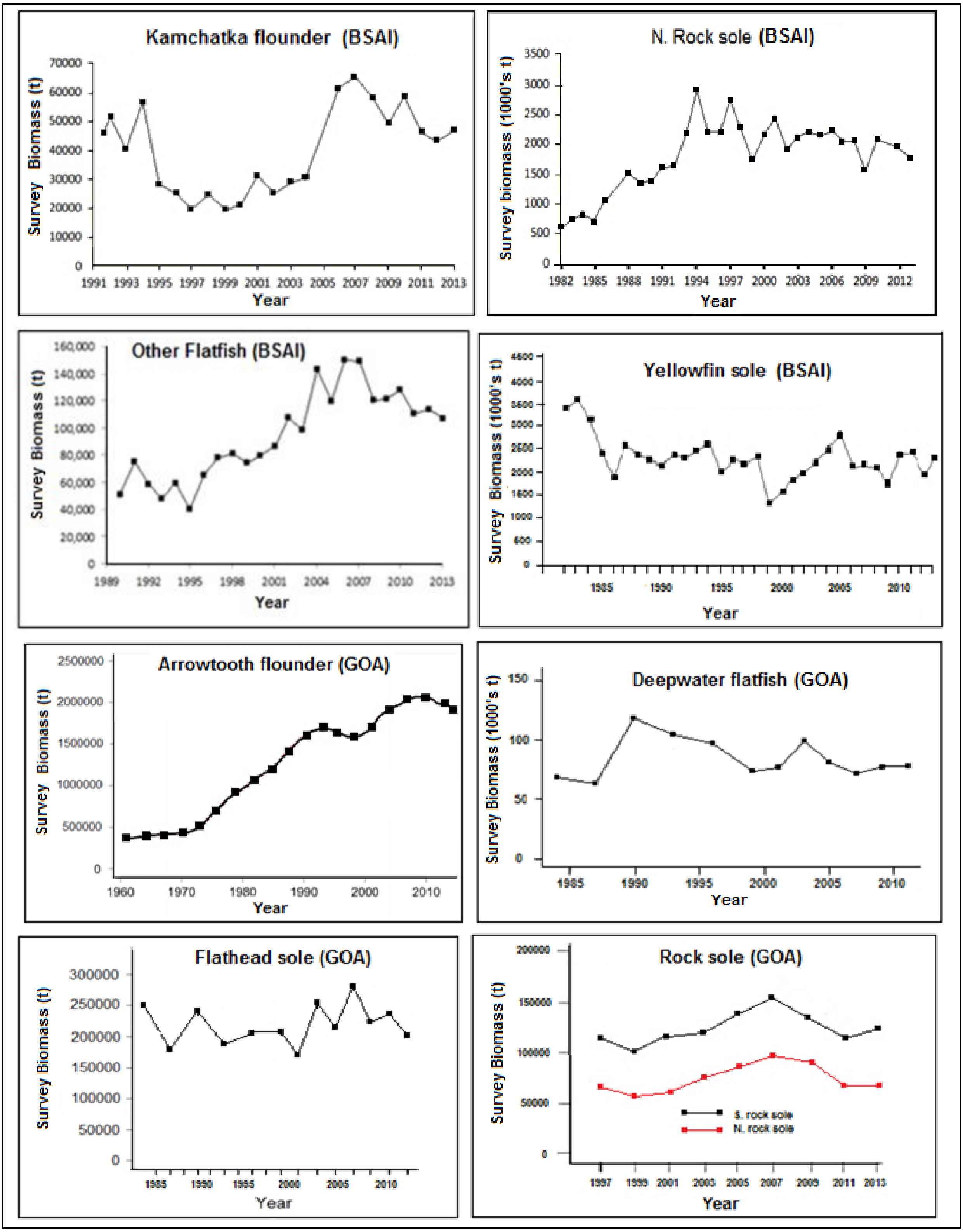
Figure 4. Stations in the Bering Sea longline survey conducted by the Auke Bay Laboratory
http://www.afsc.noaa.gov/abl/mesa/mesa_sfs_lsd.htm

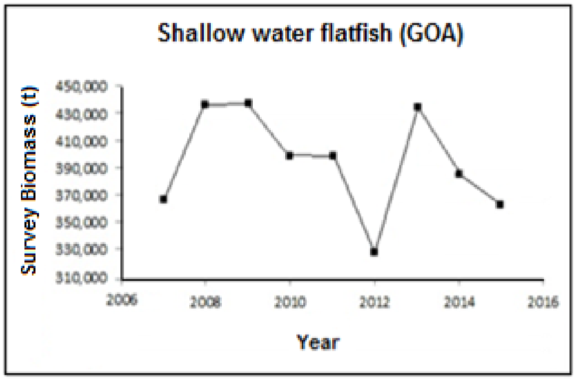
The EBS survey was subject to an independent review in 2012 which concluded that the "*EBS crab and groundfish bottom trawl surveys provide a comprehensive and consistent time series of abundance indices and relevant biological information on many key crab and finfish populations, which are critical to the stock assessment of these populations. The survey design and sampling protocol appear to be scientifically sound and robust, and adequately addresses management needs.*"
http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/912Chapters/ChenReview912.pdf

Survey Abundance Indices

Biomass indices for species in the flatfish complex are estimated from survey data and used as auxiliary information in age-structured models. These indices are stable or increasing over time, indicative of light exploitation, with one exception. The series for BSAI Greenland turbot shows a significant decline from the mid-1990s to 2009. Abundance then increases for the last four years. This stock was recognized to have fallen below the sustainable reference point in 2009 and the quota was lowered to a level which will allow the stock to rebuild.




Kamchatka flounder (BSAI)
Survey Biomass (t)
Year
N. Rock sole (BSAI)
Survey biomass (1000's t)
Year
Other Flatfish (BSAI)
Survey Biomass (t)
Year
Yellowfin sole (BSAI)
Survey Biomass (1000's t)
Year
Arrowtooth flounder (GOA)
Survey Biomass (t)
Year
Deepwater flatfish (GOA)
Survey Biomass (1000's t)
Year
Flathead sole (GOA)
Survey Biomass (t)
Year
Rock sole (GOA)
Survey Biomass (t)
S. rock sole
N. rock sole
Year



http://www.afsc.noaa.gov/refm/stocks/2013_assessments.htm

Table 7. Species groups within the GOA and BSAI flatfish complex.

Group	Area	Common name	Scientific name
Other flatfish	BSAI	Arctic flounder	*Liopsetta glacialis*
		butter sole	*Isopsetta isolepis*
		curlfin sole	*Pleuronectes decurrens*
		deepsea sole	*Embassichths bathybius*
		Dover sole	*Microstomus pacificus*
		English sole	*Parophrys vetulus*
		longhead dab	*Limanda proboscidea*
		Pacific sanddab	*Citharichthys sordidus*
		petrale sole	*Eopsetta jordani*
		rex sole	*Glyptocephalus zachirus*
		roughscale sole	*Clidodoerma asperrimum*
		sand sole	*Psettichthys melanostictus*
		slender sole	*Lyopsetta exilis*
		starry flounder	*Platichthys stellatus*
		Sakhalin sole	*Pleuronectes sakhalinensis*
deepwater flatfish	GOA	Dover sole	*Microstomus pacificus*
		Greenland turbot	*Reinhardtius hippoglossoides*
		deepsea sole	*Embassichthys bathybius*
shallow water flatfish	GOA	Northern rock sole	*Lepidopsetta polyxystra*
		Southern rock sole	*Lepidopsetta bilineata*
		Yellowfin sole	*Limanda aspera*
		Butter sole	*Isopsetta isolepis*
		Starry flounder	*Platichthys stellatus*
		English sole	*Parophrys vetulus*
		Sand sole	*Psettichthys melanostictus*
		Alaska plaice	*Pleuronectes quadrituberculatus*

5. There shall be regular stock assessment activities appropriate for the fishery, its range, the species biology and the ecosystem, undertaken in accordance with acknowledged scientific standards to support its optimum utilization.

FAO CCRF 7.2.1/12.2/12.3/12.5/12.6/12.7/12.17

FAO Eco 29-29.3

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating determination

In Alaska, there are regular stock assessment activities appropriate for the fishery, its range, flatfish species biology and the ecosystem, undertaken in accordance with acknowledged scientific standards to support its optimum utilization. NMFS conducts stock assessment and biological research in the EEZ off Alaska on FMP species. The AFSC in Seattle and the Kodiak Fisheries Research Center (KFRC) generate the scientific information and analysis necessary for the conservation, management, and utilization of the region's groundfish resources. The NPFMC and NMFS produce annual Stock Assessment & Fishery Evaluation (SAFE) reports for each fishery under federal jurisdiction. The adequacy and appropriateness of the stock assessments are ensured by extensive peer review.

The Resource Assessment and Conservation Engineering (RACE) Division comprises scientists from a wide range of disciplines whose function is to conduct quantitative fishery surveys and related ecological and oceanographic research to describe the distribution and abundance of commercially important fish and crab stocks in the region, and to investigate ways to reduce bycatch, bycatch mortality and the effects of fishing on habitat. Information derived from both regular surveys and associated research are analyzed by AFSC stock assessment scientists and supplied to fishery management agencies and to the commercial fishing industry. The Resource Ecology and Fisheries Management (REFM) Division conducts research and data collection to support an ecosystem approach to management of fish and crab resources. More than twenty-five groundfish and crab stock assessments are developed annually and used to set catch quotas. In addition, economic and ecosystem assessments are provided to the Council on an annual basis. The Fisheries Monitoring and Analysis Division (FMA) monitors groundfish fishing activities and conducts research associated with sampling commercial fishery catches and estimation of catch and bycatch mortality, and analysis of fishery-dependent data.

The three surveys (EBS, AI and GOA) collect demographic data (length and age) as well as stomach content data for potential use in multi-species assessment models. The EBS survey is conducted annually, while the GOA and the AI surveys are conducted biannually, alternating with each other.
Stock Assessment and Fishery Evaluation (SAFE) Reports are produced annually for flatfish in the BSAI and GOA Regions. These reports contain all the details of the assessments including data collected and used, and stock assessment models trialed.

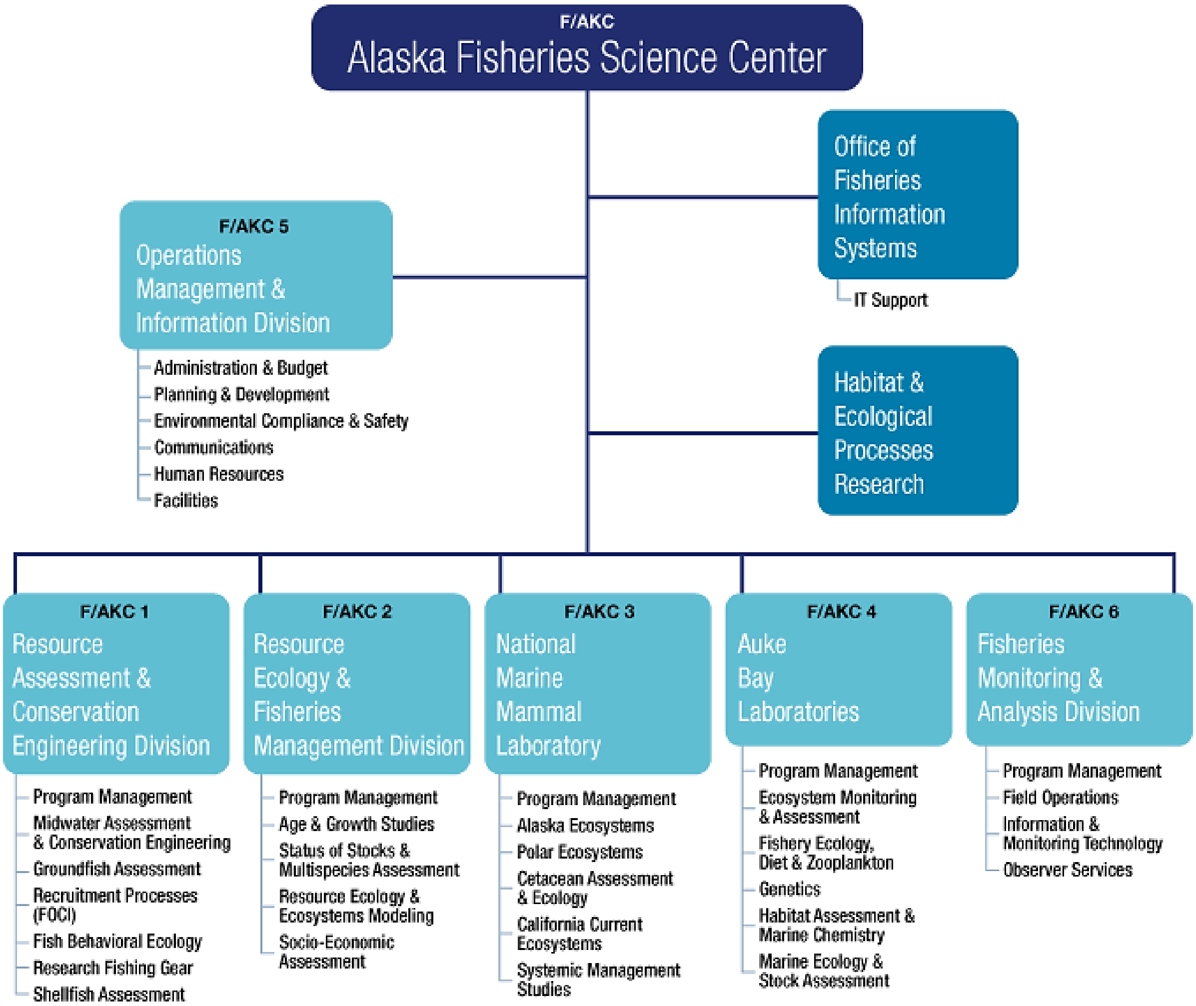


Figure 5. AFSC structure

Specific to the assessment and management of the Alaska flatfish complex, the RACE division is responsible for annual groundfish surveys, developing by-catch reduction techniques to enable the commercial fisheries to manage and limit catches of PSC species and other unwanted catches, assessing and quantifying discard mortality and for undertaking research into the benthic impact of commercial gears.

The entire data collation, analysis and assessment procedures are periodically subject to extensive external peer review through the Center for Independent Experts (CIE). In 2013, CIE reviews of flatfish species SAFEs included: BSAI Yellowfin sole, BSAI Greenland turbot, GOA Deepwater flatfish, GOA Arrowtooth flounder and GOA Flathead sole. The BSAI and GOA groundfish fishery management plans define a series of target and limit reference points for flatfish and other groundfish covered by these plans. Each SAFE report describes the current fishing mortality rate, stock biomass relative to target and limit reference points. Both management plans specify the Overfishing Limits (OFL) and the Fishing mortality rate (F_{OFL}) used to set OFL, Acceptable Biological Catch (ABC) and the fishing mortality rate (F_{ABC}) used to set ABC, the determination of each being dependent on the knowledge base for each stock.

The adequacy and appropriateness of the stock assessments are ensured by extensive peer review. For BSAI and GOA groundfish assessments, the review process begins with an internal review of assessments by the AFSC. Following that review, assessments are reviewed annually by the Groundfish Plan Teams who provide comments to the assessment authors on revisions to the assessment as well as to make recommendations to the SSC regarding OFL and ABC levels for each stock. The majority of the Groundfish Plan Team members have expertise in stock assessment and fisheries biology with some additional members bringing in expertise in fishery management, in-season catch accounting, seabirds, marine mammals, and economics. The assessments as well as the Plan Team recommendations are then subsequently reviewed by the SSC who make the final OFL and ABC recommendations to the NPFMC. The SSC may modify the recommendations from the Plan Team based upon additional considerations. The NPFMC sets TAC at or below the ABC recommendations of the SSC. The AFSC periodically requests a more comprehensive review of groundfish stock assessments by the Center for Independent Experts (CIE). These reviews are intended to lay a broader groundwork for improving the stock assessments outside the annual assessment cycle. CIE recommendations are provided to the stock assessment author, the AFSC, the Plan Team, and the SSC for review, comment, and consideration of priorities for improving the assessment.

Overview of Flatfish Stock Assessments

Overall, the status of the flatfish complex stocks in the BSAI and GOA continues to appear favorable. Nearly all stocks are above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$. The abundances of all flatfishes managed under Tiers 1 or 3 are projected to be above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ in 2014. The abundance of Greenland turbot is projected to be below $B_{35\%}$ for 2014: by about 13 percent. The sum of the biomasses for 2014 listed in Table 8 is nearly the same as reported for 2013, following declines of 5% from 2013 to 2012 and 6% from 2012 to 2011. Flatfishes are generally increasing. The biomass of Greenland turbot has been increasing due to recent increased recruitment, but is still low.

Table 8. BSAI summary of stock abundance (biomass), overfishing level (OFL), acceptable biological catch (ABC), the fishing mortality rate corresponding to ABC (F_{ABC}), and the fishing mortality rate corresponding to OFL (F_{OFL}) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2014 and 2015. "Biomass" corresponds to projected January abundance for the age+ range reported in the summary. Stock-specific biomass, OFL, and ABC are in metric tons.

			2014				
Species or Complex	**Tier**	**Area**	**Biomass**	**OFL**	**ABC**	**F_{OFL}**	**F_{ABC}**
Yellowfin sole	1a	BSAI	2,113,000	259,700	239,800	0.112	0.105
Greenland turbot	3b	Total	84,546	2,647	2,124	0.140	0.120
Arrowtooth flounder	3a	BSAI	1,023,440	125,642	106,599	0.186	0.156
Kamchatka flounder	3	BSAI	136,600	8,270	7,100	0.073	0.063
Northern rock sole	1a	BSAI	1,393,200	228,700	203,800	0.164	0.146
Flathead sole	3a	BSAI	745,237	79,633	66,293	0.348	0.285
Alaska plaice	3a	BSAI	576,300	66,800	55,100	0.190	0.158
Other flatfish	5	BSAI	107,500	16,700	12,400	.17/.085/.15	.13/.064/.113
Pacific ocean perch	3a	BSAI	639,505	39,585	33,122	0.076	0.063

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIintro.pdf

Model runs were required only for species where a conservation concern has been noted. In such "abbreviated" assessments, authors were not required to include alternative models and were not required to respond to SSC or Team comments, among other things. For all other Tier 1-3 stocks, updated projections from the previous year using 2013 catch data were required at a minimum, with results presented in executive summaries using the "off-year" format for stocks on biennial assessment cycles. For stocks managed in Tiers 4-6, executive summaries using the "off-year" format for biennial assessment cycles were required. Tier 4-5 Gulf of Alaska assessments included the 2013 GOA trawl survey datum in their estimates of biomass and harvest recommendations. The abundances of flathead sole, northern and southern rock sole and arrowtooth flounder are above target stock size. The target biomass levels for deep-water flatfish (excluding Dover sole), shallow-water flatfish (excluding northern and southern rock sole) and rex sole are unknown.

BSAI Yellowfin sole

The catch history for BSAI Yellowfin sole in recent years is given in the following table. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013 (http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIyfin.pdf). New input data for the December 2013 assessment include 2012 fishery age composition, 2012 survey age composition, 2013 trawl survey biomass point estimate and standard error, estimate of the discarded and retained portions of the 2012 catch, and the estimate of total catch made through the end of 2013.

Table 9. Catch (t) of BSAI Yellowfin sole by fishery, 1964-2013

		Domestic		
Year	Foreign	JVP	DAP	Total
1964	111,777			111,777
1965	53,810			53,810
1966	102,353			102,353
1967	162,228			162,228
1968	84,189			84,189
1969	167,134			167,134
1970	133,079			133,079
1971	160,399			160,399
1972	47,856			47,856
1973	78,240			78,240
1974	42,235			42,235
1975	64,690			64,690
1976	56,221			56,221
1977	58,373			58,373
1978	138,433			138,433
1979	99,019			99,019
1980	77,768	9,623		87,391
1981	81,255	16,046		97,301
1982	78,331	17,381		95,712
1983	85,874	22,511		108,385
1984	126,762	32,764		159,526
1985	100,706	126,401		227,107
1986	57,197	151,400		208,597
1987	1,811	179,613	4	181,428
1988		213,323	9,833	223,156
1989		151,501	1,664	153,165
1990		69,677	14,293	83,970

1991	115,842	115,842
1992	149,569	149,569
1993	106,101	106,101
1994	144,544	144,544
1995	124,740	124,740
1996	129,659	129,659
1997	181,389	181,389
1998	101,201	101,201
1999	67,320	67,320
2000	83,850	83,850
2001	63,395	63,395
2002	73,000	73,000
2003	74,418	74,418
2004	69,046	69,046
2005	94,383	94,383
2006	99,068	99,068
2007	121,029	121,029
2008	148,894	148,894
2009	107,528	107,528
2010	118,624	118,624
2011	151,164	151,164
2012	147,183	147,183
2013	153,000	153,000

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIyfin.pdf

Spawning biomass and stock status trends

BSAI Yellowfin sole projected female spawning biomass estimate for 2014 is 581,100 t, which is nearly identical to the 2013 estimate from last year's assessment (582,300 t). The projected spawning biomass for 2014 and beyond suggests a turnaround from the generally monotonic decline in spawning biomass that has prevailed since 1994. Likewise, the total stock biomass is trending upwards due to high recruitment from the 2003 year class.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of B_{MSY} and the probability density function for F_{MSY} exist for this stock. Accordingly, yellowfin sole qualify for management under Tier 1. The estimate of B_{MSY} from the present assessment is 366,000 t. Corresponding to the approach used in recent years, the 1978-2006 stock-recruitment data were used in 2013 to determine the Tier 1 harvest recommendation. This provided a maximum permissible ABC harvest ratio (the harmonic mean of the F_{MSY} harvest ratio) of 0.113. The current value of the OFL harvest ratio (the arithmetic mean of the F_{MSY} ratio) is 0.123. The product of the maximum permissible ABC harvest ratio and the geometric mean of the 2014 biomass estimate produced 2014 ABC of 239,800 t recommended by the author and Team, and the corresponding product using the OFL harvest ratio produces the 2014 OFL of 259,700 t. For 2015, the corresponding quantities are 248,300 t and 268,900 t, respectively.

Status determination

Yellowfin sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

BSAI Greenland turbot

Status and catch specifications (t) of Greenland turbot in recent years are given in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013.

Table 10. Catch estimates for Greenland turbot by gear type (t; including discards) and ABC and TAC values since implementation of the MFCMA.

Year	Trawl	Longline & Pot	Total	ABC	TAC
1977	29,722	439	30,161	40,000	
1978	39,560	2,629	42,189	40,000	
1979	38,401	3,008	41,409	90,000	
1980	48,689	3,863	52,552	76,000	
1981	53,298	4,023	57,321	59,800	
1982	52,090	32	52,122	60,000	
1983	47,529	29	47,558	65,000	
1984	23,107	13	23,120	47,500	
1985	14,690	41	14,731	44,200	
1986	9,864	0.4	9,864	35,000	33,000
1987	9,551	34	9,585	20,000	20,000
1988	6,827	281	7,108	14,100	11,200
1989	8,293	529	8,822	20,300	6,800
1990	12,119	577	12,696	7,000	7,000
1991	6,246	1,617	7,863	7,000	7,000
1992	749	3,003	3,752	7,000	7,000
1993	1,145	7,325	8,470	7,000	7,000
1994	6,427	3,846	10,272	7,000	7,000
1995	3,979	4,216	8,194	7,000	7,000
1996	1,653	4,903	6,556	7,000	7,000
1997	1,210	5,990	7,200	9,000	9,000
1998	1,576	7,181	8,757	15,000	15,000
1999	1,795	4,058	5,853	9,000	9,000
2000	1,947	5,027	6,974	9,300	9,300
2001	2,149	3,164	5,313	8,400	8,400
2002	1,033	2,602	3,635	8,000	8,000
2003	931	2,615	3,546	4,000	4,000
2004	675	1,583	2,258	3,500	3,500
2005	729	1,879	2,608	3,500	3,500
2006	361	1,625	1,986	2,740	2,740
2007	458	1,544	2,002	2,440	2,440
2008	1,935	988	2,923	2,540	2,540
2009	3,080	1,431	4,511	7,380	7,380
2010	1,977	2,160	4,138	6,120	6,120
2011	1,618	2,028	3,646	6,140	5,060
2012	2,612	2,107	4,720	9,660	8,660
2013*	1,024	226	1,250	2,060	2,060

*Catch estimated as of October 2013

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIturbot.pdf

Spawning biomass and stock status trends

The projected 2014 female spawning biomass is 22,010 t. This is a 17% decrease from the 2014 spawning biomass of 26,537 t projected in the previous year's assessment. Spawning biomass is projected to increase in 2015 to 27,624 t. While spawning biomass continued to decline as of 2013, large 2008 and 2009 year classes are still being observed in both the survey and fishery size composition data. 2013 classes are both estimated to be stronger than any other year class spawned since the 1970s. A near doubling of abundance in the 2012 slope survey estimate (relative to 2010) is largely attributable to an increase in small (30-50 cm) fish.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock. Greenland turbot therefore qualifies for management under Tier 3. Updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 39,906 t, 0.22, and 0.27, respectively. The stock remains in Tier 3b. The maximum permissible value of F_{ABC} under this tier translates into a maximum permissible ABC of 2,124 t for 2014 and 3,173 t for 2015, and an OFL of 2,647 t for 2014 and 3,864 t for 2015. These are the authors' and Team's ABC and OFL recommendations.

Status determination

Given that the ABCs for Greenland turbot are lower than the OFLs, the stock is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

BSAI Arrowtooth flounder

Status and catch specifications (t) of Arrowtooth flounder in recent years are given in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year, except that the 2013 value was held constant at the 2012 value. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team and are taken from the 2011 assessment. Catch data are current through November 9, 2013.

Table 11. Biomass and Catch Projections for BSAI Arrowtooth flounder

Year	Biomass (t)[1]	OFL	ABC	TAC	Catch[2]
2012	1,127,050	181,000	150,000	25,000	22,714
2013	1,048,350	186,000	152,000	25,000	19,722[1]
2014	1,036,960	125,642	105,968		
2015	1,024,080	125,025	106,089		

[1] Total biomass from age-structured projection model.

[2] Catch as of October 27, 2013.

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIatf.pdf

Because this is an "off-year" for the BSAI ATF, new survey information was not incorporated into the assessment model for the 2013 update. Instead, a projection model was run with updated catch information. The projection model run incorporates the most recent catch and provides estimates of 2014 and 2015 ABC and OFL without re-estimating the stock assessment model parameters and biological reference points. The projection model is based on the previous year's model, except that it incorporates a new maturity to give, which was approved by the Team in September.

Spawning biomass and stock status trends

The 2012 stock assessment model (using a different maturity schedule) resulted in a 2014 age 1+ biomass projection of 1,021,060 t, compared to 1,023,440 t from the 2013 assessment. The corresponding values for 2014 spawning biomass are 638,377 t (2012 assessment) and 626,319 t (2013 assessment). The 2013 assessment projects a slight increase in female spawning biomass between 2014 and 2015.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$ and $F_{35\%}$ exist for this stock. Arrowtooth flounder therefore qualifies for management under Tier 3. The point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the 2012 assessment were 246,476 t, 0.17, and 0.21, respectively; from 2013 assessment, they are 231,015 t, 0.156, and 0.186, respectively. The projected 2014 spawning biomass is far above $B_{40\%}$ in 2012 and 2013 assessments, so ABC and OFL recommendations for 2014 were calculated under sub-tier "a" of Tier 3. The authors and Team recommend setting F_{ABC} at the $F_{40\%}$ level, which is the maximum permissible level under Tier 3a, which results in 2014 and 2015 ABCs of 106,599 t and 106,089 t, respectively, and 2014 and 2015 OFLs of 125,642 t and 125,025 t.

Status determination

Arrowtooth flounder is a largely unexploited stock in the BSAI. Arrowtooth flounder is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Ecosystem Considerations

In contrast to the Gulf of Alaska, arrowtooth flounder is not at the top of the food chain on the EBS shelf. Arrowtooth flounder in the EBS is an occasional prey in the diets of groundfish, being eaten by Pacific cod, walleye pollock, Alaska skates, and sleeper sharks. However, given the large biomass of these species in the EBS overall, these occasionally recorded events translate into considerable total mortality for the arrowtooth flounder population in the EBS ecosystem.

Kamchatka flounder

Status and catch specifications (t) of Kamchatka flounder in recent years are given in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013.

Table 12. Biomass and Catch Projections for BSAI Kamchatka flounder

Area	Year	Age 1+ Bio	OFL	ABC	TAC	Catch
BSAI	2012	125,000	24,800	18,600	17,700	9,668
	2013	125,000	16,300	12,200	10,000	7,794
	2014	136,600	8,270	7,100	n/a	n/a
	2015	138,700	8,500	7,300	n/a	n/a

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIkamchatka.pdf

In 2013, although this stock was originally scheduled for an "off-year" assessment, the SAFE authors planned to provide a full assessment due to development of a revised age-structured model. However, as a result of the October 2013 government shutdown, only an executive summary was presented.

In 2011 and 2012, this stock was managed under Tier 5. An age-structured model was presented to the Team and SSC in September and October of 2012. The SSC did not accept the model, and recommended a large number of further evaluations. For 2013, the stock continued to be managed under Tier 5. The authors responded to the SSC's October 2013 recommendations in a preliminary assessment presented to the Team and SSC in September and October of 2013. For the Dec. 2013 final assessment, the projection model was run, based on parameters and numbers at age from the age-structured model presented in the preliminary assessment. New input data for the projection model included updating the 2012 catch and estimated values of the 2013 and 2014 catch. Results from the 2013 EBS shelf survey were not incorporated.

Spawning biomass and stock status trends

Kamchatka flounder has a widespread distribution along the deeper waters of the BSAI region and is believed to be increasing in abundance. Projected 2014 female spawning biomass is estimated at 50,400 t, above the $B_{40\%}$ level of 46,100 t, and is projected to remain above $B_{40\%}$.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Team recommended using the age-structured model presented in September, the results of which form the basis for the projection model results presented in the SAFE chapter. Anticipating that the SSC will concur, Kamchatka flounder would be managed under Tier 3 for the first time. For the 2014 fishery, the SAFE authors and Plan Team recommended setting 2014 ABC at the maximum permissible value of 7,100 t from the projection model. This value is a decrease of $_{40\%}$ of the 2013 ABC (12,200 t) that was derived from Tier 5 methodology. The 2014 OFL from the projection model is 8,270 t, down from 16,300 t for 2013.

Status Determination

Assuming that the SSC will concur with the Team's recommendation to begin managing Kamchatka flounder under Tier 3, the stock is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

BSAI Northern rock sole

Status and catch specifications (t) of northern rock sole in recent years are given in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013.

Table 13. Biomass and Catch Projections for BSAI Northern rock sole.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2012	1,860,000	231,000	208,000	87,000	76,098
	2013	1,470,000	241,000	214,000	92,380	59,040
	2014	1,393,200	228,700	203,800	n/a	n/a
	2015	1,299,600	213,310	190,100	n/a	n/a

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIkamchatka.pdf

Although this stock was scheduled for a full assessment, the chapter was presented in executive summary format due to the October 2013 government shutdown. Nevertheless, results from two models were included: the 2012 accepted model and an alternative that includes a relationship between temperature and survey catchability. The assessment models were not re-run. Instead, projections for both models were based on results from the 2012 assessment. There were no changes to the input data.

Spawning biomass and stock status trends

The stock assessment model estimates a 2014 spawning biomass of 638,300 t. This was equal to the 2014 value projected in the previous year assessment, due to the fact that there were no changes in the data. According to the 2012 assessment, spawning biomass was expected to increase due to strong 2000-2005 year classes, if fishing mortality rates remained at recent levels.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that northern rock sole qualifies for management under Tier 1.
Spawning biomass for 2014 is projected to be well above B_{MSY}, placing northern rock sole in sub-tier "a" of Tier 1. The Tier 1 2014 ABC harvest recommendation is 203,800 t (F_{ABC} = The Tier 1 2014 ABC harvest recommendation is 203,800 t (F_{ABC} = 0.15) and the 2014 OFL is 228,700 t (F_{OFL} = 0.16). The 2015 ABC and OFL values are 190,100 t and 213,310 t, respectively. This is a stable fishery consistent with light exploitation because it is constrained by PSC limits and by the BSAI optimum yield limit. Usually the fishery only takes a small portion of the northern rock sole ABC (the average catch/biomass ratio is about 4 percent).

Status determination

Northern rock sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

BSAI Flathead sole

Status and catch specifications (t) of flathead sole in recent years are contained in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013.

Table 14. Biomass and Catch Projections for BSAI Flathead sole.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2012	811,000	84,500	70,400	34,100	11,381
	2013	748,454	81,500	67,900	22,699	16,713
	2014	745,237	79,633	66,293	n/a	n/a
	2015	744,631	77,023	64,127	n/a	n/a

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIflathead.pdf

Changes from previous assessment

The chapter was presented in executive summary format, as a scheduled "off-year" assessment. New information available to update the projection model for flathead sole consists of total catch for 2012 (11,386 t) and estimated catch for 2013 (17,246 t) and 2014 (assumed equal to 2013). The projected spawning stock biomass for 2014 is 239,985 t. Flathead sole are abundant and only lightly exploited. In the 2012 SAFE assessment, spawning biomass was projected to decrease for the next several years.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying flathead sole for management under Tier 3. The current values of these reference points are: $B_{40\%}$=128,286 t, $F_{40\%}$=0.285, and $F_{35\%}$=0.348. Because projected spawning biomass for 2014 (239,985 t) is above $B_{40\%}$, flathead sole is in sub-tier "a" of Tier 3. The SAFE authors and Plan Team recommend setting ABCs for 2014 and 2015 at the maximum permissible values under Tier 3a, which are 66,293 t and 64,127 t, respectively. The 2014 and 2015 OFLs under Tier 3a are 79,633 t and 77,023 t, respectively.

Status determination

Flathead sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIflathead.pdf

BSAI Alaska plaice

Status and catch specifications (t) of Alaska plaice in recent years are contained in the table below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 9, 2013.

Table 15. Biomass and Catch Projections for BSAI Alaska plaice.

Area	Year	Age 3 + Bio	OFL	ABC	TAC	Catch
BSAI	2012	606,000	64,600	53,400	24,000	16,612
	2013	589,000	67,000	55,200	20,000	23,312
	2014	576,300	66,800	55,100	n/a	n/a
	2015	572,900	66,300	54,700	n/a	n/a

For 2013, NMFS plans to increase the Alaska plaice TAC with a reallocation from the non-specified reserves.

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIplaice.pdf

Changes from previous assessment

This assessment was presented in executive summary format, as a scheduled "off-year" assessment. New input for the projection model included the final estimate of the 2012 catch and preliminary estimates of 2013 and 2014 catch. The model assessment methodology was unchanged (only the projection model was run).

Spawning biomass and stock status trends

Female spawning biomass decreased from 1985 to 1998 and has been relatively stable since then. The shelf survey biomass has been fairly steady since the mid-1980s. There was exceptionally strong recruitment from the 2002 year class. There may also be a strong 2004 year class.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, therefore qualifying it for management under Tier 3a. 2012 estimates (which were not updated in 2013) are $B_{40\%}$ = 152,000 t, $F_{40\%}$ = 0.158, and $F_{35\%}$ = 0.19. Given that the projected 2014 spawning biomass of 250,600 t exceeds $B_{40\%,}$ the ABC and OFL recommendations for 2014 were calculated under sub-tier "a" of Tier 3. Projected harvesting at the $F_{40\%}$ level gives maximum permissible ABCs of 55,100 t and 54,700 t for 2014 and 2015, respectively. The SAFE author and Plan Team recommended setting the ABCs at those values. The OFLs were determined from the Tier 3a formula, which gives a 2014 value of 66,800 t and a 2015 value of 66,300 t.

Status determination

Alaska plaice is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

GOA Assessments

GOA Shallow water flatfish

Changes in assessment methodology and data

An executive summary was presented in the Dec. 2013 SAFE which included updated 2012 catch and the partial 2013 catch as well as projections using the updated catches from the northern and southern rock sole assessment.

SAFE Author and Plan Team evaluation of alternative models

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. The rock sole model was planned for update in 2014.

Status determination and stock trends

Stock status for shallow-water flatfish is based on the NMFS bottom trawl survey (triennial from 1984 to 1999 and biennial from 1999 to 2013). Survey abundance estimates for the entire shallow-water complex were lower in 2013 compared to 2011; decreasing by 35,156 t. By species, southern rock sole has a generally increasing trend in abundance. Northern rock sole survey trend has been variable in recent years and increased between 2011 and 2013. The rest of the species in the shallow-water flatfish complex have varying trends. Notable declines were observed in the trends for butter sole and yellowfin sole from 2011 to 2013.

Table 16. Survey biomass estimates for GOA shallow water flatfish in 2011 and 2013.

Species	2011	2013
Northern rock sole	72,875	74,586
Southern rock sole	120,573	131,441
Yellowfin sole	46,576	23,016
Butter sole	19,695	8,122
Starry flounder	39,757	30,028
English sole	16,720	18,121
Sand sole	755	703
Alaska plaice	12,266	8,044
Total	329,217	294,061

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAshallowflat.pdf

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.

Tier determination/Plan Team discussion resulting ABCs and OFLs

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. 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 in 2013; the remaining shallow water flatfish biomass estimates were from the 2013 survey.

For the shallow water flatfish complex, ABC and OFL for southern and northern rock sole are combined with the ABC and OFL for the rest of the shallow water flatfish complex. This yields a combined ABC of 40,805 t and OFL of 50,007 t for 2014. For 2015, the combined ABC is 37,505 t and the OFL is 46,207 t. The GOA Plan Team agreed with authors' recommended ABC for the shallow water flatfish complex which was equivalent to maximum permissible ABC. The recommended apportionment percentages based on the 2013 survey biomass abundances by area are:

Year	Western	Central	West Yakutat	SEO	Total
2014	20,376	17,813	2,039	577	40,805
2015	18,728	16,372	1,875	530	37,505

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAshallowflat.pdf

GOA Northern and Southern rock sole

The 2012 stock assessment document contains the most recent information for the full stock assessment (http://www.afsc.noaa.gov/REFM/Docs/2012/GOAnsrocksole.pdf).

New information and projections

The biomass estimate from the 2013 GOA NMFS bottom trawl survey for northern rock sole was a slight increase (2.3%) from the estimate from the 2011 survey. The biomass estimate from the 2013 survey for southern rock sole was an increase of 9% from the estimate from the 2011 survey.

The catch totals for 2012 and 2013 for the shallow-water flatfish complex and rock sole were updated and used in the projections to obtain updated harvest specifications. The total rock sole catch for 2012 and 2013 was assumed to be split equally between northern and southern rock sole. No stock assessment models were run.

Tier determination/Plan Team discussion resulting ABCs and OFLs

The ABCs and OFLs for southern and northern rock sole were combined with the ABC and OFL for the rest of the shallow water flatfish complex. This yields a combined ABC of 40,805 t and OFL of 50,007 t for 2014. For 2015, the combined ABC is 37,505 t and the OFL is 46,207 t.

GOA Rex sole

Status and catch specifications (t) projections for 2014 and 2015 for Rex sole are listed below. Biomass for each year corresponds to the estimate given when the ABC was determined. Catch data in the table below are current through November 9th, 2013.

Table 17. Biomass and Catch for GOA rex sole in 2012-13 and projections for 2014-15.

Year	Biomass	OFL	ABC[a]	TAC	Catch
2012	87,162	12,561	9,612	9,612	2,426
2013	86,684	12,492	9,560	9,560	3,573
2014	84,702	12,207	9,341		
2015		11,963	9,155		

[a]ABC values are calculated using the catch equation applied to beginning year biomass values estimated by the SAFE authors' age structured model.
http://www.afsc.noaa.gov/REFM/Docs/2013/GOArex.pdf

Changes in assessment methodology and data

Rex sole are assessed on a biennial schedule to coincide with the timing of survey data. In 2013, an executive summary of the assessment was presented due to the government shutdown. The SAFE author updated the assessment by running the single-species projection model using parameter values from the accepted 2011 assessment model, together with updated catch information for 2011–2013, to predict adult biomass for rex sole in 2014 and 2015.

Status determination and stock trends

The assessment model biomass estimates (age 3+) decreased from 86,684 t in 2013 to 84,702 t in 2014 and a continuing decrease into 2015 is expected. The model estimate of female spawning biomass in 2014 is 52,807 t, which is greater than $B_{35\%}$ (19,434 t). The stock is not considered overfished. Catches of rex sole are well below TACs and below levels where overfishing would be a concern. 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 $F_{35\%}$. Using F_{ABC} = 0.75M = 0.128 results in a 2014 ABC of 9,341 t. The 2014 OFL using F_{OFL} = M = 0.17 is 12,207 t. The Plan Team concurred with the author's recommended maximum permissible ABCs for 2014 and 2015.

Area apportionment

Area apportionments of rex sole ABC's for 2014 and 2015 are based on the fraction of the 2011 GOA Bottom trawl survey biomass in each area.

Year	Western	Central	West Yakutat	SEO	Total
2014	1,270	6,231	813	1,027	9,341
2015	1,245	6,106	796	1,008	9,155

http://www.afsc.noaa.gov/REFM/Docs/2013/GOArex.pdf

GOA Arrowtooth flounder

Status and catch specifications (t) and projections for Arrowtooth flounder 2014 and 2015 are listed below. Biomass for each year corresponds to the estimate given when the ABC was determined.

Catch data in the table below are current through November 9th, 2013.

Table 18. Biomass and Catch for GOA Arrowtooth flounder in 2012-13 and projections for 2014-15.

Year	Biomass	OFL	ABC	TAC	Catch
2012	2,161,690	250,100	212,882	103,300	20,714
2013	2,055,560	247,196	210,451	103,300	19,956
2014	1,978,340	229,248	195,358		
2015		222,160	189,556		

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAatf.pdf

Changes in assessment methodology and data

The 2013 NMFS GOA trawl survey biomass and length data were added to the model. Catch for 2011 was updated, and updated catch for 2012 and 2013 was added. Fishery length data was updated for 2011 and fishery length data from 2012 and 2013 was added to the model. No new age data were available. There were no changes in assessment methodology. Arrowtooth flounder are managed as a Tier 3 stock, using a statistical age-structured model as the primary assessment tool. An age-based model was used with the same configuration as the 2011 assessment.

Status determination and stock trends

The estimated age 3+ biomass from the model has increased by an order of magnitude since 1961 and peaked at about 2.2 million t in 2006. The age 3+ biomass estimates are slightly lower in the current assessment for the years since 2000 when compared to estimates from the 2011 assessment. Female spawning biomass in 2013 was estimated at 1,200,320 t, which is <1% less than the projected 2013 biomass of 1,278,530 t from the 2011 assessment. Age 3+ biomass is expected to decrease in 2015. 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.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

GOA Arrowtooth flounder has been determined to fall under Tier 3a. The 2014 ABC using $F_{40\%}$=0.172 is 195,358 t, a decrease from the 2013 ABC of 210,451 t. The 2014 OFL using $F_{35\%}$=0.204 is 229,248 t. The 2015 ABC (189,556 t) and OFL (222,160 t) were estimated using the projection model and with total catch in 2012 and the estimated catch for 2013 and 2014. Catch in 2013 and 2014 was estimated using the recent 5-year average (F=0.02).

Area apportionment

The Plan Team agreed with the SAFE author's recommended ABC for arrowtooth flounder which is the maximum permissible ABC. Area apportionments of arrowtooth flounder for 2014 and 2015 are based on the fraction of the 2013 survey biomass in each area.

Year	Western	Central	West Yakutat	East Yakutat/SE	Total
2014	31,142	115,612	37,232	11,372	195,358
2015	30,217	112,178	36,126	11,035	189,556

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAatf.pdf

GOA Flathead sole

Status and catch specifications (t) and projections for 2014 and 2015 for GOA flathead sole are listed below. Biomass for each year corresponds to the estimate given when the ABC was determined. Catch data in the table below are current through November 9th, 2013.

Table 19. Biomass and Catch for GOA Flathead sole in 2012-13 and projections for 2014-15.

Year	Biomass	OFL	ABC	TAC	Catch
2012	292,189	59,380	47,407	30,319	2,166
2013	288,538	61,036	48,738	30,496	2,627
2014	252,361	50,664	41,231		
2015		50,376	41,007		

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAflathead.pdf

Changes in assessment methodology and data

A full assessment with a new model was presented in 2013. Catch data for 1978-1983 and 2012-2013 catch data were included in the model. 2012 and 2013 fishery length composition data were added and 1985-1988, 2000, and 2008 fishery length composition data were excluded from the model due to low sample size. The number of hauls was used as the effective sample size of fishery length-composition data. The 2013 survey biomass index and survey length composition data were added to the model. Conditional age-at-length data were used instead of marginal age composition data. 2011 age composition data (within each length bin) were added to the model. The “plus” group was increased to age 29.

The assessment was conducted using the Stock Synthesis modeling platform. The fishery and survey selectivity curves were estimated using an age-based double-normal function without a descending limb instead of an age-based logistic function. A conditional age-at-length likelihood approach was used: expected age composition within each length bin was fit to age data conditioned on length in the likelihood function, rather than fitting the expected marginal age-composition to age data that weren’t conditioned on length. Growth parameters and an initial equilibrium fishing mortality rate were estimated within the model. Relative weights of composition data were adjusted using a data-weighting method that accounted for correlations in composition data. An ageing error matrix was incorporated into the model. Recruitment deviations prior to 1984 were estimated as “early-period” recruits separately from main period recruitment deviations (1984-2008). The Plan Team endorsed the author’s recommended model.

Status determination and stock trends

The 2014 spawning biomass estimate (84,076 t) is above $B_{40\%}$ (35,532 t) and projected to be stable through 2015. The stock is not overfished nor approaching an overfished condition. Catch levels for this species remain below the TAC.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Flathead sole are determined to be in Tier 3a. For 2014 the Plan Team concurred with the SAFE authors' recommendation to use the maximum permissible ABC of 41,231 t. The F_{OFL} is set at $F_{35\%}$ (0.61) and gives an estimate of OFL of 50,664 t.

Area apportionment

Area apportionments of flathead sole ABCs for 2014 and 2015 are based on the fraction of the 2013 GOA bottom trawl survey biomass in each area.

Year	Western	Central	West Yakutat	SEO	Total
2014	12,730	24,805	3,525	171	41,231
2015	12,661	24,670	3,506	170	41,007

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAflathead.pdf

C. The Precautionary Approach

6. The current state of the stock shall be defined in relation to reference points or relevant proxies or verifiable substitutes allowing for effective management objectives and targets. Remedial actions shall be available and taken where reference point or other suitable proxies are approached or exceeded.

FAO CCRF 7.5.2/7.5.3
Eco 29.2/29.2bis/30-30.2

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination

The ASFC SAFE reports consist of three volumes: a volume containing stock assessments, a volume containing economic analysis, and a volume describing ecosystem considerations. The stock assessment volume contains a chapter or sub-chapter for each stock or stock complex in the "target species" category, and a summary chapter prepared by the Groundfish Plan Team. Each chapter contains estimates of all annual harvest specifications except TAC, all reference points needed to compute such estimates, and all information needed to make annual status determinations with respect to "overfishing" and "overfished" conditions.

The BSAI and GOA groundfish management plans define target and limit reference points for the flatfish complex and other groundfish. Each SAFE report describes the current fishing mortality rate, stock biomass relative to target and limit reference points. Both management plans specify the Overfishing Limits (OFL) and the Fishing mortality rate (F_{OFL}) used to set OFL and Acceptable Biological Catch (ABC) and the fishing mortality rate (F_{ABC}) used to set ABC; the determination of each is dependent on the knowledge base for each stock. The management plan classifies each stock based on a tier system (Tiers 1-6) with Tier 1 having the greatest level of information on stock status and fishing mortality relative to MSY considerations. The resultant harvest control rule for determining appropriate ABC and OFL depending on the information base (presence/absence of B, B_{MSY}, F, F_{MSY} and F_{SPR}) is shown in Figure 6.

Tiers used to determine ABC and OFL for groundfish stocks.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY} .

1a) *Stock status:* $B/B_{MSY} > 1$

$F_{OFL} = m_A$, the arithmetic mean of the pdf

$F_{ABC} \leq m_H$, the harmonic mean of the pdf

1b) *Stock status:* $a < B/B_{MSY} \leq 1$

$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \leq m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) *Stock status:* $B/B_{MSY} \leq a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(2) Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.

2a) *Stock status:* $B/B_{MSY} > 1$

$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%})$

$F_{ABC} \leq F_{MSY}$

2b) *Stock status:* $a < B/B_{MSY} \leq 1$

$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%}) \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \leq F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$

2c) *Stock status:* $B/B_{MSY} \leq a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(3) Information available: Reliable point estimates of B, $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.

3a) *Stock status:* $B/B_{40\%} > 1$

$F_{OFL} = F_{30\%}$

$F_{ABC} \leq F_{40\%}$

3b) *Stock status:* $a < B/B_{40\%} \leq 1$

$F_{OFL} = F_{30\%} \times (B/B_{40\%} - a)/(1 - a)$

$F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) *Stock status:* $B/B_{40\%} \leq a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(4) Information available: Reliable point estimates of B, $F_{30\%}$, and $F_{40\%}$.

$F_{OFL} = F_{30\%}$

$F_{ABC} \leq F_{40\%}$

(5) Information available: Reliable point estimates of B and natural mortality rate M.

$F_{OFL} = M$

$F_{ABC} \leq 0.75 \times M$

(6) Information available: Reliable catch history from 1978 through 1995.

OFL= *the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information*

$ABC \leq 0.75 \times OFL$

Figure 6. Tier used to determine ABC and OFL for groundfish stocks. The suitability of these proxies, target and limit reference points for exploitation (e.g. $B_{35\%}$, $B_{40\%}$) has been the subject of considerable research (Clark 1991, Restrepo 1999).

http://www.st.nmfs.noaa.gov/StockAssessment/workshop_documents/nsaw5/introduc.pdf

In general terms, the harvest control rules become progressively precautionary with increasing tier classification and catch options are automatically adjusted depending on the status of stocks relative to B_{MSY} or the biomass $B_{X\%}$ corresponding to the percentage of the equilibrium spawning biomass that would be obtained in the absence of fishing.

The BSAI and GOA groundfish fishery management plans define a series of target and limit reference points for flatfish and other groundfish covered by these plans. Each SAFE report describes the current fishing mortality rate, stock biomass relative to target and limit reference points. Both management plans specify the Overfishing Limits (OFL) and the Fishing mortality rate (F_{OFL}) used to set OFL, Acceptable Biological Catch (ABC) and the fishing mortality rate (F_{ABC}) used to set ABC, the determination of each being dependent on the knowledge base for each stock. The overall objectives of the management plans are to prevent overfishing and to optimize the yield of the fishery through the promotion of conservative harvest levels while considering differing levels of uncertainty. The management plan classifies each stock based on a tier system (Tiers 1-6) with Tier 1 having the greatest level of information on stock status and fishing mortality relative to MSY considerations.

Another limit reference point used in managing groundfish in the BSAI and GOA is the optimum yield (OY). The sum of the TACs of all groundfish species (except Pacific halibut) is required to fall within a given range. The upper range for BSAI is 2.0 million Mt while for the GOA is 800 thousand Mt, acting as an ecosystem cap. In practice, only the upper OY limit in the BSAI has been a factor in altering and limiting harvests.

The biological reference points used in these assessments reflect the uncertainty in the stock assessment for each of these species. Each species is categorized as to the level of certainty in their analysis from 1 to 5 where 1 is the most certain and 5 the least certain. In 1999, the NPFMC prescribed that OFL should never exceed the amount that would be taken if the stock were fished at F_{MSY} (or a proxy for F_{MSY}), after Congress redefined the terms "overfishing" and "overfished" to mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce MSY on a continuing basis. The OFL could be set lower than catch at F_{MSY} at the discretion of the SSC. OFL can be then virtually defined as the upper limit reference point.

Because Tiers 2–4 could be interpreted as treating MSY as a target rather than as a limit, the NPFMC revised those tiers by changing the default value for the rate of fishing mortality from $F_{30\%}$ (the rate that reduces equilibrium biomass to 30% of its unfished level under an assumption of constant recruitment) to the more conservative estimate of $F_{35\%}$. The buffer between OFL and ABC accounts for uncertainty in single-species stock assessments, ecosystem considerations, and operational constraints in managing the fishery. The SSC sets these management benchmarks based on scientific standards. Finally, the NPFMC determines the TAC based on social and economic considerations. In application, the NPFMC sets TAC ≤ ABC < OFL. Under the new requirements, ACL = ABC. In many cases environmental factors have been incorporated into spawning stock biomass per recruit (SPR) calculations to determine biological reference points. The reference points estimated in these assessments include, B0, virgin biomass, B_{MSY}, biomass at which maximum sustainable yield is attained, B_{abc}, the biomass associated with the acceptable biological catch and B_{ofl}, the biomass associated with the overfishing limit. Fishing mortality reference points estimated include F_{abc}, the fishing mortality associated with the acceptable biological catch, F_{OFL}, the fishing mortality associated with the overfishing limit for the stock, $F_{40\%}$, the fishing mortality associated with reducing the biomass to a level that is 40% of the pristine level and $F_{35\%}$ the fishing mortality associated with reducing the biomass to a level that is 35% of the pristine level.

This is the level of fishing mortality that maximizes the minimum yield of all spawner recruitment relationships considered for groundfish stocks in the North Atlantic and North Pacific. This fishing mortality has been shown to be able to provide at t least 75% of maximum sustainable yield so long as the spawning biomass is maintained in the range of about 20-60% of the unfished level, regardless of the form of the spawner recruit relationship (Clark 1991). For Tier 1 species the geometric mean of the model probability density function is used to estimate F_{ABC} and F_{OFL} . For tier 2-4 species, the reference point of $F_{40\%}$ from SPR calculations is used as F_{ABC} and that of $F_{35\%}$ is used as F_{OFL}. For tier 5 species, the reference point F_{ABC}, is determined as 0.75*M, where M is the instantaneous rate of natural mortality.

http://certification.alaskaseafood.org/pdf/FAO_Based_RFM_Assessment_AK_Flatfish_Full_Assessment_Report_FINAL_Jan%202014.pdf

BSAI Federal Fishery

Table 20. BSAI federal fishery reference points, specification of OFL and Maximum Permissible ABC from the 2013 SAFE reports.

Species	Area	2013 OFL	2013 ABC	2013 TAC	2013 Catch	2014 OFL	2014 ABC	2015 OFL	2015 ABC
Yellowfin sole	BSAI	220,000	206,000	198,000	156,302	259,700	239,800	268,900	248,300
Greenland turbot	BSAI	2,540	2,060	2,060	1,747	2,647	2,124	3,864	3,173
	BS	n/a	1,610	1,610	1,437	n/a	1,659	n/a	2,478
	AI	n/a	450	450	310	n/a	465	n/a	695
Arrowtooth flounder	BSAI	186,000	152,000	25,000	20,158	125,642	106,599	125,025	106,089
Kamchatka flounder	BSAI	16,300	12,200	10,000	7,794	8,270	7,100	8,500	7,300
Northern rock sole	BSAI	241,000	214,000	92,380	59,040	228,700	203,800	213,310	190,100
Flathead sole	BSAI	81,500	67,900	22,699	16,713	79,633	66,293	77,023	64,127
Alaska plaice	BSAI	67,000	55,200	20,000	23,312	56,800	55,100	66,300	54,700
Other flatfish	BSAI	17,800	13,300	3,500	1,516	16,700	12,400	16,700	12,400

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIintro.pdf

BSAI Yellowfin sole

Yellowfin sole continue to be well-above B_{MSY} and the annual harvest remains below the ABC level. The stock is trending upwards due to a strong 2003 year class. Simulation results shown in Table 21 indicate that yellowfin sole are not currently overfished and are not approaching an overfished condition. The projection of yellowfin sole female spawning biomass through 2024 is shown in Figure 7. Female spawning biomass is above the reference point $F_{40\%}$ from 2014-2025.

Table 21. Recommended OFLs and ABCs for BSAI Yellowfin sole for 2014-15.

Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2014	2015
M (natural mortality rate)	0.12	0.12	0.12	0.12
Tier	1a	1a	1a	1a
Projected total (age 6+) biomass (t)	1,963,000	1,960,000	2,113,000	2,188,000
Female spawning biomass (t)				
Projected	582,300	601,000	581,100	594,800
B_0	966,900		989,800	
B_{MSY}	353,000		366,000	
F_{OFL}	0.112	0.112	0.123	0.123
$maxF_{ABC}$	0.105	0.105	0.113	0.113
F_{ABC}	0.105	0.105	0.113	0.113
OFL (t)	220,000	219,000	259,700	268,900
maxABC (t)	206,000	206,000	239,800	248,300
ABC (t)	206,000	206,000	239,800	248,300
Status	As determined *last* year for: 2011	2012	As determined *this* year for: 2012	2013
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIyfin.pdf

BSAI Greenland turbot

Table 22. Recommended OFLs and ABCs for BSAI Greenland turbot in 2014-15.

Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2014	2015
M (natural mortality rate)	0.112	0.112	0.112	0.112
Tier	3b	3b	3b	3b
Projected total (age 1+) biomass	80,989	94,752	84,546	96,298
Female spawning biomass (t)	23,485	26,537	22,010	27,624
Projected				
$B_{100\%}$	119,217	119,217	99,764	99,764
$B_{40\%}$	47,686	47,686	39,906	39,906
$B_{35\%}$	41,726	41,726	34,917	34,917
F_{OFL}	0.14	0.16	0.14	0.18
$maxF_{ABC}$	0.12	0.13	0.12	0.15
F_{ABC}	0.12	0.13	0.12	0.15
OFL (t)	2,539	3,266	2,647	3,864
maxABC (t)	2,064	2,655	2,124	3,173
ABC (t)	2,064	2,615	2,124	3,173
EBS	1,612	2,074	1,659	2,478
Aleutian Islands	452	581	465	695
Status	As determined *last* year 2011	2012	As determined *this* year 2012	2013
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIturbot.pdf

Specification of OFL and Maximum Permissible ABC and ABC

Recommendation in the past several years, the ABC has been set below the maximum permissible estimates. For example, in 2008 the ABC recommendation was 21% of the maximum permissible level. The rationale for these lower values have been generally due to concerns over stock structure uncertainty, lack of apparent recruitment, and modeling issues. Last year a slope survey was conducted and while some areas show lower abundances (i.e., the Aleutian Islands) the signs of recruitment are the best ever seen for this stock. Therefore, the authors recommended the ABC to be set to the maximum permissible. The projected Greenland turbot maximum permissible ABC and OFL levels for 2014 and 2015 are shown below (catch for 2013 was set to 1,924).

Year	Catch (for projection)	Maximum permissible ABC	Recommended ABC	OFL	Female spawning biomass
2014	2,124 t	2,124 t	2,124 t	2,647 t	22,010 t
2015		3,173 t	3,173 t	3,864 t	27,624 t

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIturbot.pdf

The estimated overfishing level based on the adjusted $F_{35\%}$ rate is 2,647 t corresponding to a full selection F of 0.14. The value of the Council's overfishing definition depends on the age specific selectivity of the fishing gear, the somatic growth rate, natural mortality, and the size (or age) - specific maturation rate. As this rate depends on assumed selectivity, future yields are sensitive to relative gear-specific harvest levels. Because harvest of this resource is unallocated by gear type, the unpredictable nature of future harvests between gears is an added source of uncertainty. However, this uncertainty is considerably less than uncertainty related to treatment of survey biomass levels, i.e., factors which contribute to estimating absolute biomass (Ianelli et al. 1999).

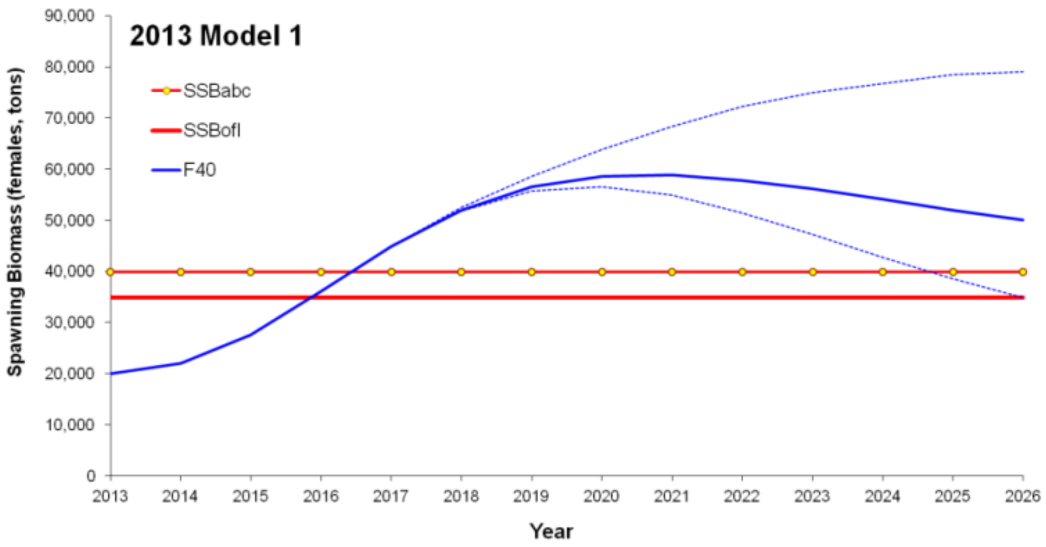
Scenarios 1 through 7 were projected 13 years from 2013. Fishing at the maximum permissible rate indicate that the spawning stock continued to decline in 2013 but will increase after 2014 with the incoming large year classes. The projection model run under these conditions indicates that for Scenario 6, the Greenland turbot stock is not overfished based on the first criterion (year 2013 spawning biomass estimated at 19,865 t relative to $0.5B_{35\%}$ = 17,459 t) and will be above its MSY value (34,918 t) in 2023 at 50,259 t.

Projections with fishing at the maximum permissible level result in an expected value of spawning biomass of 43,654 t by 2026. These projections illustrate the impact of the recent recruitment observed in the survey. For example, under all scenarios, the spawning biomass is expected to increase starting in 2014 when the recruits in recent years mature. In both Scenario 6 and 7 spawning biomass peaks in 2020 and then begins to drop again as the influence of the 2008 and 2009 year classes begins to wane and the projection relies on mean recruitment. Under Scenarios 6 and 7 of the 2013 Reference Model, the projected spawning biomass for Greenland turbot is not currently overfished, nor is it approaching an overfished status.

Table 23. Mean spawning biomass, F and yield projections for Greenland turbot, 2013-2026. The full-selection fishing mortality rates (F's) between longline and trawl gears were assumed to be 50:50.

SSB	Max F_{abc}	F_{abc}	5-year avg.	$F_{75\%}$	No Fishing	Scenario 6	Scenario 7
2013	20,006	20,006	20,006	20,006	20,006	20,006	20,006
2014	22,010	22,010	22,010	22,010	22,010	22,010	22,010
2015	27,624	27,624	28,278	28,334	28,837	27,329	27,624
2016	36,120	36,120	37,769	37,884	38,923	35,492	36,120
2017	44,911	44,911	48,287	48,472	50,156	43,828	44,325
2018	51,958	51,958	57,808	58,083	60,602	50,197	50,621
2019	56,511	56,511	65,460	65,850	69,449	53,926	54,284
2020	58,616	58,616	71,202	71,732	76,659	55,112	55,410
2021	58,836	58,836	75,352	76,042	82,507	54,419	54,663
2022	57,823	57,823	78,255	79,117	87,260	52,600	52,797
2023	56,113	56,113	80,185	81,220	91,107	50,259	50,416
2024	54,083	54,083	81,344	82,548	94,176	47,796	47,919
2025	51,996	51,996	81,914	83,275	96,586	45,523	45,615
2026	50,048	50,048	82,062	83,564	98,462	43,654	43,720
F							
2013	0.11	0.11	0.11	0.11	0.11	0.11	0.11
2014	0.12	0.12	0.05	0.05	0.00	0.14	0.12
2015	0.15	0.15	0.05	0.05	0.00	0.18	0.15
2016	0.20	0.20	0.05	0.05	0.00	0.24	0.25
2017	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2018	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2019	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2020	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2021	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2022	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2023	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2024	0.22	0.22	0.05	0.05	0.00	0.27	0.27
2025	0.22	0.22	0.05	0.05	0.00	0.26	0.26
2026	0.21	0.21	0.05	0.05	0.00	0.25	0.25
Catch							
2013	1,924	1,924	1,924	1,924	1,924	1,924	1,924
2014	2,124	2,124	975	876	0	2,647	2,124
2015	3,173	3,173	1,171	1,054	0	3,864	3,173
2016	5,268	5,268	1,505	1,356	0	6,317	6,555
2017	7,351	7,351	1,951	1,760	0	8,907	9,018
2018	8,874	8,874	2,438	2,201	0	10,643	10,740
2019	10,103	10,103	2,893	2,614	0	11,963	12,047
2020	10,869	10,869	3,267	2,957	0	12,673	12,745
2021	11,182	11,182	3,549	3,217	0	12,816	12,877
2022	11,151	11,151	3,746	3,402	0	12,560	12,610
2023	10,906	10,906	3,874	3,525	0	12,085	12,126
2024	10,552	10,552	3,950	3,602	0	11,415	11,453
2025	10,129	10,129	3,989	3,643	0	10,619	10,651
2026	9,633	9,633	4,001	3,660	0	9,934	9,958

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIturbot.pdf



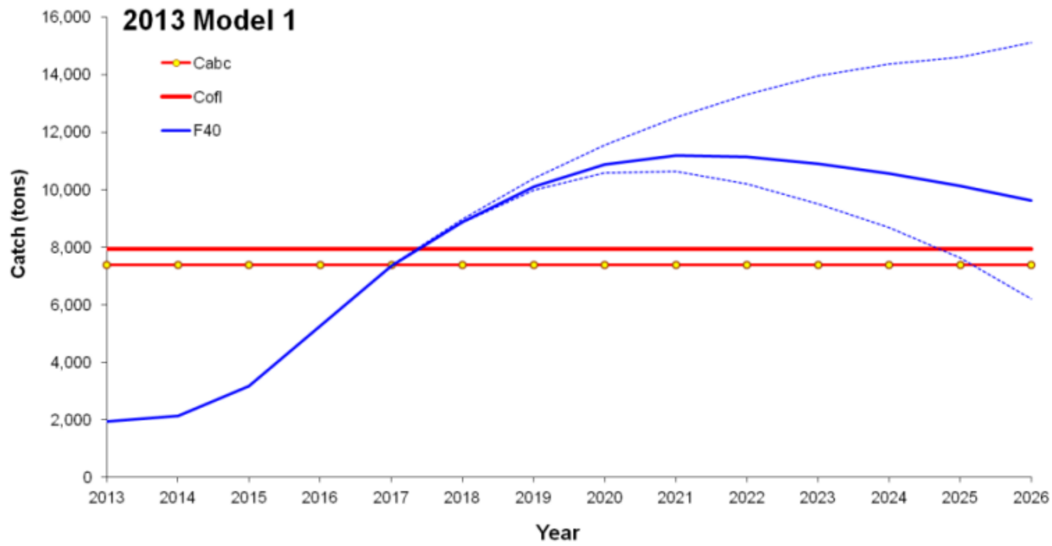


Figure 7. Alternative 1 projected (upper) female spawning stock biomass and (bottom) catch at $F_{40\%}$ fishing with long-term expected OFL and ABC reference levels.

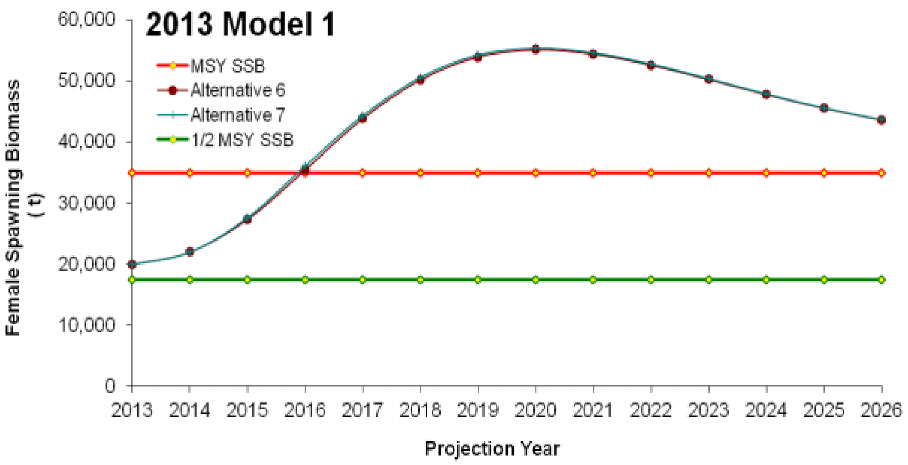


Figure 8. Projected female spawning stock biomass under Alternatives 6 and 7 with SSB_{MSY} and ½SSB_{MSY} reference levels. $SSB_{35\%}$ is a proxy for SSB_{MSY}. http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIturbot.pdf

BSAI Arrowtooth flounder

The 2013 Bering Sea survey biomass estimate for arrowtooth flounder was 405,509 t, which is similar to the 2012 estimate of 402,887 t. The 2012 estimate of $B_{40\%}$ was 281,088 t; arrowtooth flounder biomass is above this reference point. The exploitation level remains at less than 5% for 2013. Because the maturity ogive was changed in the 2013 assessment, the reference points calculated for 2012 are not appropriate for 2013. However, under both sets of reference points, female spawning biomass is well above $B_{40\%}$, and in no danger of overfishing.

Table 24. Recommended OFLs and ABCs for BSAI Arrowtooth flounder for 2014-15.

Quantity/Status	Last year 2013	Last year 2014	This year 2014	This year 2015
M (natural mortality)	0.35, 0.2	0.35, 0.2	0.13	0.13
Specified/recommended Tier	3a	3a	3a	3a
Projected biomass (ages 1+)	1,021,060	1,014,250	1,023,440	995,494
Female spawning biomass (t)				
Projected (point estimate)	638,377	638,377	626,319	632,319
Lower 95% confidence interval			574,000	576,000
Upper 95% confidence interval			679,000	689,000
$B_{100\%}$	616,191	616,191	577,538	577,538
$B_{40\%}$	246,476	246,476	231,015	231,015
$B_{35\%}$	215,667	215,667	202,138	202,138
F_{OFL}	0.21	0.21	0.186	0.186
$maxF_{ABC}$ (maximum allowable = F40%)	0.17	0.17	0.156	0.156
Specified/recommended F_{ABC}	0.17	0.17	0.156	0.156
Specified/recommended OFL (t)	186,000	186,000	125,642	125,025
Specified/recommended ABC (t)	152,000	152,000	106,599	106,089
Status	As determined last year for: 2011	As determined last year for: 2012	As determined this year for: 2012	As determined this year for: 2013
Is the stock being subjected to overfishing?	No	No	No	n/a
Is the stock currently overfished?	No	No	No	No
Is the stock approaching a condition of being overfished?	No	No	No	No

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIatf.pdf

Kamchatka flounder

Reference values for Kamchatka flounder are summarized in the following table, with the recommended 2014 values in bold. Projected 2014 female spawning biomass is estimated at 50,400 t, above the $B_{40\%}$ level of 46,100 t, and is projected to remain above $B_{40\%}$ if fishing continues at that level (see figure below). The stock was not being subjected to overfishing in 2012, is currently not overfished, nor is it approaching a condition of being overfished in 2014.

Table 25. Recommended OFLs and ABCs for BSAI Kamchatka flounder, 2014-2015

	Tier 3 assessment model			
	As estimated or *specified last* year for:		As would have been estimated or *recommended last* year for:	
Quantity	2013	2014	2014	2015
M (natural mortality rate)	0.13	0.13	0.11	0.11
Tier	5	5	3	3
Biomass (t)	108,800	108,800		
Projected total (age 1+) biomass (t)			136,600	138,700
Female spawning biomass (t)				
Projected			**50,400**	50,100
$B_{100\%}$	na	na	**115,200**	115,200
$B_{40\%}$	na	na	**46,100**	46,100
$B_{35\%}$	na	na	**40,300**	40,300
F_{OFL}	0.13	0.13	**0.073**	0.073
$maxF_{ABC}$	0.098	0.098	**0.063**	0.063
F_{ABC}	0.098	0.098	**0.063**	0.063
OFL (t)	16,300	16,300	**8,270**	8,500
maxABC (t)	12,200	12,200	**7,100**	7,300
ABC (t)	12,200	12,200	**7,100**	7,300
	As determined *last* year for:		As determined *this* year for:	
Status	2011	2012	2012	2013
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	n/a	no	no
	Alternative Tier 5 model			
Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	Alternative Tier 5 model			
	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2013	2014	2014	2015
M (natural mortality rate)	0.13	0.13	0.13	0.13
Tier	5	5	5	5
Biomass (t)	108,800	108,800	128,300	128,300
F_{OFL}	0.13	0.13	0.13	0.13
$maxF_{ABC}$	0.098	0.098	0.098	0.098
F_{ABC}	0.098	0.098	0.098	0.098
OFL (t)	16,300	16,300	16,600	16,600
maxABC (t)	12,200	12,200	12,400	12,400
ABC (t)	12,200	12,200	12,400	12,400
	As determined *last* year for:		As determined *this* year for:	
Status	2013	2014	2014	2015
Overfishing	no	no	n/a	n/a

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIkamchatka.pdf

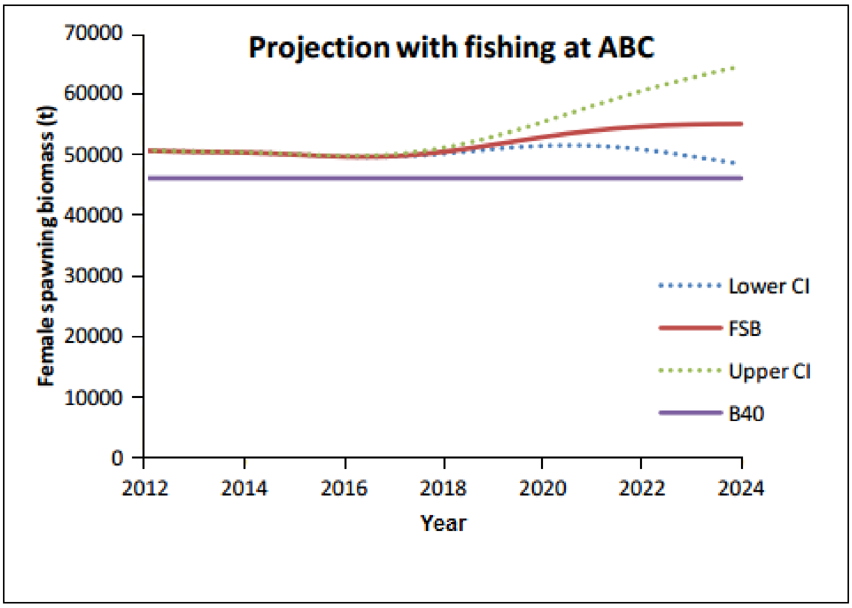


Figure 9. Projection of the effect of fishing at F_{ABC} on female spawning biomass.
http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIkamchatka.pdf

BSAI Northern rock sole

The 2013 catch of 58,810 t through October 26 is 90% of the assumed value of the 2013 catch in the stock assessment model (65,000 t). For the 2014 fishery, the authors recommended the maximum allowable ABC of 222,500 t from the temperature-dependent catchability model. This value is an increase of 9% over the 2012 estimate of 2014 ABC which did not use temperature/catchability modeling. Reference values for northern rock sole are summarized in the following tables, with the recommended 2014 values in bold. The stock was not being subjected to overfishing last year, is currently not overfished, nor is it approaching a condition of being overfished.

For the 2013 updated assessment, no changes were made to the model input data. Both models project forward using the model estimated numbers at age for 2013 from the 2012 assessments. The 2013 catch of 58,810 t through October 26 is 90% of the assumed value of the 2013 catch in the stock assessment model (65,000 t). For the 2014 fishery, the authors recommend the maximum allowable ABC of 222,500 t from the temperature-dependent catchability model. This value is an increase of 9% over the 2012 estimate of 2014 ABC which did not use temperature/catchability modeling. Reference values for northern rock sole are summarized in the following tables, with the recommended 2014 values in bold. The stock was not being subjected to overfishing last year, is currently not overfished, nor is it approaching a condition of being overfished.

Table 26. Recommended OFLs and ABCs for BSAI Northern rock sole, 2014-15

	Temperature-dependent catchability model			
Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2013	2014	2014	2015
M (natural mortality rate)	0.15	0.15	0.15	0.15
Tier	1a	1a	1a	1a
Projected total (age 6+)	1,465,600	1,393,200	1,555,700	1,456,600
Female spawning biomass (t)	628,300	638,300	713,200	698,800
Projected				
B_0	694,500		694,500	
B_{MSY}	260,000	260,000	260,000	260,000
F_{OFL}	0.164	0.164	0.16	0.16
$maxF_{ABC}$	0.146	0.146	0.143	0.143
F_{ABC}	0.146	0.146	**0.143**	0.143
OFL (t)	241,000	229,000	**249,000**	233,100
maxABC (t)	214,000	204,000	**222,500**	208,300
ABC (t)	214,400	204,000	**222,500**	208,300
Status	As determined *last* year for:		As determined *this* year	
	2011	2012	2012	2013
Overfishing	No	n\a	No	n\a
Overfished	n\a	No	n\a	No
Approaching overfished	n\a	No	n\a	No

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIrocksole.pdf

Flathead sole

Flathead sole is currently managed as a Tier 3a stock. New information available to update the single species projection model for flathead sole consists of the total catch for 2012 (11,386 t) and the current catch for 2013 (16,322 t as of Oct. 12, 2013). To run the projection model to predict ABC's for 2014 and 2015, estimates are required for the total catches in 2013 and 2014. The final catch for 2013 was estimated by dividing the current catch (as of Oct. 12) by the ratio of the catch in the corresponding week in 2012 to the final 2012 catch. The estimated final catch for 2013 (17,246 t) was also used as the estimate for the final 2014 catch. Based on the updated projection model results, the maximum permissible ABC's for 2014 and 2015 are 66,293 t and 64,127 t, respectively, while the OFL's are 79,633 t and 77,023 t. The estimated spawning stock biomass for 2013 is 245,672 t. Because this is greater than $B_{35\%}$ (112,250 t), the stock is not considered overfished. In addition, because the total catch in 2012 was less than the ABC for that year (i.e., 11,386 t < 34,100 t), overfishing did not occur. Because the stock appears to be healthy and is only lightly exploited, the SAFE author's recommended ABCs for 2014 are the maximum permissible ones. The updated ABC recommendation and OFL for 2014 are quite similar to those developed last year (66,657 t and 80,069 t).

Table 27. Recommended OFLs and ABCs for values for BSAI flathead sole for 2014 and 2015.

Quantity	As estimated or specified last year (2012)		As estimated or specified this year (2013)	
	2013	2014	**2014**	**2015**
M (natural mortality)	0.2	0.2	**0.2**	**0.2**
Specified/recommended tier	3a	3a	**3a**	**3a**
Total biomass (Age 3+; t)	748,454	747,838	**745,237**	744,631
Female Spawning Biomass (t)	245,175	236,009	**239,985**	224,112
$B_{100\%}$	320,714	320,714	**320,714**	320,714
$B_{40\%}$	128,286	128,286	**128,286**	128,286
$B_{35\%}$	112,250	112,250	**112,250**	112,250
$F_{OFL} = F_{35\%}$	0.348	0.348	**0.348**	0.348
$max\ F_{ABC} = F_{40\%}$	0.285	0.285	**0.285**	0.285
$recommended\ F_{ABC}$	0.285	0.285	**0.285**	0.285
OFL (t)	81,500	80,100	**79,633**	77,023
max ABC (t)	67,900	66,700	**66,293**	64,127
ABC (t)	67,900	66,700	**66,293**	64,127
Status	**As determined last year (2012) for:**		**As determined this year (2013) for:**	
	2011	2012	**2012**	**2013**
Overfishing	no	n/a	**no**	n/a
Overfished	n/a	no	n/a	**no**
Approaching overfished	n/a	no	n/a	**no**

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIflathead.pdf

BSAI Alaska plaice

For the 2014 fishery, the authors recommend the maximum allowable ABC of 55,100 t from the updated projection model. This value is a decrease of less than 1% of the 2013 ABC of 55,200 t and similar to the projected value of 55,800 t derived from last year's full stock assessment. F_{abc} is well below F_{ofl} for 2013 and 2014 thus, the stock was not being subjected to overfishing last year, is currently not overfished, nor is it approaching a condition of being overfished. Reference values for Alaska plaice are summarized in the following table, with the recommended 2014 values in bold.

Table 28. Recommended ABCs and OFLs (in bold) relative to the 2012 recommendations for BSAI Alaska plaice.

	Last year		This year	
Quantity/Status	2013	2014	**2014**	2015
M (natural mortality)	0.13	0.13	**0.13**	0.13
Specified/recommended Tier	3a	3a	**3a**	3a
Projected biomass (ages 3+)	588,500	580,400	**576,300**	572,900
Female spawning biomass (t)				
Projected	260,500	253,600	**250,600**	246,300
$B_{100\%}$	380,000		**380,100**	
$B_{40\%}$	152,000		**152,000**	
$B_{35\%}$	133,000		**133,000**	
F_{OFL}	0.19	0.19	**0.19**	**0.19**
$maxF_{ABC}$ (maximum allowable = F40%)	0.158	0.158	**0.158**	**0.158**
Specified/recommended F_{ABC}	0.158	0.158	**0.158**	**0.158**
Specified/recommended ABC (t)	55,200	55,800	**55,100**	54,700
Specified/recommended OFL (t)	67,000	60,200	**66,800**	66,300
Is the stock being subjected to overfishing?	No	No	No	No
Is the stock currently overfished?	No	No	No	No
Is the stock approaching a condition of being overfished?	No	No	No	No

http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIplaice.pdf

GOA Federal Fishery

Table 29. GOA federal fishery reference points, specification of OFL and Maximum Permissible ABC from the 2012 and 2013 SAFE reports.

Species	Area	2013 OFL	2013 ABC	2013 TAC	2013 Catch	2014 OFL	2014 ABC	2015 OFL	2015 ABC
Shallow-Water Flatfish	W		19,489	13,250	154		20,376		18,728
	C		20,168	18,000	5,068		17,813		16,372
	WYAK		4,647	4,647	1		2,039		1,875
	EYAK/SEO		1,180	1,180	2		577		530
	Total	55,680	45,484	37,077	5,225	50,007	40,805	46,207	37,505
Deep-Water Flatfish	W		176	176	21		302		300
	C		2,308	2,308	196		3,727		3,680
	WYAK		1,581	1,581	4		5,532		5,462
	EYAK/SEO		1,061	1,061	4		3,911		3,861
	Total	6,834	5,126	5,126	225	16,159	13,472	15,955	13,303
Rex Sole	W		1,300	1,300	98		1,270		1,245
	C		6,376	6,376	3,475		6,231		6,106
	WYAK		832	832	0		813		796
	EYAK/SEO		1,052	1,052	0		1,027		1,008
	Total	12,492	9,560	9,560	3,573	12,207	9,341	11,963	9,155
Arrowtooth Flounder	W		27,181	14,500	836		31,142		30,217
	C		141,527	75,000	18,632		115,612		112,178
	WYAK		20,917	6,900	52		37,232		36,126
	EYAK/SEO		20,826	6,900	76		11,372		11,035
	Total	247,196	210,451	103,300	19,596	229,248	195,358	222,160	189,556
Flathead Sole	W		15,729	8,650	582		12,730		12,661
	C		26,563	15,400	2,045		24,805		24,670
	WYAK		4,686	4,686	0		3,525		3,506
	EYAK/SEO		1,760	1,760	0		171		170
	Total	61,036	48,738	30,496	2,627	50,664	41,231	50,376	41,007

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAintro.pdf

Shallow water flatfish

This assemblage includes Northern rock sole, Southern rock sole, Yellowfin sole, Butter sole, Starry flounder, English sole and Alaska plaice. The assessment focused on northern and southern rock sole which accounted for 71% of the catch in 2013. This assemblage is lightly exploited with current catch well below the OFL and ABC reference levels and there is no danger of overfishing at this time.

Table 30. Catch (t) by species for shallow water flatfish species in the GOA in 2012-2013.

Species Shallow-water flatfish	2012 Catch	2013 Catch[1]
Northern rock sole	972	1,914
Southern rock sole	1,857	1,753
Yellowfin sole	3	8
Butter sole	803	1,198
Starry flounder	277	151
English sole	78	104
Sand sole	20	9
Alaska plaice	13	1
Total shallow-water	4,022	5,139

Table 31. Biomass and Reference points for GOA shallow water flatfish species for 2014-2015.

Species					Previous Assessment 2013		Previous Assessment 2014		Current Assessment 2014		Current Assessment 2015	
Shallow-water flatfish	Tier	FABC	FOFL	Biomass[1]	ABC	OFL	ABC	OFL	ABC	OFL	ABC	OFL
Northern rock sole	3a	0.152	0.180	*	9,700	11,400	8,500	9,900	9,400	11,000	8,300	9,700
Southern rock sole	3a	0.193	0.230	*	18,600	21,900	16,400	19,300	18,200	21,400	16,000	18,900
Yellowfin sole	5	0.15	0.2	23,016	5,895	7,678	5,895	7,678	3,452	4,603	3,452	4,603
Butter sole	5	0.15	0.2	8,122	2,493	3,246	2,493	3,246	1,218	1,624	1,218	1,624
Starry flounder	5	0.15	0.2	30,028	5,032	6,554	5,032	6,554	4,504	6,006	4,504	6,006
English sole	5	0.15	0.2	18,121	2,116	2,756	2,116	2,756	2,718	3,624	2,718	3,624
Sand sole	5	0.15	0.2	703	96	124	96	124	105	141	105	141
Alaska plaice	5	0.15	0.2	8,044	1,552	2,022	1,552	2,022	1,207	1,609	1,207	1,609
Total shallow-water					45,484	55,680	42,084	51,580	40,805	50,007	37,505	46,207

[1] 2013 survey biomass estimates

Table 32. The recommended 2014 and 2015 shallow-water flatfish ABC and OFL levels with tier 3a estimates from projections run with the 2012 model and updated with 2012 and 2013 catches for northern and southern rock sole (see A'mar et al 2013).

Quantity/Status	Last year 2013	Last year 2014	This year **2014**	This year 2015
M (natural mortality)	0.2[1]	0.2[1]	0.2[1]	0.2[1]
Specified/recommended Tier	3a and 5	3a and 5	3a and 5	3a and 5
Biomass (t)	433,869	408,469	384,134	362,534
F_{OFL} (F=M)	*	*	*	*
$maxF_{ABC}$ (maximum allowable = 0.75x F_{OFL})	*	*	*	*
Specified/recommended F_{ABC}	*	*	*	*
Specified/recommended OFL (t)	55,680	51,580	50,007	46,207
Specified/recommended ABC (t)	45,484	42,084	40,805	37,505
Status	As determined *last* year 2011	2012	As determined *this* year 2012	2013
Is the stock being subjected to overfishing?	No	No	No	N/A
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)				

***A'mar et al 2013 contains values for these cases**

1 Northern rock sole male M=0.275, southern rock sole male M= 0.267, all other M=0.2.

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAshallowflat.pdf

Northern and Southern rock sole

The biomass estimate from the 2013 GOA NMFS bottom trawl survey for northern rock sole was a slight increase (2.3%) from the estimate from the 2011 survey. The catch totals for 2012 and 2013 for the shallow-water flatfish complex and rock sole were updated and used in the projections to obtain updated harvest specifications. The total rock sole catch for 2012 and 2013 was assumed to be split equally between northern and southern rock sole. No stock assessment models were run.

Table 33. Recommended OFLs and ABCs for GOA Northern rock sole for 2014-15.

Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2014	2015
M (natural mortality rate)	0.2,0.275*	0.2, 0.275*	0.2,0.275*	0.2, 0.275*
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	89,300	80,000	87,300	79,300
Female spawning biomass (t)	42,700	36,500	40,600	34,400
Projected				
$B_{100\%}$	50,300	50,300	50,300	50,300
$B_{40\%}$	20,100	20,100	20,100	20,100
$B_{35\%}$	17,600	17,600	17,600	17,600
F_{OFL}	0.180	0.180	0.180	0.180
$maxF_{ABC}$	0.152	0.152	0.152	0.152
F_{ABC}	0.152	0.152	0.152	0.152
OFL (t)	11,400	9,900	11,000	9,700
maxABC (t)	9,700	8,500	9,400	8,300
ABC (t)	9,700	8,500	9,400	8,300
Status	As determined *last* year for: 2011	2012	As determined *this* year for: 2012	2013
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAnsrocksole.pdf

Table 34. Recommended OFLs and ABCs for GOA Southern rock sole for 2014-15.

Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2014	2015
M (natural mortality rate)	0.2, 0.267*	0.2, 0.267*	0.2, 0.267*	0.2, 0.267*
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	208,800	192,700	208,800	195,200
Female spawning biomass (t)	82,800	72,500	81,500	69,300
Projected				
$B_{100\%}$	112,900	112,900	112,900	112,900
$B_{40\%}$	45,100	45,100	45,100	45,100
$B_{35\%}$	39,500	39,500	39,500	39,500
F_{OFL}	0.230	0.230	0.230	0.230
$maxF_{ABC}$	0.193	0.193	0.193	0.193
F_{ABC}	0.193	0.193	0.193	0.193
OFL (t)	21,900	19,300	21,400	18,900
maxABC (t)	18,600	16,400	18,200	16,000
ABC (t)	18,600	16,400	18,200	16,000
Status	As determined *last* year for: 2011	2012	As determined *this* year for: 2012	2013
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

* for males; estimated

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAnsrocksole.pdf

GOA Rex sole

Although it is not possible to use a Tier 3 approach to making harvest recommendations for rex sole because estimates of $F_{35\%}$ and $F_{40\%}$ are not considered reliable, the SSC has decided that it is possible to use a Tier 3 approach for determining overfished status because the estimate of $B_{35\%}$ (i.e., 35% of the unfished spawning stock biomass) is considered unreliable (it does not depend on the fishery selectivity), as is the estimate of current (2013) spawning stock biomass. Because the estimated spawning stock biomass for 2013 (52,807 t) is greater than $B_{35\%}$ (19,434 t), the stock is not considered overfished. Because the 2012 catch was less than the 2012 ABC (i.e., 2,425 t < 9,612 t), overfishing is not occurring.

Because the stock appears to be healthy and is only lightly exploited, the author's recommended ABCs for 2014 and 2015 are the maximum permissible ones. The principal reference values for this update and from last year's assessment are summarized in the following table, with the recommended values for 2014 in bold:

Table 35. Recommended OFLs and ABCs for GOA Rex sole for 2014-15.

Quantity	As estimated or specified last year (2012) for:		As estimated or recommended this year (2013) for:	
	2013	2014	2014	2015
M (natural mortality)	0.17	0.17	0.17	0.17
Specified/recommended tier	5	5	5	5
Biomass (adult; t)	86,684	85,778	84,702	83,012
F_{OFL} =M	0.170	0.170	0.170	0.170
max F_{ABC} =0.75*M	0.128	0.128	0.128	0.128
recommended F_{ABC}	0.128	0.128	0.128	0.128
OFL (t)	12,492	12,362	12,207	11,963
max ABC (t)	9,560	9,460	9,341	9,155
ABC (t)	9,560	9,460	9,341	9,155
Status	As determined last year (2012) for:		As determined this year (2013) for:	
	2011	2012	2012	2013
Overfishing	no	n/a	no	n/a
$B_{35\%}$		19,434		19,434
Female spawning biomass (t)		53,164		52,807
Overfished	n/a	no	n/a	no

http://www.afsc.noaa.gov/REFM/Docs/2013/GOArex.pdf

GOA Arrowtooth flounder

ABC for 2014 using $F_{40\%}$ = 0.172 was estimated at 195,358 t. The projection model was used to estimate the 2015 ABC using $F_{40\%}$=0.172 at 189,556 t with the 2013 catch estimated using the average recent 5 year F=0.019. In the 2012 update assessment, the 2014 ABC using $F_{40\%}$ = 0.174 was estimated at 208,811 t (http://www.afsc.noaa.gov/REFM/Docs/2012/GOAatf.pdf).

Yield at $F_{35\%}$ = 0.204 was estimated at 229,248 t for 2014 and 222,160 t for 2015 (fishing at average F=0.019). Therefore, an ABC of 195,358 t and an OFL of 229,248 t was recommended for 2014 and an ABC of 189,556 t and an OFL of 222,160 t was recommended for 2015. The stock is not currently being subjected to overfishing, as determined by comparing the complete 2012 catch to the specified OFL for that year. The stock is not overfished, and is not approaching a condition of being overfished.

Table 36. Recommended OFLs and ABCs for GOA Arrowtooth flounder for 2014-15.

Quantity	*As specified last year for:*		*As recommended this year for:*	
	2013	2014	**2014**	**2015**
M (natural mortality)	0.2 females, 0.35 males	0.2 females, 0.35 males	0.2 females, 0.35 males	0.2 females, 0.35 males
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	2,055,560	2,104,150	1,978,340	1,949,990
Female spawning biomass (t)				
Upper 95% confidence interval			1,319,124	1,294,950
Point estimate	1,274,290	1,271,940	1,205,440	1,176,280
Lower 95% confidence interval			1,091,756	1,057,610
$B_{100\%}$	1,205,580	1,205,580	1,155,170	1,155,170
$B_{40\%}$	482,231	482,231	462,067	462,067
$B_{35\%}$	421,953	421,953	404,309	404,309
$F_{OFL} = F_{35\%}$	0.207	0.207	0.204	0.204
$max\ F_{ABC} = F_{40\%}$	0.174	0.174	0.172	0.172
F_{ABC}	0.174	0.174	0.172	0.172
OFL (t)	247,196	245,262	229,248	222,160
maxABC (t)	210,451	208,811	195,358	189,556
ABC (t)	210,451	208,811	195,358	189,556
	As determined *last* year for:		As determined *this* year for:	
Status	2011	2012	2012	2013
Overfishing	No	No	No	n/a
Overfished	No	No	No	No
Approaching overfished	No	No	No	No

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAatf.pdf

GOA Flathead sole

The stock is not overfished and is not approaching an overfished condition. With regard to assessing the current stock level, the expected stock size in the year 2014 of scenario 6 is 84,059 t, more than 2 times $B_{35\%}$ (31,090 t). Thus the stock is not currently overfished. With regard to whether the stock is approaching an overfished condition, the expected spawning stock size in the year 2026 of scenario 7 (32,701 t) is greater than $B_{35\%}$; thus, the stock is not approaching an overfished condition. The reference fishing mortality rate for flathead sole is determined by the amount of reliable population information available (Amendment 56 of the Fishery Management Plan for the groundfish fishery of the Bering Sea/Aleutian Islands). Estimates of $F_{40\%}$, $F_{35\%}$, and $SPR_{40\%}$ were obtained from a spawner-per recruit analysis.

Assuming that the average recruitment from the 1983-2010 year classes estimated in this assessment represents a reliable estimate of equilibrium recruitment, an estimate of $B_{40\%}$ is calculated as the product of $SPR_{40\%}$ times the equilibrium number of recruits. Since reliable estimates of the 2013 spawning biomass (B), $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist and $B > B_{40\%}$, the flathead sole reference fishing mortality is defined in Tier 3a. For this tier, F_{ABC} is constrained to be $\leq F_{40\%}$, and F_{OFL} is defined to be $F_{35\%}$.

The values of these quantities are:

SSB 2013	96,782
$B_{40\%}$	40,182
$F_{40\%}$	0.43
max$Fabc$	0.43
$B_{35\%}$	35,159
$F_{35\%}$	0.56
F_{OFL}	0.56

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAflathead.pdf

Table 37. Projected spawning biomass based on the previous (2011) assessment model for the seven harvest scenarios listed in the "Harvest Recommendations" section.

Year	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
2013	96,393	96,393	96,393	96,393	96,393	96,393	96,393
2014	96,782	96,782	96,782	96,782	96,782	96,782	96,782
2015	74,782	74,782	96,139	92,926	97,747	69,167	74,782
2016	59,929	59,929	94,687	88,769	97,741	52,520	59,929
2017	50,146	50,146	92,874	84,757	97,192	42,654	46,828
2018	44,154	44,154	91,139	81,312	96,522	37,244	39,540
2019	41,011	41,011	89,866	78,767	96,117	35,389	36,193
2020	39,796	39,796	89,118	77,119	96,053	35,412	35,665
2021	39,721	39,721	88,868	76,224	96,349	36,005	36,050
2022	40,001	40,001	88,904	75,787	96,827	36,530	36,511
2023	40,264	40,264	89,081	75,597	97,374	36,812	36,784
2024	40,420	40,420	89,265	75,499	97,861	36,906	36,886
2025	40,488	40,488	89,446	75,453	98,299	36,909	36,898
2026	40,509	40,509	89,574	75,410	98,632	36,887	36,882

Table 38. Projected fishing mortality rates based on the previous (2011) assessment model for the seven harvest scenarios listed in the "Harvest Recommendations" section.

Year	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
2013	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2014	0.43	0.43	0.03	0.08	0.00	0.56	0.43
2015	0.43	0.43	0.03	0.08	0.00	0.56	0.43
2016	0.43	0.43	0.03	0.08	0.00	0.56	0.56
2017	0.43	0.43	0.03	0.08	0.00	0.56	0.56
2018	0.43	0.43	0.03	0.08	0.00	0.52	0.55
2019	0.43	0.43	0.03	0.08	0.00	0.49	0.50
2020	0.42	0.42	0.03	0.08	0.00	0.49	0.49
2021	0.42	0.42	0.03	0.08	0.00	0.50	0.50
2022	0.42	0.42	0.03	0.08	0.00	0.51	0.51
2023	0.42	0.42	0.03	0.08	0.00	0.51	0.51
2024	0.42	0.42	0.03	0.08	0.00	0.51	0.51
2025	0.42	0.42	0.03	0.08	0.00	0.51	0.51
2026	0.42	0.42	0.03	0.08	0.00	0.51	0.51

Table 39. Recommended OFLs and ABCs for GOA flathead sole for 2014-15.

Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2014	2015
M (natural mortality rate)	0.2	0.2	0.2	0.2
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	288,538	285,128	252,361	253,418
Female spawning biomass (t)				
Projected				
Upper 95% confidence interval	--		84,076	83,287
Point estimate	106,377	107,178	84,058	83,204
Lower 95% confidence interval	--		84,045	83,141
$B_{100\%}$	103,868	103,868	88,829	88,829
$B_{40\%}$	41,547	41,547	35,532	35,532
$B_{35\%}$	36,354	36,354	31,090	31,090
F_{OFL}	0.593	0.593	0.61	0.61
$maxF_{ABC}$	0.45	0.45	0.47	0.47
F_{ABC}	0.45	0.45	0.47	0.47
OFL (t)	61,036	62,296	50,664	50,376
maxABC (t)	48,738	49,771	41,231	41,007
ABC (t)	48,738	49,771	41,231	41,007
Status	As determined in 2012 for: 2011	2012	As determined in 2013 for: 2012	2013
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAflathead.pdf

7. Management actions and measures for the conservation of stock and the aquatic environment shall be based on the Precautionary Approach. Where information is deficient a suitable method using risk assessment shall be adopted to take into account uncertainty.

FAO CCRF 7.5.1/7.5.4/7.5.5
FAO ECO 29.6/32

Evidence adequacy rating:

☑**High** ☐ **Medium** ☐ **Low**

Rating determination
The process for management of the Alaska flatfish complex includes the specification of objectives, development of limit and target reference points, agreement on management actions and assessment of management performance with respect to the accepted reference points. The management steps for this fishery ensure that target reference points are not exceeded and that the risk of exceeding limit reference points is low. In cases where the species/stock has been overfished target reference points are established which allow recovery in a reasonable time frame supported by projections for the foreseeable future. When new uncertainties arise, research recommendations are made and there is accountability in subsequent years to follow up on related action items. However, these uncertainties do not lead to a postponement for providing advice, in all cases precaution is the rule.

BSAI and GOA Flatfish complex

Fishery Management Plans (FMP) for flatfish complex species in the Bering Sea-Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) incorporate the precautionary approach for individual species and species groups including BSAI: yellowfin sole, Greenland turbot, arrowtooth flounder, Kamchatka flounder, northern rock sole, flathead sole, Alaska plaice and other flatfish (15 species included) and GOA: flathead sole, arrowtooth flounder, rex sole, deep water flatfish (Dover sole, Greenland turbot and deepsea sole) and shallow-water flatfish (8 species including northern and southern rock sole).

Measures used to satisfy the precautionary approach include the use of annual catch quotas, area closures, permits, limited entry, seasons, in-season adjustments, gear restrictions, bycatch limits and rates, record keeping, reporting requirements and observer monitoring and landings validation. Vessels fishing in the trawl fishery for flatfish are required to use special gear to reduce habitat impacts on the fishing grounds and to reduce the bycatch of bottom-dwelling invertebrates such as crab and soft corals. Nonpelagic trawl gear used for directed fishing for flatfish species in the BSAI subarea must be modified to reduce the potential impacts of nonpelagic trawl gear on bottom habitat. Regulations specify modifications necessary to reduce the potential impact of nonpelagic trawl gear on bottom habitat. For vessels fishing for flatfish using nonpelagic trawl gear elevating devices on the sweeps are also required in the Central GOA Regulatory Area.

Directed fisheries can deplete bycatch components which are less abundant than the primary species. Bycatch is a particularly important characteristic of several eastern Bering Sea target fisheries, including yellowfin sole, rock sole, flathead sole, and Alaska plaice. To protect minor components in these fisheries, catch caps have been established for bycatch species to ensure that they are not overfished. Gear improvements and the already mandated phasing-in of requirements for retaining flatfish bycatch under the improved retention/improved utilization management approach show promise for producing a fishery management system with increased protection for protected species such as halibut and a large reduction in the levels of flatfish discards in flatfish directed fisheries. In addition, a reserve of 20% of the TAC for BSAI and GOA flatfish is set aside and may be reapportioned at any time and in any amount by the Regional Administrator to ensure that quotas are not exceeded.

Climate change will have a significant effect on the BSAI and GOA ecosystems and fishery managers require information on the potential change in productivity that can occur for BSAI and GOA. Evidence from observations during the past two decades and the results of modeling studies using historical and recent data from the North Pacific Ocean suggest that physical oceanographic processes, particularly climatic regime shifts, might be driving ecosystem-level changes that have been observed in the BSAI and GOA. Commercial fishing has not been largely implicated in BSAI and GOA ecosystem changes, but studies of other ecosystems with much larger fishing pressures indicate that fishing, in combination with climate change, can alter ecosystem species composition and productivity. The BSAI and GOA flatfish complex assessments include a section on ‘ecosystem considerations’ which provides managers with information on the potential change in productivity for these areas.

Fishery Management Plan for the Groundfish of the BSAI 2014:
http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf
Fishery Management Plan for the Groundfish of the GOA 2014:
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmp.pdf

http://www.npfmc.org/
http://alaskafisheries.noaa.gov/
http://www.nmfs.noaa.gov/ole/
http://www.dps.alaska.gov/awt/Marine.aspx

The FAO Guidelines for the Precautionary Approach (PA) are satisfied

The precautionary approach is applied widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The MSA, as amended, sets out ten national standards for fishery conservation and management. The BSAI and GOA Groundfish FMPs are consistent with MSA requirements in applying the Precautionary Approach to fisheries. The FAO Guidelines for the Precautionary Approach (PA) (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review, prior identification of desirable (target) and undesirable (limit) outcomes, and measures in place to avoid and correct undesirable outcomes, the action to be taken when specified deviations from operational targets are observed and an effective management plan. Lastly, the FAO guidelines advocate that the absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species as well as non-target species and their environment. The overall management for the Flatfish in Alaska comprises all the elements as specified above in the FAO guidelines for the PA.

Absence of adequate scientific information is not used as a reason for postponing or failing to take conservation and management measures. The BSAI and GOA flatfish stocks are managed under a tier system rule based on stock knowledge. Status determination criteria for groundfish stocks are annually calculated using a six-tier system that accommodates varying levels of uncertainty of information. The six-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. The higher the tier (i.e. 4, 5 or 6), the more conservative the determination of OFL/ABC and ACL are. This is because more conservative determinations are at the higher tier levels where less stock information is available. This system is intrinsically precautionary in nature and the results involve catches always lower than the overfishing level (equivalent to MSY).

Stock assessment results indicate that the BSAI and GOA Flatfish stocks biomasses are generally well above $B_{40\%}$ and that the stocks are neither overfished nor undergoing overfishing. Greenland Turbot in the BSAI is the exception, currently being between target and limit reference point, but projected to increase in the upcoming years, starting in 2014.

Another limit reference point used in managing groundfish in the BSAI and GOA is the optimum yield (OY). The sum of the TACs of all groundfish species (except Pacific halibut) is required to fall within a given range. The upper range for BSAI is 2.0 million Mt while for the GOA is 800 thousand Mt, acting as an ecosystem cap. In practice, only the upper OY limit in the BSAI has been a factor in altering and limiting harvests.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf

http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmp.pdf

D. Management Measures

8. Management shall adopt and implement effective measures including; harvest control rules and technical measures applicable to sustainable utilization of the fishery and based upon verifiable evidence and advice from available scientific and objective, traditional sources.

FAO CCRF 7.1.1/7.1.2/7.1.6/7.4.1/7.6.1/7.6.9/12.3
FAO Eco 29.2/29.4/30

Evidence adequacy rating:

☑High **☐ Medium** **☐ Low**

Rating determination

The Alaska flatfish commercial fisheries are managed according to a modern management plan that attempts to balance long-term sustainability of the resources with optimum utilization. For every change/amendment or new development affecting fisheries management and therefore modifying the FMPs, there is an evaluation of alternative conservation and management measures, including considerations of their cost effectiveness and social impact.

Conservation and management measures are outlined in the BSAI and GOA FMPs for Groundfish. Along with yearly stock assessment surveys and reports (SAFEs), evaluation of the fisheries stock status, determination of OFL (consistent with MSY), ABC, ACL and TAC accounting for scientific uncertainty and variability and precision in catch control (see explanatory figure below), part of the assessment procedure is an extensive ecosystem assessment that shows development towards ecosystem-based management.

The management is intended to conform to the *National Standards for Fishery Conservation and Management* according to the MSA. Within this framework the groundfish fishery has 46 clear management objectives falling under the following objectives:

- *Prevent Overfishing;*
- *Promote Sustainable Fisheries and Communities;*
- *Preserve Food Web;*
- *Manage Incidental Catch and Reduce Bycatch and Waste:*
- *Avoid Impacts to Seabirds and Marine Mammals;*
- *Reduce and Avoid Impacts to Habitat;*
- *Promote Equitable and Efficient Use of Fishery Resources;*
- *Increase Alaska Native Consultation.*

Determining Harvest Levels

The management uses several reference points that are summarized and discussed in the FMPs.

- *Maximum sustainable yield (MSY)* is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions fishery technological characteristics (e.g., gear selectivity), and distribution of catch among fleets.
- *Optimum yield (OY)* is the amount of fish which a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; b) is prescribed as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.
- *Maximum fishing mortality threshold (MFMT, also called the "OFL control rule")* is the level of fishing mortality (F), on an annual basis, used to compute the smallest annual level of catch that would constitute overfishing. Overfishing occurs whenever a stock or stock complex is subjected to a level of fishing mortality or annual total catch that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. The MFMT may be expressed either as a single number (i.e., a fishing mortality rate or F value), or as a function of spawning biomass or other measure of reproductive potential.
- *Overfishing limit (OFL)* is the annual amount of catch that results from applying the MFMT to a stock or stock complex's abundance. The OFL is the catch level above which overfishing is occurring.
- *Minimum stock size threshold (MSST)* is the level of biomass below which the stock or stock complex is considered to be overfished. To the extent possible, the MSST should equal whichever of the following is greater: One-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years, if the stock or stock complex were exploited at the MFMT.
- *Acceptable biological catch (ABC)* is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC is set below the OFL.
- *Annual catch limit (ACL)* is the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures. ACL cannot exceed the ABC, and may be divided into sector- ACLs.
- *Total allowable catch (TAC)* is the annual catch target for a stock or stock complex, derived from the ABC by considering social and economic factors and management uncertainty (i.e., uncertainty in the ability of managers to constrain catch so the ACL is not exceeded, and uncertainty in quantifying the true catch amount). The TAC is also constrained by the BSAI and GOA Optimum Yield cap.

Management measures in the FMPs include (i) permit and participation, (ii) authorized gear, (iii) time and area, and catch restrictions, (iv) measures that allow flexible management authority, (v) designate monitoring and reporting requirements for the fisheries, and (vi) describe the schedule and procedures for review of the FMP or FMP component.

For every change/amendment or new development affecting fisheries management and therefore modifying the FMPs, there is an evaluation of alternative conservation and management measures, including considerations of their cost effectiveness and social impact. The Regulatory Flexibility Act (RFA) requires agencies (NPFMC, ADFG) to consider the impact of their rules (Fishery Management Plans, Fishing Regulations) on small entities (fishermen communities) and to evaluate alternatives that would accomplish the objectives of the rule without unduly burdening small entities when the rules impose a significant economic impact on a substantial number of small entities.

In August 2000, the NMFS issued guidelines for economic analysis of Fishery Management Actions. The purpose of the document was to provide guidance on understanding and meeting the procedural and analytical requirements of E.O. 12866 and the RFA for regulatory actions of federally managed fisheries. http://www.epa.gov/fedfac/documents/executive_order_12898.htm

Economic and social analysis is part of the NEPA (essentially an environmental impact assessment) requirements, of which the NPFMC and NMFS consistently adhere and comply with. A recent change affecting the flatfish fisheries in Alaska is the restructuring and implementation (Jan. 2013) of the groundfish observer program.

http://www.fakr.noaa.gov/sustainablefisheries/amds/default.htm
https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf

Management

Recent developments in management of flatfish fisheries in Alaska

Bering Sea flatfish harvest specifications flexibility

In March 2013, the Council published the public review draft of the regulatory impact review draft/initial regulatory flexibility analysis for the Bering Sea flatfish harvest specifications flexibility. This document analyzed a proposed action that would allocate the ABC surplus (i.e., the difference between acceptable biological catch and total allowable catch) for flathead sole, rock sole, and yellowfin sole, among the Amendment 80 cooperatives and CDQ groups, using the same formulas that are used in the annual harvest specifications process. These entities would be able to exchange their quota share of one of the three species (flathead sole, rock sole, and/or yellowfin sole) for an equivalent amount of their allocation of the ABC surplus for another (flathead sole, rock sole, and/or yellowfin sole). The approach is intended to increase the opportunity for maximizing the harvest of these species, while ensuring that the overall 2 million mt optimum yield, and ABCs for each individual species, are not exceeded. The analysis also includes options to restrict flexibility in the exchange of yellowfin sole, if the analysis shows that there is a potential negative impact of the approach on users of yellowfin sole in the Bering Sea Aleutian Islands trawl limited access sector. The proposed action would amend the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and Federal regulations related to the Bering Sea / Aleutian Islands (http://www.npfmc.org/wp-content/PDFdocuments/SPECS/BSFlatfishFlexPR413.pdf).

Gear modifications

In 2011, a trawl sweep modification requirement was implemented for vessels participating in the Bering Sea flatfish fishery. Elevating devices (e.g., discs or bobbins) are required to be used on the trawl sweeps, to raise the sweeps off the seabed and limit adverse impacts of trawling on the seafloor. Research has demonstrated that this gear modification reduces unobserved mortality of red king crab, Tanner crab, and snow crab. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basket stars and sea whips. Effective February 18th 2014, after appropriate trials in the region, this requirement was extended to all central GOA flatfish fisheries. First, this rule (Amendment 89 of the GOA Groundfish FMP) establishes a protection area in Marmot Bay, northeast of Kodiak Island, and closes that area to fishing with trawl gear except for directed fishing for pollock with pelagic trawl gear. The closure will reduce bycatch of Tanner crab (*Chionoecetes bairdi*) in Gulf of Alaska (GOA) groundfish fisheries. Second, this rule requires that nonpelagic trawl gear used in the directed flatfish fisheries in the Central Regulatory Area of the GOA be modified to raise portions of the gear off the sea floor. The modifications to nonpelagic trawl gear used in these fisheries will reduce the unobserved injury and mortality of Tanner crab, and will reduce the potential adverse impacts of nonpelagic trawl gear on bottom habitat. Finally, this rule makes a minor technical revision to the modified nonpelagic trawl gear construction regulations to facilitate gear construction for those vessels required to use modified nonpelagic trawl gear in the GOA and Bering Sea groundfish fisheries. This rule is intended to promote the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the GOA groundfish FMP, and other applicable law.

http://www.gpo.gov/fdsys/pkg/FR-2014-01-16/html/2014-00780.htm

GOA salmon bycatch management

Pacific salmon are taken as bycatch in the GOA groundfish fisheries, in which they are considered prohibited. Although five species of salmon are caught in the fisheries, the Council has been concerned about Chinook salmon, as the species with the highest bycatch in recent years. Chinook salmon bycatch primarily occurs in trawl fisheries, in the central and western regulatory areas. Between 2003 and 2010, the pollock target fishery accounted for an average of three-quarters of intercepted Chinook salmon, while other, primarily nonpelagic, trawl fisheries for flatfish, rockfish, and Pacific cod accounted for the remainder. In 2011, the Council approved Chinook salmon prohibited species catch (PSC) limits for the GOA pollock fisheries in the central and western regulatory areas. Once these annual limits are reached, the respective fisheries are closed. The Council is also considering other, comprehensive management measures to address Chinook salmon bycatch in the GOA trawl fisheries.

GOA Trawl Bycatch Management

Pacific halibut and Chinook salmon are taken as prohibited species catch (PSC) in the GOA groundfish trawl fisheries. In June 2012, the Council initiated the process of developing a program to provide the groundfish trawl fleet with tools for effective management of PSC, including incentives for minimization of bycatch, and vessel level accountability.

C-7 Gulf of Alaska Trawl Bycatch Management
Final Council motion 10/12/14

In 2014, with C-7 Gulf of Alaska Trawl Bycatch Management Final motion dated October 12th the Council initiated analysis of the following alternatives and options for Gulf of Alaska trawl bycatch management, with the existing objectives and purpose and need statement.

ALTERNATIVE 1. No action. Existing management of the Central and Western Gulf of Alaska trawl fisheries under the License Limitation Program.

ALTERNATIVE 2. Gulf of Alaska Trawl Bycatch Management Program for the Western Gulf, Central Gulf and West Yakutat areas. The following elements apply to the program:

- Observer Coverage and Monitoring (i.e. 100% of trawl vessels monitoring);
- Sector eligibility (i.e. inshore and offshore);
- Allocated species (target, secondary, PSC species, halibut and chinook salmon);
- Sector allocations of target and secondary species;
- Sector allocations of PSC;
- Voluntary inshore cooperative structure;
- Voluntary catcher processor cooperative structure;
- Fishery dependent community stability (applies to inshore cooperatives);
- Transferability;
- Gear conversion;
- Limited access trawl fisheries (CV and CP);
- Sideboards;
- Program Review;
- Cost recovery and loan program.

http://www.npfmc.org/salmon-bycatch-overview/gulf-of-alaska-salmon-bycatch/

GOA Halibut Bycatch management

In June 2012, the Council took action to reduce GOA halibut PSC limits, which were implemented in

2014. Amendment 95 modified the FMP to: establish halibut prohibited species catch (PSC) limits for the Gulf of Alaska (GOA) in Federal regulation; reduce the GOA halibut PSC limits for trawl and hook and line gear; reduce trawl halibut PSC sideboard limits for American Fisheries Act, Amendment 80, and Central GOA Rockfish Program vessels; and provide two additional management measures associated with halibut PSC accounting for Amendment 80 vessels subject to halibut PSC sideboards and for halibut PSC made by trawl vessels from May 15 through June 30, which would maintain groundfish harvest while achieving the halibut PSC limit reductions intended by this action.

Amendment 95 established reduced PSC levels for trawl and hook-and-line gear as follows:

- 7 percent reduction for hook-and-line catcher/processors;
- 15 percent reduction phased-in over 3 years for hook-and-line catcher vessels (7 percent in 2014, an additional 5 percent in 2015, and the final 3 percent in 2016);
- 1 mt reduction for the hook- and-line demersal shelf rockfish southeast outside district; and
- 15 percent reduction phased-in over 3 years for trawl (7 percent in 2014, an additional 5 percent in 2015, and the final 3 percent in 2016).

Seasonal and gear apportionments of halibut PSC limits would continue to be set through the annual GOA groundfish harvest specifications process. Both the commercial and charter halibut (directed fishing) sectors are expected to benefit under Amendment 95.
http://www.npfmc.org/goa-halibut-bycatch/

Restructured North Pacific Groundfish Observer Program
In January 2013, a restructured observer program was implemented. All sectors of the groundfish fishery, including previously uncovered sectors such as vessels less than 60 feet length overall (LOA) and the commercial halibut sector, are included in the new Observer Program. The program originally placed all vessels and processors in the groundfish and halibut fisheries off Alaska into one of two observer coverage categories:

(1) a full coverage category, where vessels must have at least one observer onboard 100% of the time, and (2) a partial coverage category. In the partial coverage category, the new program allows NMFS to determine when and where to deploy observers according to management and conservation needs, and based on a scientifically defensible deployment plan. Funds are provided through an industry fee equal to 1.25% of the retained value of groundfish and halibut in fisheries subject to partial coverage.

Annual Deployment Plan for 2015
On September 2014, the Council approved the Annual Deployment Plan for 2015 with the following recommendations:

- Use trip selection strata to assign vessels in 2015.
- Using two selection strata for 2015: small vessel trip selection and large vessel trip selection.
- Use 12% selection probability for the small vessel trip selection stratum and 24% selection probability for the large vessel stratum.

- Allow conditional releases in 2015 for vessels in the small vessel trip selection stratum that: 1) do not have sufficient life raft capacity to accommodate an observer, and/or 2) to assist in addressing bunk space limited vessels, have been selected for two consecutive trips (e.g., the third consecutive trip is released).
- Vessels selected by NMFS to participate in EM Cooperative Research will be in the no selection pool while participating in such research.
- Trawl vessels that fish for Pacific cod in the BSAI will be given the opportunity to opt-in to full observer coverage and carry an observer at all times while fishing in the BSAI using the same approach as 2014.
- The Annual Report will include information to evaluate a sunset provision, including information on the potential for bias that could be introduced through life raft conditional release, the costs to an individual operator of upgrading to a larger life raft, and the enforcement disincentives from downgrading one's life raft.

http://www.npfmc.org/observer-program/ (see C1 Observer ADP Council Motion – FINAL 10/9/14)

9. There shall be defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels.

FAO CCRF 7.1.8/7.6.3/7.6.6/8.4.5/8.4.6/8.5.1/8.5.3/8.5.4/8.11.1/12.10
FAO Eco 29.2bis

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating determination
There are well defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels. Measures are also introduced to identify and protect depleted resources and those resources threatened with depletion, and to facilitate the sustained recovery of such stocks (MSA). Also, efforts are made to ensure that resources and habitats critical to the wellbeing of such resources (EFH) which have been adversely affected by fishing or other human activities are restored.

The NPFMC harvest control system is complex and multi-faceted in order to address issues related to sustainability, legislative mandates, and quality of information. The rigorous process which has been in place for over 30 years ensures that annual quotas are set at conservative, sustainable levels for all managed groundfish stocks. The management system for the NPFMC groundfish fisheries is a complex suite of measures comprised of harvest controls, effort controls (limited access, licenses, cooperatives), time and/or area closures (i.e. gear closures, habitat protection measures, marine reserves), bycatch controls (Maximum Retainable Bycatch (MRB) amounts, PSC limits, retention and utilization requirements), monitoring and enforcement (observer program), social and economic protections, and rules responding to other constraints (e.g., regulations to protect Steller sea lions and to avoid seabird bycatch).

The Maximum Sustainable Yield (MSY) as defined by the groundfish fishery management plans is “the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions, fishery technological characteristics (e.g., gear selectivity), and distribution of catch among fleets.” Each groundfish fishery has a defined OY range which is based primarily on historical MSY estimates, and which limits the total annual removals across all stocks. Additionally, an MSY or MSY-proxy is calculated annually for each individual stock within the groundfish complex, depending on the tier (and therefore information available) of the stock.

Overall, the status of the flatfish complex stocks in the BSAI and GOA continues to appear favorable. Nearly all stocks are above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$. The abundances of all flatfishes managed under Tiers 1 or 3 are projected to be above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ in 2014. The abundance of Greenland turbot is projected to be below $B_{35\%}$ for 2014, by about 13 percent. The sum of the biomasses for 2014 is nearly the same as reported for 2013. The biomass of Greenland turbot has been increasing due to recent increased recruitment, but is still low.

None of the BSAI or GOA flatfish stocks part of the unit of certification are currently estimated to be overfished or undergoing overfishing. Careful stock surveys and accompanying stock analysis carried out annually by staff from the NMFS ensure these flatfish stocks remain at sustainable levels. See evidence from Section B – Science and Stock Assessment Activities, Fundamental Clauses 5 and 6.

The EFH regulations state that the NPFMC and NMFS should conduct a complete review of EFH provisions of FMPs at least once every 5 years and revise or amend the EFH provisions as warranted based on available information. An Omnibus FMP Amendment implemented the changes recommended via the 5-year review that was completed in 2010. The next one is due in 2015.

The last 5-year review found that fishing effects on the habitat of flatfish in the BSAI and GOA does not appear to have impaired either the stocks 'ability to sustain itself at or near the MSY level'.

Evidence

http://www.fakr.noaa.gov/habitat/efh/review.htm
http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmp.pdf

10. Fishing operations shall be carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations.

FAO CCRF 8.1.7/8.1.10/8.2.4/8.4.5

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating determination

Alaska enhances through education and training programs the education and skills of fishers and, where appropriate, their professional qualifications. Records of fishermen are maintained up to date by the fishery management organizations.

The North Pacific Fishing Vessel Owners association (NPFVO) provides a large and diverse training program that many of the professional fishermen crew members must pass. Training ranges from firefighting on a vessel, damage control, man- overboard, MARPOL, etc., and The Sitka-based Alaska Marine Safety Education Association alone has trained more than 10,000 fishermen in marine safety and survival through a Coast Guard-required class on emergency drills http://www.npfvoa.org/

The State of Alaska, Department of Labor & Workforce Development (ADLWD) includes AVTEC (formerly called Alaska Vocational Training & Education Center, now called Alaska's Institute of Technology). One of AVTEC's main divisions is the Alaska Maritime Training Center. The goal of the Alaska Maritime Training Center is to promote safe marine operations by effectively preparing captains and crew members for employment in the Alaskan maritime industry.

The Alaska Maritime Training Center is a United States Coast Guard (USCG) approved training facility located in Seward, Alaska, and offers USCG/STCW-compliant maritime training (STCW is the international Standards of Training, Certification, & Watchkeeping). In addition to the standard courses offered, customized training is available to meet the specific needs of maritime companies. Courses are delivered through the use of world class ship simulator, state of the art computer based navigational laboratory, and modern classrooms equipped with the latest instructional delivery technologies. Supplemental to their on-campus classroom training, the Alaska Maritime Training Center has a partnership with the Maritime Learning System to provide mariners with online training for entry-level USCG Licenses, endorsements, and renewals.
http://www.avtec.edu/amtc-cost.aspx

The University of Alaska Sea Grant Marine Advisory Program (MAP) provides education and training in several sectors, including fisheries management, in the forms of seminars and workshops.
http://seagrant.uaf.edu/map/fisheries/

In addition, MAP conducts sessions of their Alaska Young Fishermen's Summit (AYFS). Each Summit is an intense, 3-day course in all aspects of Alaska fisheries, from fisheries management & regulation,

to seafood markets & marketing. The target audience for these Summits is young Alaskans from coastal communities. The summit provides three days of training in the land-based aspects of running a fishing operation: marketing, business management, the fisheries regulatory process, and the science impacting fisheries management, and an opportunity for fishermen to meet with fisheries managers and researchers.
https://seagrant.uaf.edu/map/workshops/2013/ayfs/

Finally, the Alaska Marine Safety Education Association (AMSEA) provides courses on small boating safety, drill conductor training, stability and damage control, ergonomics, dredger safety and survival at sea training. http://www.amsea.org/

In addition to the practical training necessary to enter the fishing industry, the NPFMC meetings are public and the process involves extensive industry representation for input in the management process and the drafting of new regulation in a changing conservation environment. Through selected industry representation at these meetings, individual fishermen are kept up to date and remain aware of new requirements for fisheries as they arise throughout the year.

E. Implementation, Monitoring and Control

11. An effective legal and administrative framework shall be established and compliance ensured through effective mechanisms for monitoring, surveillance, control and enforcement for all fishing activities within the jurisdiction.

FAO CCRF 7.1.7/7.7.3/7.6.2/8.1.1/8.1.4/8.2.1
FAO Eco 29.5

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating determination

The Alaska flatfish fishery fleet uses enforcement measures including vessel monitoring systems (VMS) on board vessels, USCG boardings and inspection activities. The U.S. Coast Guard (USCG) and NMFS Office of Law Enforcement (OLE) enforce fisheries laws and regulations. OLE Special Agents and Enforcement Officers conduct complex criminal and civil investigations, board vessels fishing at sea, inspect fish processing plants, review sales of wildlife products on the internet and conduct patrols on land, in the air and at sea. NOAA Agents and Officers can assess civil penalties directly to the violator in the form of Summary Settlements (SS) or can refer the case to NOAA's Office of General Counsel for Enforcement and Litigation (GCEL).

Vessel Monitoring Systems (VMS)

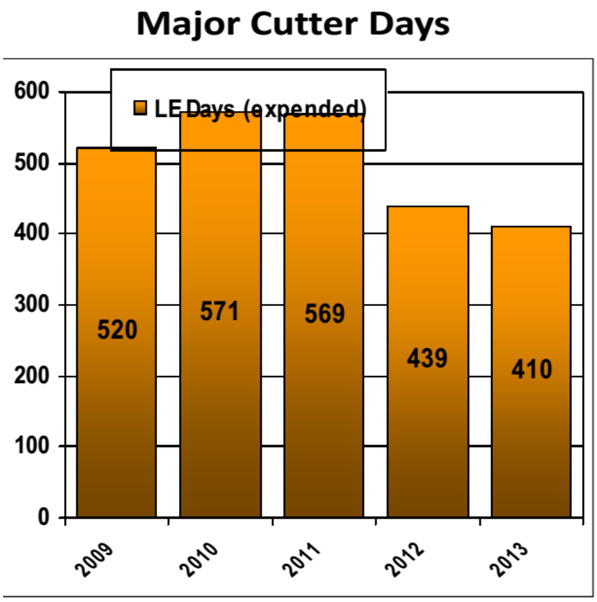
VMS in Alaska is a relatively simple system involving a tamperproof VMS unit, set to report a vessel identification and location to the NOAA Fisheries Office of Law Enforcement (OLE) at fixed 30-minute intervals. In October 2012, the Enforcement Committee noted that having VMS data substantially improves efficiency in both investigating and litigating enforcement violation cases.

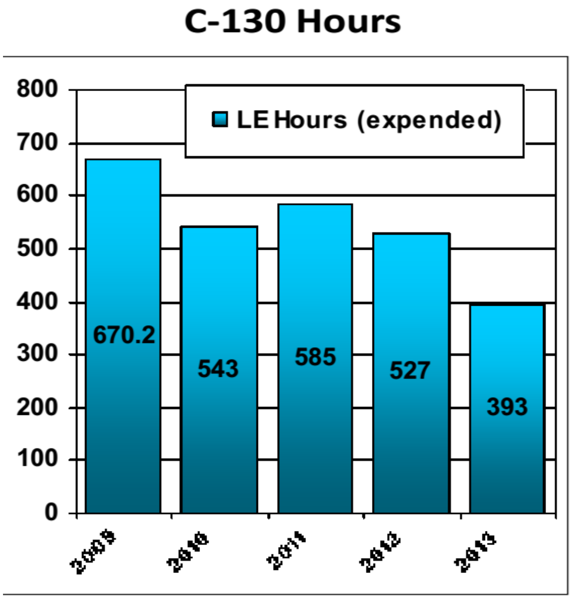
In December of 2012 an expanded discussion paper was presented to the Council, and the NPFMC stated that while there is uncertainty regarding whether a major change to (or expansion of) VMS requirements is necessary in the North Pacific, there is interest in reviewing the current state of the North Pacific VMS requirements.
http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/VMSdiscusPaper1112.pdf

USCG and OLE

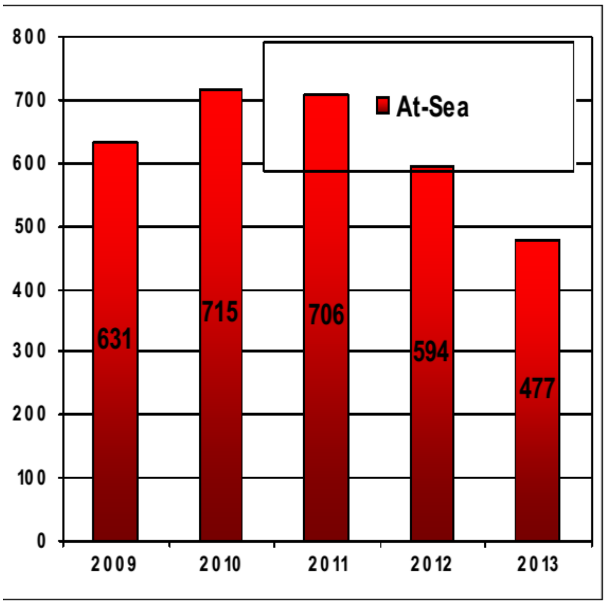
The U.S. Coast Guard (USCG) is the lead federal maritime law enforcement agency for enforcing national and international law on the high-seas, outer continental shelf and inward from the U.S. Exclusive Economic Zone (EEZ) to inland waters. The USCG also patrols US waters to reduce foreign poaching, and inspects fishing vessels for compliance with safety requirements. The four figures below are taken from the USCG Year in review report to the Council. They represent major cutter Aircraft (C130) usage as well as the boardings and violations effected in the groundfish and crab fisheries of the BSAI and GOA during 2013.

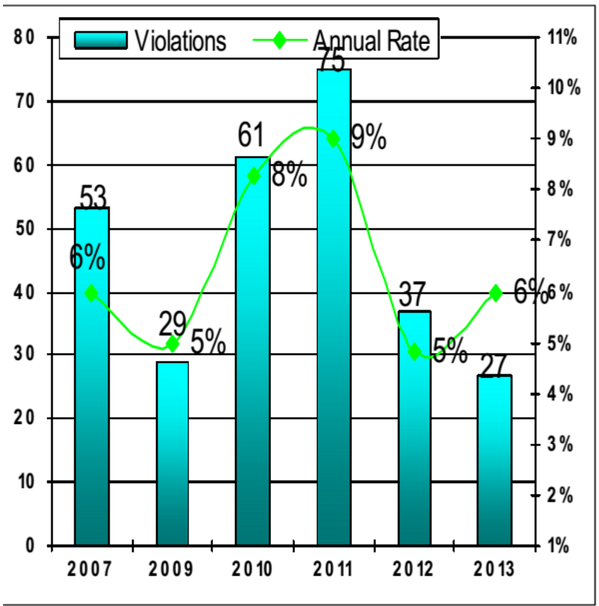
USCG Aircraft and Cutter Usage





USCG boardings and violations detected





Overall Violations

9 – Fishing in a prohibited area
5 – Logbook violations
4 – Missing or no fisheries permit
3 – Failure to respond to LE Assets
3 – Boarding Ladder
1 – Failure to use Seabird Avoidance Gear

1 – Illegal subsistence halibut gear
1 – Illegal halibut processing
http://www.npfmc.org/summary-reports/ (USCG year in review report)

NMFS OLE
NOAA Office of Law Enforcement (OLE) Special Agents and Enforcement Officers perform a variety of tasks associated with the protection and conservation of Alaska's living marine resources. In order to enforce these laws, OLE special agents and enforcement officers conduct investigations and use OLE patrol vessels to board vessels fishing at sea, and conduct additional patrols on land, in the air and at sea in conjunction with other local, state and Federal (e.g. USCG) agencies.

In any given year, OLE Agents and Officers spend an average 10,000-11,000 hours conducting patrols and investigations, and an additional 10,000-11,000 hours on outreach activities. The OLE maintains 19 patrol boats around the country to conduct a variety of patrols including Protected Resources Enforcement Team (PRET) boardings, protection of National Marine Sanctuaries and various undercover operations.

OLE Special Agents and Enforcement Officers conduct complex criminal and civil investigations, board vessels fishing at sea, inspect fish processing plants, review sales of wildlife products on the internet and conduct patrols on land, in the air and at sea. NOAA Agents and Officers can assess civil penalties directly to the violator in the form of Summary Settlements (SS) or can refer the case to NOAA's Office of General Counsel for Enforcement and Litigation (GCEL).

GCEL can then assess a civil penalty in the form of a Notice of Permit Sanctions (NOPs) or Notice of Violation and Assessment (NOVAs), or they can refer the case to the U.S. Attorney's Office for criminal proceedings. For perpetual violators or those whose actions have severe impacts upon the resource criminal charges may range from severe monetary fines, boat seizures and/or imprisonment may be levied by the United States Attorney's Office.
http://www.nmfs.noaa.gov/ole/index.html

Alaska Division: NMFS OLE 2013 Enforcement Priorities, Magnuson-Stevens Act

Magnuson-Stevens Act

High Priority
- Observer assault, harassment, or interference violations;
- Felony and major civil cases involving significant damage to the resource or the integrity of management schemes;
- Commercialization of sport-caught or subsistence halibut;
- Maritime Boundary Line incursions by foreign fishing or transport vessels;
- Outreach and education.

Medium Priority
- Misdemeanor and civil cases involving observer coverage violations;

- Closed Area/VMS Violations, ongoing;
- Commercial vessel incursions into closure areas or other Marine Protected Areas;
- Recordkeeping and reporting violations that impact data consistency or integrity;
- Violations involving lesser damage to the resource or the integrity of management schemes

Low Priority
- Catch reporting and trip limits;
- Noncompliance with trip and cumulative limits and record keeping requirements for landings of federally managed marine species, and specifically catch share programs.
- Gear violations;
- Deployment of unlawful gear utilized in commercial fisheries under NOAA's jurisdiction.
- Lesser permit violations

Endangered Species Act and Marine Mammal Protection Act

High Priority
- Violations wherein responsible subject and species are identifiable;
- Lethal takes, Level A harassment with the potential to injure marine mammal stock;
- Species of interest are Cook Inlet beluga, other whale species, northern fur seal, or Steller sea lion;
- Any violation involving injury or potential injury to people, such as a vessel-whale collision;
- Outreach and Education

Medium Priority
- Non-lethal takes, Level B harassment with the potential to disturb a marine mammal stock in the wild by causing a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering;
- Species is threatened rather than endangered

Low Priority
- Violations wherein responsible subject is not identifiable;
- Injured or dead animal cannot be located;
- Objective evidence is not obtainable;
- Takes of individual marine mammal species that appear consistent with legal harvest by Alaska Natives.

http://www.nmfs.noaa.gov/ole/docs/2013/ole-division-priorities-2013-final.pdf

At each of the five annual NPFMC meetings, representatives of the USCG, OLE, NMFS, ADFG and AWT meet in an Enforcement Meeting where enforcement concerns with plan amendments are discussed and materials relating to those concerns are prepared for the Council. During staff reports to the NPFMC the USCG and the OLE present information about vessel boardings and enforcement violations by the fishing industry that occurred since the last NPFMC meeting.

2013 Notable (federal) Violations and Settlements

During the time period July 1, 2013, through December 31, 2013 NOAA charged 8 civil administrative cases in Alaska (http://www.gc.noaa.gov/documents/2013/enforce_Feb_020122014.pdf).

NOAA issued a briefing to the NPFMC for the June 2013 Council meeting outlining a proposal to revise the regulations concerning the use and approval of scales for weighing catch at-sea. The use of at-sea scales can provide very precise and potentially accurate estimates of catch. These estimates are especially useful in catch share fisheries where catch accounting methods must be verifiable. At-sea scales have proven to be reliable and are now used to account for the vast majority of catch by catcher-processors fishing off Alaska. However, recent concerns about fraud and tampering with the flow scale call into question the overall accuracy of the approach and indicates that catch estimates based on scale weights could systematically underestimate harvest in those fisheries dependent on scale weights for catch accounting unless these concerns are addressed. Further, since NMFS first implemented weighing requirements for some catcher processors in 1998, the program has grown dramatically; scale technologies have evolved; and NMFS has developed greater expertise with at-sea scales. NOAA affirmed that a suite of modifications to the at-sea scales program would likely reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with recent changes in technology.

http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/MISC/FlowScale513.pdf

12. There shall be a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations.

FAO CCRF 7.7.2/8.2.7

Evidence adequacy rating:

☑ High ☐ Medium ☐ Low

Rating determination

The Magnuson-Stevens Act (50CFR600.740 Enforcement policy) provides four basic enforcement remedies for violations: ***1)*** *Issuance of a citation (a type of warning), usually at the scene of the offense,* ***2)*** *Assessment by the Administrator of a civil money penalty,* ***3)*** *for certain violations, judicial forfeiture action against the vessel and its catch,* ***4)*** *Criminal prosecution of the owner or operator for some offenses. In some cases, the Magnuson-Stevens Act requires permit sanctions following the assessment of a civil penalty or the imposition of a criminal fine. The 2011 Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions issued by NOAA Office of the General Counsel – Enforcement and Litigation, provides guidance for the assessment of civil administrative penalties and permit sanctions under the statutes and regulations enforced by NOAA. The Alaska Wildlife troopers enforce state water regulations with a number of statutes that enable the government to fine, imprison, and confiscate equipment for violations and restrict an individual's right to fish if convicted of a violation*.

The Magnuson-Stevens Act provides four basic enforcement remedies for violations (50CFR600.740 Enforcement policy).

(1) Issuance of a citation (a type of warning), usually at the scene of the offense (15 CFR part 904, subpart E).

(2) Assessment by the Administrator of a civil money penalty.

(3) For certain violations, judicial forfeiture action against the vessel and its catch.

(4) Criminal prosecution of the owner or operator for some offenses.

In some cases, the Magnuson-Stevens Act requires permit sanctions following the assessment of a civil penalty or the imposition of a criminal fine. In sum, the Magnuson-Stevens Act treats sanctions against the fishing vessel permit to be the carrying out of a purpose separate from that accomplished by civil and criminal penalties against the vessel or its owner or operator.

Magnuson Stevens Act Penalty Matrix

	Level of Intent			
Harm to the Resource or Regulatory Program, Offense Level	A Unintentional	B Negligent	C Reckless	D Willful
I	Written warning-$1,000	Written warning-$1,500	Written warning-$2,000	Written warning-$2,500
II	Written warning-$2,000	$2,000-$5,000	$5,000-$10,000	$10,000-$15,000
III	$2,000-$5,000	$5,000-$10,000	$10,000-$15,000	$15,000-$25,000
IV	$5,000-$15,000	$15,000-$25,000	$25,000-$50,000 and permit sanction of 10-20 days*	$50,000-$80,000 and permit sanction of 20-60 days*
V	$15,000-$25,000	$25,000-$50,000 and permit sanction of 10-20 days*	$50,000- $80,000 and permit sanction of 20-60 days*	$60,000- $100,000 and permit sanction of 60-180 days*
VI	$25,000-$50,000	$50,000-$80,000 and permit sanction of 20-60 days*	$60,000-$100,000 and permit sanction of 60-180 days*	$100,000-statutory maximum and permit sanction of 1 year-permit revocation*

http://www.nmfs.noaa.gov/sfa/reg_svcs/Councils/ccc_2011/Tab%20L%20-%20Enforcement%20Issues/Enforcement%20Issues.pdf

On March 16, 2011, NOAA issued a new Penalty Policy that provided guidance for the assessment of civil administrative penalties and permit sanctions under the statutes and regulations enforced by NOAA. In that Policy, the NOAA General Counsel's Office committed to periodic review of the Penalty Policy to consider revisions or modifications as appropriate. The July 2014 revised version of the Penalty Policy is a result of that review. The purpose of the 2014 Policy is to ensure that: (1) civil administrative penalties and permit sanctions are assessed in accordance with the laws that NOAA enforces in a fair and consistent manner; (2) penalties and permit sanctions are appropriate for the gravity of the violation; (3) penalties and permit sanctions are sufficient to deter both individual violators and the regulated community as a whole from committing violations; (4) economic incentives for noncompliance are eliminated; and (5) compliance is expeditiously achieved and maintained to protect natural resources.

Under the new revised Policy, NOAA expects to continue to promote consistency at a national level, provide greater predictability for the regulated community and the public, maintain transparency in enforcement, and more effectively protect natural resources. The effective date of this Policy was July 1, 2014. This Policy supersedes all previous guidance regarding the assessment of penalties or permit sanctions, and all previous penalty and permit sanction schedules issued by the NOAA Office of the General Counsel. Currently pending cases charged under the March 16, 2011 Penalty Policy, will continue to be governed by that Policy until those cases have been finally adjudicated.

While the overall approach to this revised Penalty Policy remains largely the same, notable changes to the previous Penalty Policy issued on March 16, 2011 include:

(1) Addition of more detail in some penalty schedules to better describe the most commonly occurring violations;
(2) Clearer distinctions among multiple-level violations to ensure consistent application of the Penalty Policy;
(3) Revision of the treatment of prior violations so that prior adjudicated violations older than 5 years are no longer considered an aggravating factor;
(4) Ensuring consistent application of the Penalty Policy to recreational offenses by replacing the commercial/recreational distinction as a penalty adjustment factor with the additional Level I and II penalties that capture recreational violations;
(5) Creating a new penalty adjustment for "such other matters as justice may require" by combining the "Activity After Violation" factor with new considerations.

The new 2014 revised Policy provides guidance for the NOAA Office of the General Counsel, but does not, nor is it intended to, create a right or benefit, substantive or procedural, enforceable at law or in equity, in any person or company. The basis for penalties calculated under this Policy, however, will be included in charging documents filed by the Agency. Further, although this Policy provides guidance regarding the assessment of proposed penalties and permit sanctions, NOAA retains discretion to assess the full range of penalties authorized by statute in any particular case.

For significant violations, the NOAA attorney may recommend charges under NOAA's civil administrative process (*see* 15 C.F.R. Part 904), through issuance of a Notice of Violation and Assessment of a penalty (NOVA), Notice of Permit Sanction (NOPS), Notice of Intent to Deny Permit (NIDP), or some combination thereof. Alternatively, the NOAA attorney may recommend that there is a violation of a criminal provision that is sufficiently significant to warrant referral to a U.S. Attorney's office for criminal prosecution.

http://www.gc.noaa.gov/documents/Penalty%20Policy_FINAL_07012014_combo.pdf

The Alaska Region Summary Settlement and fix-it schedule is available at this page http://www.gc.noaa.gov/enforce-office3.html under the Alaska region tab. At each of the five annual Council meetings, representatives of the USCG, OLE, NMFS, ADFG and AWT meet in an Enforcement Meeting where enforcement concerns with plan amendments are discussed and materials relating to those concerns are prepared for the Council. During staff reports to the Council the USCG and the OLE present information about vessel boardings and enforcement violations by the fishing industry that occurred since the last Council meeting.

50CFR600.740 Enforcement policy
http://dps.alaska.gov/awt/mission.aspx

F. Serious Impacts of the Fishery on the Ecosystem

13.	**Considerations of fishery interactions and effects on the ecosystem shall be based on best available science, local knowledge where it can be objectively verified and using a risk based management approach for determining most probable adverse impacts. Adverse impacts of the fishery on the ecosystem shall be appropriately assessed and effectively addressed.** ***FAO CCRF 7.2.3/8.4.7/8.4.8/12.11*** ***Eco 29.3/31***

Evidence adequacy rating:

☑**High** ☐ **Medium** ☐ **Low**

Rating determination

*The NPFMC, NOAA/NMFS, and other institutions interested in the North Pacific conduct assessments and research on environmental factors affecting flatfish, other groundfish and associated species and their habitats. Findings and conclusions are published in SAFE documents, annual Ecosystem Considerations documents, and other research reports. The SAFE documents summarize ecosystem considerations for the major flatfish stocks. They include sections for **1)** Ecosystem effects on the stock and **2)** Effects of the fishery on the ecosystem. Adverse impacts on the fishery on the ecosystem including bycatch and discards, ETP species interactions and gear habitat interactions have been appropriately assessed and effectively addressed. All the flatfish stocks in Alaska appear to be under very light exploitation rate minimizing potentially negative food-web interactions in the ecosystem.*

Ecosystem research

Tens of millions of dollars on research essential to NPFMC management has occurred over the past decade to understand the Bering Sea and Gulf of Alaska ecosystems and how these systems play a dynamic role in the status of groundfish species. Major research projects like the Bering Sea Integrated Ecosystem Research Program (BSIERP) and the GOA Integrated Ecosystem Research Program (GOAIERP) have provided and are providing, among many others, significant insight into these major North Pacific Integrated Ecosystem Research Plans and research findings that are presented annually at the North Pacific Science Symposium.

GOAIERP

The GOA Integrated Ecosystem Research Program is a $17.6 million Gulf of Alaska ecosystem study that examines the physical and biological mechanisms that determine the survival of juvenile groundfish in the eastern and western GOA. From 2010 to 2014, oceanographers, fisheries biologists and modelers looked at the gauntlet faced by commercially important groundfish, specifically walleye pollock, Pacific cod, Pacific ocean perch, sablefish and arrowtooth flounder, during their first year of life as they are transported from offshore areas where they are spawned to near shore nursery areas. The study includes two field years (2011 and 2013) followed by one synthesis year (http://www.nprb.org/gulf-of-alaska-project/detailed-results-findings/).

BEST - BSIERP

The scientific foundations of the BEST- BSIERP partnership were formed by a blending of two large programs: the "Bering Ecosystem Study" funded by the National Science Foundation; and the "Bering Sea Integrated Ecosystem Research Program", funded by the North Pacific Research Board. The NSF-BEST program focuses on understanding the impacts of changing sea-ice conditions on the chemical, physical, and biological characteristics of the ecosystem and human resource use activities. BSIERP focuses on understanding key processes regulating the production, distribution and abundance of marine organisms in the Bering Sea, especially marine mammals, seabirds, and fish, and how they may respond to natural and human-induced influences, particularly those related to climate change and its economic and sociological impacts (http://www.nprb.org/bering-sea-project/detailed-results-findings/).

SAFE report, ecosystem section

NPFMC and NOAA/NMFS conduct assessments and research on environmental factors as affected by the commercial flatfish fisheries and associated species and their habitats. Findings and conclusions are published in the Ecosystem section of the SAFE documents, annual Ecosystem Considerations documents, and the various other research reports. The SAFE reports include sections for 1) Ecosystem effects on the stock and 2) Effects of the fishery on the ecosystem.

The Resource Ecology and Ecosystem Management (REEM) group at the Alaska Fishery Science Center (AFSC) provides up-to-date ecosystem information and assessments in annual Ecosystem Considerations documents, found under the groundfish stock assessment reports page (http://www.afsc.noaa.gov/REFM/docs/2014/ecosystem.pdf).

NOAA also supports the Fisheries and the Environment (FATE) program to ensure the sustainable use of US fishery resources under a changing climate. The focus of FATE is on the development, evaluation, and distribution of leading ecological and performance indicators.
http://access.afsc.noaa.gov/reem/ecoweb/
http://fate.nmfs.noaa.gov/

BSAI Yellowfin Sole

Ecosystem Effects on the stock

1) *Prey availability/abundance trends*

Yellowfin sole diet by life stage varies as follows. Larvae consume plankton and algae, early juveniles consume zooplankton, late juvenile stage and adults prey includes bivalves, polychaetes, amphipods, mollusks, euphausids, shrimps, brittle stars, sculpins and miscellaneous crustaceans. Information is not available to assess the abundance trends of the benthic infauna of the Bering Sea shelf. The original description of infaunal distribution and abundance by Haflinger (1981) resulted from sampling conducted in 1975 and 1976 and has not been re-sampled since. The large populations of flatfish which have occupied the middle shelf of the Bering Sea over the past twenty-five years for summertime feeding do not appear food-limited. These populations have fluctuated due to the variability in recruitment success which suggests that the primary infaunal food source has been at an adequate level to sustain the yellowfin sole resource.

2) *Predator population trends*
As juveniles, it is well-documented from studies in other parts of the world that flatfish are prey for shrimp species in near shore areas. This has not been reported for Bering Sea yellowfin sole due to a lack of juvenile sampling and collections in near shore areas, but is thought to occur. As late juveniles they have been found in stomachs of Pacific cod and Pacific halibut; mostly on small yellowfin sole ranging from 7 to 25 cm standard length. Past, present and projected future population trends of these predator species can be found in their respective SAFE chapters and also from annual reports compiled by the International Pacific Halibut Commission. Encounters between yellowfin sole and their predators may be limited since their distributions do not completely overlap in space and time.

3) *Changes in habitat quality*
Changes in the physical environment which may affect yellowfin sole distribution patterns, recruitment success and migration timing patterns are catalogued in the Ecosystem Considerations Appendix of the SAFE report. Habitat quality may be enhanced during years of favorable cross-shelf advection (juvenile survival) and warmer bottom water temperatures with reduced ice cover (higher metabolism with more active feeding).

Fishery Effects on the ecosystem

1) The yellowfin sole target fishery contribution to the total bycatch of other target species is shown for 2001-2013 in Table 40. The catch of non-target species from 2003-2013 is shown in Table 41. The yellowfin sole target fishery contribution to the total bycatch of prohibited species is summarized for 2012 as follows:

Prohibited species	Yellowfin sole fishery % of total bycatch
Halibut mortality	25.4
Herring	<1
Red King crab	18.2
C. bairdi	57.2
Other Tanner crab	84.8
Salmon	<1

2) Relative to the predator needs in space and time, the yellowfin sole target fishery has a low selectivity for fish 7-25 cm and therefore has minimal overlap with removals from predation.
3) The target fishery is not perceived to have an effect on the amount of large size target fish in the population due to its history of light to moderate exploitation (6%) over the past 30 years.
4) Yellowfin sole fishery discards are presented in the safe and accounted within the overall catches.
5) It is unknown what effect the fishery has had on yellowfin sole maturity-at-age and fecundity.
6) Analysis of the benthic disturbance from the yellowfin sole fishery is available in the Preliminary draft of the Essential Fish Habitat Environmental Impact Statement.

Ecosystem effects on yellowfin sole			
Indicator	Observation	Interpretation	Evaluation
Prey availability or abundance trends			
Benthic infauna	Stomach contents	Stable, data limited	Unknown
Predator population trends			
Fish (Pacific cod, halibut, skates)	Stable	Possible increases to yellowfin sole mortality	
Changes in habitat quality			
Temperature regime	Cold years yellowfin sole catchability and herding may decrease, timing of migration may be prolonged	Likely to affect surveyed stock	No concern (dealt with in model)
Winter-spring environmental conditions	Affects pre-recruit survival	Probably a number of factors	Causes natural variability

***Yellowfin sole* effects on ecosystem**			
Indicator	Observation	Interpretation	Evaluation
Fishery contribution to bycatch			
Prohibited species	Stable, heavily monitored	Minor contribution to mortality	No concern
Forage (including herring, Atka mackerel, cod, and pollock)	Stable, heavily monitored	Bycatch levels small relative to forage biomass	No concern
HAPC biota	Low bycatch levels of (spp)	Bycatch levels small relative to HAPC biota	No concern
Marine mammals and birds	Very minor direct-take	Safe	No concern
Sensitive non-target species	Likely minor impact	Data limited, likely to be safe	No concern
Fishery concentration in space and time	Low exploitation rate	Little detrimental effect	No concern
Fishery effects on amount of large size target fish	Low exploitation rate	Natural fluctuation	No concern
Fishery contribution to discards and offal production	Stable trend	Improving, but data limited	Possible concern
Fishery effects on age-at-maturity and fecundity	Unknown	NA	Possible concern

Table 40. Catch and bycatch (t) of other BSAI target species in the yellowfin sole directed fishery from 2001-2013 estimated from a combination of regional office reported catch and observer sampling of the catch.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Pollock	16,502	14,489	11,396	10,382	10,312	6,084	4,041	9,867	7,024	3,749	8,685	11,226	20,246
Arrowtooth Flounder	1,845	998	1,125	279	645	352	216	1,969	1,858	868	2,338	995	2,012
Pacific Cod	6,531	6,259	4,621	3,606	3,767	2,588	2,529	5,769	10,849	8,649	16,300	19,230	24,382
Groundfish, General	3,936	2,678	3,133	1,612	2,134	2,333	4003			3,048			
Rock Sole	5,810	10,665	8,419	10,068	10,086	8,113	8,218	10,487	9,109	9,030	9,762	8,959	7,737
Flathead Sole	3,231	2,190	2,899	1,102	1,246	2,039	1,744	5,581	3,525	1,895	3,236	2,109	4,191
Sablefish	0				1			<1	<1		<1		
Atka Mackerel	0	0	17		110	17		<1	<1		<1	<1	<1
Pacific ocean Perch	1	1	11		15			<1	<1		<1		17
Rex Sole	2	0						2					
Other flatfish												1,201	388
Squid	0	0	1					<1			<1		
Dover Sole													
Thornyhead													
Shortraker/Rougheye	1												
Butter Sole		7											
Starry Flounder	82	133											
Northern Rockfish		1			3							<1	
Dusky Rockfish		0											
Yellowfin Sole	54,722	66,178	68,954	65,604	82,420	84,178	108,254	131,000	98,194	90,008	136,905	133,719	147,477
English Sole		1											
Unsp.demersal rockfish													
Greenland Turbot	32	2		1	7	8	1	<1	4		6	6	335
Alaska Plaice	1,905	10,396	365	5,891	8,707	14,043	16,389	13,519	10,748	10,749	18,340	13,613	16,006
Sculpin, General	12	1,226						2,891	1,438		1,808	1,924	1,922
Skate, General	21	1,042						1,301	1,481		1,969	2,270	2,686
Sharpchin Rockfish													
Bocaccio													
Rockfish, General	1		1	3	1	1		<1					<1
Octopus												1.3	
Smelt, general	0												
Chilipepper													
Eels	0	0											
Lingcod	2												
Jellyfish (unspecified)	173	161											
Snails	0	4											
Sea cucumber		0											
Korean horsehair crab	0												
Kamchatka flounder												110	147

Table 41. Estimated non-target species catch (t) in the yellowfin sole fishery, 2002-2013 (PSC not included).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Benthic urochordata	1670846	1695563	674762.4	520091.4	114427.4	347756.2	205806	155571.5	132867.4	143575.8	59971.79
Birds			0				0	0	0		
Bivalves	1542.82	1113.09	1327.44	343.22	447.7	1483.57	1300.1	1822.05	1670.78	692.05	345.3
Brittle star unidentified	34302.87	32271.17	28705.62	19961.38	7526.49	19047.93	5208.82	4081.56	14023.73	13126.42	1440.18
Capelin	2.67	4518.5	45.09	108	321.47	160.96	251.49	717.98	3768.89	2324.6	180.56
Corals Bryozoans	239.86	45.5	1231.63	9378.05	161.67	8309.49	312.1	504.22	950.09	676.5	960.83
Eelpouts	19044.18	12256.3	7729.27	4514.26	2344.44	5597.91	5188.39	5144.11	29320.08	14293.47	43287.9
Eulachon	12.03	277.55	33.15	115.04	5074.69	21.84	89.45	133.33	453.29	133.21	19.89
Giant Grenadier									235.58		
Greenlings	646.04	753.19	282.8	703.14	474.41	182.73	24.2	53.48	48.68	97.62	
Grenadier					339.3		357.8				
Gunnels					1.19						0.65
Hermit crab unidentified	87939.91	51999.48	82996.41	26898.09	35819.7	36606.14	15623.28	16760.07	15897.91	10096.95	2945.35
Invertebrate unidentified	556494.8	625561.3	418512.4	177181.3	40008.9	70400.76	30664.99	25883.21	65462.15	120895.9	21252.66
Misc crabs	14432.08	21523.78	11774.18	10570.58	27966.67	14094.76	11051.61	11681.31	20215.58	18002.27	12094.84
Misc crustaceans	13.8	185.99	225.41	2325.42	1401.8	719.29	1334.96	935.43	539.01	501.3	571.28
Misc fish	95744.69	91469.01	66164.3	42470.32	70970.52	66421.67	48912.64	29255.96	40107.75	86011.68	31511.52
Misc inverts (worms etc)	20.22	123.25	24.52	49.77	46.33	152.28	170.17	105.17	181.36	97.14	227.31
Other osmerids	4257.76	4291.77	496.86	633.64	35770.11	9832.96	848.75	2829.56	2053.14	4692.28	956.36
Pacific Sand lance	9.07	167	97.05	32.73	17.12	36.98	14.91	34.6	394.84	169.68	21.15
Pandalid shrimp	215.69	919.62	114.92	772.47	101.27	305.2	493.67	743.55	2272.93	605.64	1980.37
Polychaete unidentified	16.04	68.43	42.04	360.08	69.18	175.12	74.78	102.37	212.39	53.38	177.51
Scypho jellies	111900.4	299034	115550.4	46784.63	42345.58	146153	222943.9	152367.2	309001	176727.9	206559.8
Sea anemone unidentified	6086.94	6202.28	2580.69	4895.6	8790.75	24839.66	25572.46	20526.38	14667.5	5964.91	22625.99
Sea pens whips	9.28	28.05	164.2	3.01	12.05	323.91	184.8	634.57	19.59	66.6	38.71
Sea star	1939624	1865768	1606948	1308482	1456620	1831017	684867.4	791632.2	1662779	1728950	500173.1
Snails	118257	191064.2	69769.44	141516.9	95875.79	139765.1	58354.07	57060.24	74718.49	33707.79	23106.13
Sponge unidentified	11433.58	6807.34	12205.34	3118.2	405.2	6720.98	69506.33	16622.61	11311.53	12383.7	13330.54
Stichaeidae	72.11	31.78		9.92	784.32	238.7	9.55	171.16	383.74	135.62	147.32
Surf smelt						1.02					
urchins dollars cucumbers	2253.73	314.93	2548.64	845.45	3477.35	4897.16	7548.42	1278.18	987.46	753.88	667.21

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIyfin.pdf

BSAI Rock Sole

Ecosystem Effects on the stock

1) *Prey availability/abundance trends*
Rock sole diet by life stage varies as follows. Larvae consume plankton and algae, early juveniles consume zooplankton, late juvenile stage and adults prey includes bivalves, polychaetes, amphipods, mollusks and miscellaneous crustaceans. Information is not available to assess the abundance trends of the benthic infauna of the Bering Sea shelf. The original description of infaunal distribution and abundance by Haflinger (1981) resulted from sampling conducted in 1975 and 1976 and has not been resampled since. The large populations of flatfish which have occupied the middle shelf of the Bering Sea over the past thirty years for summertime feeding do not appear food-limited. These populations have fluctuated due to the variability in recruitment success which suggests that the primary infaunal food source has been at an adequate level to sustain the northern rock sole resource.

2) *Predator population trends*
As juveniles, it is well-documented from studies in other parts of the world that flatfish are prey for shrimp species in near shore areas. This has not been reported for Bering Sea northern rock sole due to a lack of juvenile sampling and collections in near shore areas, but is thought to occur. As late juveniles they are found in stomachs of pollock, Pacific cod, yellowfin sole, skates and Pacific halibut; mostly on small rock sole ranging from 5 to 15 cm standard length. Past, present and projected future population trends of these predator species can be found in their respective SAFE chapters. Encounters between rock sole and their predators may be limited as their distributions do not completely overlap in space and time.

3) *Changes in habitat quality*
Changes in the physical environment which may affect rock sole distribution patterns, recruitment success, migration timing and patterns are catalogued in the Ecosystem Considerations Appendix of the SAFE report. Habitat quality may be enhanced during years of favorable cross-shelf advection (juvenile survival) and warmer bottom water temperatures with reduced ice cover (higher metabolism with more active feeding).

Fishery Effects on the ecosystem
1) The rock sole target fishery contribution to the total bycatch of other target species is shown for 2004-2013 in Table 42 and the catch of non-target species from the rock sole fishery is shown in Table 43. The northern rock sole target fishery contribution to the total bycatch of prohibited species is summarized for 2012 as follows:

Prohibited species	Rock sole fishery % of total bycatch
Halibut mortality	12
Herring	<1
Red King crab	51
C. bairdi	14
Other Tanner crab	2
Salmon	< 1

2) Relative to the predator needs in space and time, the rock sole target fishery is not very selective for fish between 5-15 cm and therefore has minimal overlap with removals from predation.
3) The target fishery is not perceived to have an effect on the amount of large size target fish in the population due to the history of very light exploitation (3%) over the past 30 years.
4) Rock sole fishery discards are accounted for within overall catch levels.
5) It is unknown what effect the fishery has had on rock sole maturity-at-age and fecundity.
6) Analysis of the benthic disturbance from the rock sole fishery is available in the Essential Fish Habitat Environmental Impact Statement.

Ecosystem effects on rock sole			
Indicator	Observation	Interpretation	Evaluation
Prey availability or abundance trends			
Benthic infauna	Stomach contents	Stable, data limited	Unknown
Predator population trends			
Fish (Pollock, Pacific cod, halibut, yellowfin sole, skates)	Stable	Possible increases to rock sole mortality	
Changes in habitat quality			
Temperature regime	Cold years rock sole catchability and herding may decrease	Likely to affect surveyed stock	No concern (dealt with in model)
Winter-spring environmental conditions	Affects pre-recruit survival	Probably a number of factors	Causes natural variability

Rock sole effects on ecosystem			
Indicator	Observation	Interpretation	Evaluation
Fishery contribution to bycatch			
Prohibited species	Stable, heavily monitored	Minor contribution to mortality	No concern
Forage (including herring, Atka mackerel, cod, and pollock)	Stable, heavily monitored	Bycatch levels small relative to forage biomass	No concern
HAPC biota	Low bycatch levels of (spp)	Bycatch levels small relative to HAPC biota	No concern
Marine mammals and birds	Very minor direct-take	Safe	No concern
Sensitive non-target species	Likely minor impact	Data limited, likely to be safe	No concern
Fishery concentration in space and time	Low exploitation rate	Little detrimental effect	No concern
Fishery effects on amount of large size target fish	Low exploitation rate	Natural fluctuation	No concern
Fishery contribution to discards and offal production	Stable trend	Improving, but data limited	Possible concern
Fishery effects on age-at-maturity and fecundity	unknown	NA	Possible concern

Table 42. Catch and bycatch in the rock sole target fisheries, 2004-2013, from blend of regional office reported catch and observer sampling.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Walleye Pollock	8,937	7,240	6,922	3,212	4,995	6,124	6,016	7,091	6,779	7,372
Arrowtooth Flounder	346	599	516	220	464	600	1,841	448	101	683
Pacific Cod	5,648	5,192	4,901	3,238	3,927	3,608	6,659	7,332	9,777	8,599
Groundfish, General	801	910	1,605	1,807	3			6		
Rock Sole	24,287	16,667	20,129	21,217	35,180	29,703	37,311	39,682	58,178.00	42,433
Flathead Sole	881	850	1,691	1,061	1,945	1,770	3,446	2,028	769	2,019
Sablefish	9			3	1					
Atka Mackerel	16	48	87	210	4	<1	<1	<1	<1	<1
Pacific Ocean Perch				<1			<1	1	<1	45
Rex Sole					33					
Flounder, General	820	937	620	1,009	2	691	517	411	1144	313
Shortraker/Rougheye										
Butter Sole					560					
Starry Flounder					622					
Northern Rockfish				4	<1	<1	<1		<1	1
Yellowfin Sole	3,888	7,579	9,983	8,916	12,903	6,608	12,038	9,827	9557	8,477
Greenland Turbot	4	1	27	8		7	3	1	<1	3
Alaska Plaice	1,111	1,352	1,828	1,810	2,710	2,299	2,446	3,162	1653	4,339
Sculpin, General					1,104			905	969	1,288
Kamchatka flounder									17	109
Octopus									1	
Other rockfish									10	<1
Skate, General					559			711	653	529

Table 43. Non-Target species catch (t) in the northern rock sole fishery.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Benthic urochordata	118678	220868	318778	105544	12759	30837	9764	58513	5801	17201	8125
Birds		0	0	0	0		0	0		0	0
Bivalves	4700	339	206	365	397	299	288	477	383	175	192
Brittle star unidentified	32	865	1774	7290	1539	1103	262	1398	83	72	79
Capelin	1	388	24	4	6	22	43	103	316	57	4
Corals Bryozoans	690	693	16	1347	21	100	19	1984	105	348	168
Eelpouts	1000	4296	2156	3245	6906	136	150	4900	1861	85	2385
Eulachon		14			2	4	2	33	93	4	5
Giant Grenadier					4573			3331			
Greenlings	1150	334	429	335	268	45		18	35		
Grenadier	0	503									
Hermit crab unidentified	19169	7150	7588	10401	5765	2683	637	4087	2308	3606	1939
Invertebrate unidentified	105866	3129	84181	6938	24240	1582	2392	14526	6897	3423	36890
Misc crabs	18830	6424	9293	6508	13622	8922	3263	6369	2877	6348	3905
Misc crustaceans	380	152	45	500	199	180	257	1046	174	365	87
Misc fish	12857	16944	22422	17281	70990	25202	11690	14957	16736	17865	6267
Misc inverts (worms etc)	1	52		24	100	8	11	121	16	11	6
Other osmerids	3716	64	726	268	185	627	82	22	124	24	44
Pacific Sand lance	16	45	7	33	42	31	105	15	6	7	
Pandalid shrimp	201	86	30	20	53	22	59	60	58	53	34
Polychaete unidentified	2	7		1	103	21	19	15	4	12	8
Scypho jellies	257847	304925	393491	73281	94520	185158	233299	348530	264225	314919	135754
Sea anemone unidentified	18449	13291	6456	8995	6346	6735	2560	8770	9462	4749	13290
Sea pens whips		19	36	0		29	50	201	28	79	65
Sea star	1171098	333433	555351	731041	711347	206605	30565	174184	67505	89062	112089
Snails	23795	23967	12923	28386	24402	9313	2694	11207	9698	14138	6883
Sponge unidentified	198371	67555	69937	40985	19246	19270	64699	139966	115985	64410	152707
Stichaeidae	42	1	3		0	4	1	3	6		2
urchins dollars cucumbers	13420	8890	9280	3900	32200	6035	1105	4173	3449	1607	419

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIrocksole.pdf

BSAI Alaska Plaice

Ecosystem Effects on the stock

1) Prey availability/abundance trends
The feeding habits of juvenile Alaska plaice are relatively unknown, although the larvae are relatively large at hatching (5.85 mm) with more advanced development than other flatfish (Pertseva-Ostroumova 1961). For adult fish, Zhang (1987) found that the diet consisted primarily of polychaetes and amphipods regardless of size. For fish under 30 cm, polychaetes contributed 63% of the total diet with sipunculids (marine worms) and amphipods contributing 21.7% and 11.6%, respectively. For fish over 30 cm, polychaetes contributed 75.2% of the total diet with amphipods and echiurans (marine worms) contributing 6.7% and 5.7%, respectively. Similar results were in stomach sampling from 1993-1996, with polychaetes and marine worms composing the majority of the Alaska plaice diet (Lang et al. 2003). McConnaughy and Smith (2000) contrasted the food habits of several flatfish between areas of high and low CPUE, using aggregated data from 1982 to 1994. For Alaska plaice, the diets were nearly identical with 76.5% of the diet composed of polychaetes and unsegmented coelomate worms in the high CPUE areas as compared to 83.1% in the low CPUE areas.

2) Predator population trends
Alaska plaice contribute a relatively small portion of the diets of Pacific cod, Pacific halibut, and yellowfin sole as compared with other flatfish. Total consumption estimates of Alaska plaice from 1993 to 1996 ranged from 0 t in 1996 to 574 t in 1994 (Lang et al. 2003). Consumption by yellowfin sole is upon fish < 2 cm whereas consumption by Pacific halibut is upon fish > 19 cm (Lang et al. 2003).

3) Changes in habitat quality
The habitats occupied by Alaska plaice are influenced by temperature, which has shown considerable variation in the eastern Bering Sea in recent years. For example, the timing of spawning and advection to nursery areas are expected to be affected by environmental variation. Musienko (1970) reported that spawning occurs immediately after the ice melt, with peak spawning occurring at water temperatures from -1.53 to 4.11. In 1999, one of the coldest years in the eastern Bering Sea, the distribution was shifted further to the southeast than it was during 1998-2002. However, in 2003, one of the warmest years in the EBS, the distribution was shifted further to the southeast than observed in 1999.

Fishery effects on the ecosystem

Alaska plaice are not a targeted species and are harvested in a variety of fisheries in the BSAI area. Since 2002, when single-species management for Alaska plaice was initiated, harvest estimates by fishery are available. Most Alaska plaice are harvested by the yellowfin sole fishery, accounting for over 80% of the Alaska plaice catch since 2002. Flathead sole, rock sole, and Pacific cod fisheries make up the remainder of the catch. Due to the minimal consumption estimates of Alaska plaice

(Lang et al. 2003) by other groundfish predators, the yellowfin sole fishery does not have a significant impact upon those species preying upon Alaska plaice. Additionally, the relatively light fishing mortality rates experienced by Alaska plaice are not expected to have significant impacts on the size structure of the population or the maturity and fecundity at age. It is not known what effects the fishery may have on the maturity-at-age of Alaska plaice. The yellowfin sole fishery, however, does contribute substantially to the total discards in the EBS, as indicated by the discarding of Alaska plaice discussed in the species SAFE, and general discards within this fishery discussed in the yellowfin sole assessment. Discards are accounted within the overall catches and are well within TAC. Discard rates are shown below.

Table 44. Discarded and retained BSAI Alaska plaice catch (t) for 2002-2013, from NMFS Alaska regional office 'blend" (2002) and catch accounting system (2003 - 2014) data.

year	Discard	Retained	Total	Proportion discarded
2002	11,806	370	12,176	0.97
2003	9,428	350	9,778	0.96
2004	7,193	379	7,572	0.95
2005	10,293	786	11,079	0.93
2006	14,746	2,564	17,310	0.85
2007	15,481	3,946	19,427	0.8
2008	9,330	8,046	17,376	0.54
2009	5,061	8,882	13,945	0.36
2010	5,845	10,322	16,166	0.36
2011	7,197	16,459	23,656	0.30
2012	3,589	13,023	16,611	0.22
2013	9,053	14,470	23,523	0.38

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIplaice.pdf

BSAI Flathead Sole

Ecosystem effects on the stock

Prey availability/abundance trends

Results from an Ecopath-like model (Aydin et al., 2007) based on stomach content data collected in the early 1990's indicate that flathead sole occupy an intermediate trophic level in the eastern Bering Sea ecosystem. They feed upon a variety of species, including juvenile walleye pollock and other miscellaneous fish, brittlestars, polychaetes, and crustaceans. The proportion of the diet composed of fish appears to increase with flathead sole size (Lang et al., 2003). The population of walleye pollock has fluctuated but has remained relatively stable over the past twenty years. Information about the abundance trends of the benthic infauna of the Bering Sea shelf is sparse, although some benthic infauna are caught in the EBS groundfish trawl survey. The original description of infaunal distribution and abundance by Haflinger (1981) resulted from sampling conducted in 1975 and 1976 and has not been re-sampled since.

Over the past 20 years, many of the flatfish populations that occupy the middle shelf of the eastern Bering Sea have increased substantially in abundance, leading to concern regarding the action of potential density-dependent factors. Walters and Wilderbuer (2000) found density-dependent changes in mean length for age-3 northern rock sole during part of that stock's period of expansion, but similar trends in size have not been observed for flathead sole (Spencer et al., 2004). These populations have fluctuated primarily due to variability in recruitment success, in which climatic factors or pre-recruitment density dependence may play important roles (Wilderbuer et al., 2002). Evidence for post-recruitment density dependent effects on flathead sole is lacking, which suggests that food limitation has not occurred and thus the primary infaunal food source has been at an adequate level to sustain the flathead sole resource. McConnaughy and Smith (2000) compared the diet between areas with high survey CPUE to that in areas with low survey CPUE for a variety of flatfish species. For flathead sole, the diet in high CPUE areas consisted largely of echinoderms (59% by weight; mostly *ophiuroids*), whereas 60% of the diet in the low CPUE areas consisted of fish, mostly pollock. These areas also differed in sediment types, with the high CPUE areas consisting of relatively more mud than the low CPUE areas. McConnaughy and Smith (2000) hypothesized that the substrate-mediated food habits of flathead sole were influenced by energetic foraging costs.

Predator population trends

The dominant predators of adult flathead sole are Pacific cod and walleye pollock. Pacific cod, along with skates, also account for most of the predation upon flathead sole less than 5 cm (Lang et al. 2003). Arrowtooth flounder, Greenland turbot, walleye pollock, and Pacific halibut comprised other predators. Flathead sole contributed a relatively minor portion of the diet of skates from 1993-1996, on average less than 2% by weight, although flatfish in general comprised a more substantial portion of skates greater than 40 cm. A similar pattern was seen with Pacific cod, where flathead sole generally contribute less than 1% of the cod diet by weight, although flatfish in general comprised up to 5% of the diet of cod greater than 60 cm. The 2013 stock assessment for BSAI Pacific cod indicates that cod biomass has increased by approximately 750,000 t to 1,500,00 t since 2008 (Thompson et al. 2013).

Biomass of skates appears to have remained stable since the 1980s (Ormseth 2012). However, there is a good deal of uncertainty concerning predation on flathead sole given that, according to the model, almost 80% of the mortality that flathead sole experience is from unexplained sources. There is some evidence of cannibalism for flathead sole. Stomach content data collected from 1990 indicate that flathead sole were the most dominant predator, and cannibalism was also noted in 1988 (Livingston et al. 1993).

Changes in habitat quality

The habitats occupied by flathead sole are influenced by temperature, which has shown considerable variation in the eastern Bering Sea in recent years. For example, the timing of spawning and advection to nursery areas are expected to be affected by environmental variation. Flathead sole spawn in deeper waters near the margin of the continental shelf in late winter/early spring and migrate to their summer distribution of the mid and outer shelf in April/May. The distribution of flathead sole, as inferred by summer trawl survey data, has been variable. In 1999, one of the coldest years in the eastern Bering Sea, the distribution was shifted further to the southeast than it was during 1998-2002. Bottom temperatures during the 2006-2010 and 2012-2013 summertime EBS Trawl Surveys were colder than average, and 2014 were very warm. In 2010, as noted previously, RACE extended the groundfish survey into the northern Bering Sea. No flathead sole were found in the northern Bering Sea area, but a substantial abundance of Bering flounder was found. Bering flounder biomass in the northern Bering Sea area was estimated at 12,761 t, larger than that in the standard survey area (12,360 t). This is consistent with the view that Bering flounder in the BSAI fishery are a marginal stock on the edge of their species range in the eastern Bering Sea. Unfortunately, this area has not been surveyed since 2010. Potential management implications of the northern Bering Sea survey for Bering flounder were discussed in more detail in Appendix C of the 2010 SAFE document (Stockhausen et al., 2010).

Table 45. Non-target catch in the directed flathead sole fishery as a proportion of total bycatch of each species. Conditional highlighting from white (lowest numbers) to green (highest numbers) is applied.

Non-Target Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Benthic urochordata	0.043	0.000	0.007	0.039	0.102	0.047	0.002	0.065	0.011	0.007	0.001	0.019
Bivalves	0.016	0.041	0.002	0.010	0.029	0.006	0.005	0.023	0.004	0.005	0.004	0.083
Brittle star unidentified	0.301	0.108	0.023	0.015	0.034	0.016	0.253	0.094	0.004	0.002	0.034	0.034
Capelin	0.000	0.005	0.000	0.000	0.000	0.052	0.026	0.000	0.006	0.000	0.037	0.000
Corals Bryozoans	0.002	0.010	0.009	0.004	0.001	0.000	0.000	0.036	0.000	0.000	0.000	0.000
Eelpouts	0.101	0.209	0.129	0.096	0.040	0.034	0.017	0.100	0.083	0.161	0.271	0.195
Eulachon	0.000	0.001	0.007	0.000	0.000	0.006	0.001	0.007	0.003	0.001	0.122	0.012
Giant Grenadier	0.000	0.005	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.003	0.001	0.000
Greenlings	0.000	0.021	0.005	0.000	0.006	0.007	0.034	0.000	0.000	0.000	0.000	0.000
Grenadier	0.020	0.016	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.003	0.000
Hermit crab unidentified	0.021	0.133	0.068	0.027	0.122	0.057	0.018	0.063	0.005	0.033	0.048	0.023
Invertebrate unidentified	0.010	0.053	0.032	0.027	0.016	0.183	0.080	0.085	0.009	0.001	0.001	0.003
Lanternfishes (myctophidae)	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Misc crabs	0.216	0.031	0.042	0.022	0.020	0.029	0.006	0.010	0.006	0.005	0.024	0.024
Misc crustaceans	0.067	0.325	0.104	0.026	0.090	0.218	0.034	0.080	0.015	0.008	0.163	0.037
Misc fish	0.024	0.019	0.018	0.020	0.007	0.011	0.014	0.006	0.002	0.000	0.004	0.005

Misc inverts (worms etc)	0.899	0.875	0.882	0.133	0.000	0.571	0.112	0.029	0.055	0.093	0.076	0.025
Other osmerids	0.016	0.031	0.024	0.010	0.000	0.000	0.001	0.001	0.018	0.000	0.010	0.001
Pacific Sand lance	0.009	0.000	0.018	0.000	0.000	0.026	0.000	0.000	0.000	0.000	0.000	0.000
Pandalid shrimp	0.191	0.072	0.286	0.027	0.048	0.112	0.042	0.040	0.007	0.056	0.069	0.065
Polychaete unidentified	0.372	0.277	0.044	0.000	0.032	0.072	0.110	0.006	0.006	0.001	0.004	0.003
Scypho jellies	0.003	0.003	0.001	0.001	0.002	0.001	0.002	0.007	0.001	0.000	0.001	0.005
Sea anemone unidentified	0.074	0.235	0.021	0.069	0.474	0.109	0.030	0.132	0.019	0.017	0.070	0.047
Sea pens whips	0.037	0.017	0.008	0.012	0.022	0.017	0.003	0.001	0.001	0.000	0.001	0.000
Sea star	0.045	0.096	0.047	0.098	0.054	0.097	0.078	0.041	0.028	0.005	0.017	0.046
Snails	0.070	0.195	0.102	0.048	0.100	0.094	0.029	0.063	0.035	0.022	0.045	0.119
Sponge unidentified	0.008	0.004	0.003	0.005	0.000	0.009	0.001	0.014	0.001	0.000	0.015	0.007
Stichaeidae	0.008	0.025	0.215	0.693	0.001	0.028	0.097	0.048	0.002	0.000	0.007	0.004
urchins dollars cucumbers	0.048	0.068	0.009	0.016	0.016	0.062	0.027	0.023	0.034	0.006	0.025	0.007

Table 46. Prohibited species catch in the flathead sole directed fishery as a proportion of all prohibited species catch in the BSAI.

	2014		2013	
Prohibited Species	PSCNQ Estimate (*)	Halibut Mortality (mt)	PSCNQ Estimate (*)	Halibut Mortality (mt)
Bairdi Tanner Crab			0.069	
Blue King Crab			0.047	
Chinook Salmon	0.000		0.000	
Golden (Brown) King Crab			0.001	
Halibut	0.022	0.038	0.017	0.035
Herring			0.002	
Non-Chinook Salmon	0.000		0.000	
Opilio Tanner (Snow) Crab			0.096	
Red King Crab			0.007	

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIflathead.pdf

BSAI Arrowtooth Flounder

Ecosystem Effects on the stock

1) Prey availability/abundance trends

Arrowtooth flounder diet varies by life stage. Regarding juvenile prey and its associated habitat, information is not available to assess the abundance trends of the benthic infauna of the Bering Sea shelf. The original description of infaunal distribution and abundance by Haflinger (1981) resulted from sampling conducted in 1975 and 1976 and has not be re-sampled since. It has been hypothesized that predators on pollock, such as adult arrowtooth flounder, may be important species which control (with other factors) the variation in year-class strength of juvenile pollock (Hunt et al. 2011). The populations of arrowtooth flounder which have occupied the outer shelf and slope areas of the Bering Sea over the past twenty years for summertime feeding do not appear food-limited. These populations have fluctuated due to the variability in recruitment success which suggests that the primary infaunal food source has been at an adequate level to sustain the arrowtooth flounder population.

2) Predator population trends

As juveniles, it is well-documented from studies in other parts of the world that flatfish are prey for shrimp species in nearshore areas. This has not been reported for Bering Sea arrowtooth flounder due to a lack of juvenile sampling and collections in nearshore areas, but is thought to occur. As late juveniles they are found in stomachs of pollock and Pacific cod, mostly small arrowtooth flounder ranging from 5 to 15 cm standard length. Past, present and projected future population trends of these predator species can be found in their respective SAFE chapters in this volume. Encounters between arrowtooth flounder and their predators may be limited as their distributions do not completely overlap in space and time.

3) Changes in habitat quality

Changes in the physical environment which may affect arrowtooth flounder distribution patterns, recruitment success, migration timing and patterns are catalogued in the Ecosystem Considerations section of the SAFE report. Habitat quality may be enhanced during years of favorable cross-shelf advection (juvenile survival) and warmer bottom water temperatures with reduced ice cover (higher metabolism with more active feeding).

Fishery Effects on the ecosystem

1) Arrowtoooth flounder are not pursued as a target fishery at this time and thus have no "fishery effect" on the ecosystem. In instances when arrowtooth flounder were caught in sufficient quantities in the catch that they could be classified as a target, their contribution to the total bycatch of prohibited species is summarized for 2007 as follows:

Prohibited species	Arrowtooth flounder "fishery" % of total bycatch
Halibut mortality	<1
Herring	0
Red King crab	0
C. bairdi	<1
Other Tanner crab	<1
Salmon	<1

2) Relative to the predator needs in space and time, harvesting of arrowtooth flounder selects few fish between 5-15 cm and therefore has minimal overlap with removals from predation.

3) The catch is not perceived to have an effect on the amount of large size target fish in the population due to it's history of very light exploitation (2%) over the past 30 years.

4) Arrowtooth flounder discards are accounted for in the overall TAC and catches.

5) It is unknown what effect the catch has had on arrowtooth flounder maturity-at-age and fecundity.

6) Analysis of the benthic disturbance from harvesting arrowtooth flounder is available in the Preliminary draft of the Essential Fish Habitat Environmental Impact Statement.

Ecosystem effects on arrowtooth flounder			
Indicator	Observation	Interpretation	Evaluation
Prey availability or abundance trends			
Benthic infauna	Stomach contents	Stable, data limited	Unknown
Predator population trends			
Fish (Pollock, Pacific cod)	Stable	Possible increases to arrowtooth mortality	
Changes in habitat quality			
Temperature regime	Cold years arrowtooth catchability and herding may decrease	Likely to affect surveyed stock	No concern (dealt with in model)
Winter-spring environmental conditions	Affects pre-recruit survival	Probably a number of factors	Causes natural variability

***Arrowtooth flounder* effects on ecosystem**			
Indicator	Observation	Interpretation	Evaluation
Fishery contribution to bycatch			
Prohibited species	Stable, heavily monitored	Minor contribution to mortality	No concern
Forage (including herring, Atka mackerel, cod, and pollock)	Stable, heavily monitored	Bycatch levels small relative to forage biomass	No concern
HAPC biota	Low bycatch levels of (spp)	Bycatch levels small relative to HAPC biota	No concern
Marine mammals and birds	Very minor direct-take	Safe	No concern
Sensitive non-target species	Likely minor impact	Data limited, likely to be safe	No concern
Fishery concentration in space and time	Very low exploitation rate	Little detrimental effect	No concern
Fishery effects on amount of large size target fish	Very low exploitation rate	Natural fluctuation	No concern
Fishery contribution to discards and offal production	Stable trend	Improving, but data limited	Possible concern
Fishery effects on age-at-maturity and fecundity	Unknown	NA	Possible concern

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIatf.pdf

BSAI Kamchatka Flounder

Ecosystem Effects on the stock

Prey availability/abundance trends

Arrowtooth flounder diet varies by life stage as indicated in the previous section. Regarding juvenile prey and its associated habitat, information is not available to assess the abundance trends of the benthic infauna of the Bering Sea shelf. The original description of infaunal distribution and abundance by Haflinger (1981) resulted from sampling conducted in 1975 and 1976 and has not be re-sampled since. It has been hypothesized that predators on pollock, such as adult arrowtooth flounder, may be important species which control (with other factors) the variation in year-class strength of juvenile pollock (Hunt et al. 2002).

The populations of arrowtooth flounder which have occupied the outer shelf and slope areas of the Bering Sea over the past twenty years for summertime feeding do not appear food-limited. These populations have fluctuated due to the variability in recruitment success which suggests that the primary infaunal food source has been at an adequate level to sustain the arrowtooth flounder resource.

Predator population trends

As juveniles, it is well-documented from studies in other parts of the world that flatfish are prey for shrimp species in near shore areas. This has not been reported for Bering Sea arrowtooth flounder due to a lack of juvenile sampling and collections in near shore areas, but is thought to occur. As late juveniles they are found in stomachs of pollock and Pacific cod, mostly on small arrowtooth flounder ranging from 5 to 15 cm standard length. Past, present and projected future population trends of these predator species can be found in their respective SAFE chapters. Encounters between arrowtooth flounder and their predators may be limited as their distributions do not completely overlap in space and time.

Changes in habitat quality changes in the physical environment which may affect Kamchatka flounder distribution patterns, recruitment success, migration timing and patterns are catalogued in the Ecosystem Considerations SAFE report. Habitat quality may be enhanced during years and warmer bottom water temperatures with reduced ice cover (higher metabolism with more active feeding). Environmental factors important to juvenile survival are presently not well known.

Fishery Effects on the Ecosystem

Ecosystem effects on Kamchatka flounder

Indicator	Observation	Interpretation	Evaluation
Prey availability or abundance trends			
Benthic infauna	Stomach contents	Stable, data limited	Unknown
Predator population trends			
Fish (Pollock, Pacific cod)	Stable	Possible increases to Kamchatka mortality	
Changes in habitat quality			
Temperature regime	Cold years Kamchatka catchability and herding may decrease	Deeper water species so less likely to affect surveyed stock	No concern (dealt with in model)
Winter-spring environmental conditions	Affects pre-recruit survival	Probably a number of factors	Causes natural variability

Arrowtooth flounder effects on ecosystem			
Indicator	Observation	Interpretation	Evaluation
Fishery contribution to bycatch			
Prohibited species	Stable, heavily monitored	Minor contribution to mortality	No concern
Forage (including Pollock, shrimp and euphausids)	Stable, heavily monitored	Bycatch levels small relative to forage biomass	No concern
HAPC biota	Low bycatch levels of (spp)	Bycatch levels small relative to HAPC biota	No concern
Marine mammals and birds	Very minor direct-take	Safe	No concern
Sensitive non-target species	Likely minor impact	Data limited, likely to be safe	No concern
Fishery concentration in space and time	Recent high exploitation rate	Little detrimental effect	No concern
Fishery effects on amount of large size target fish	Recent high exploitation rate, but unknown effect	Natural fluctuation	No concern
Fishery contribution to discards and offal production	Stable trend	Improving, but data limited	Possible concern
Fishery effects on age-at-maturity and fecundity	Unknown	NA	Possible concern

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIkamchatka.pdf

BSAI Greenland Turbot

Ecosystem Considerations

Greenland turbot have undergone dramatic declines in the abundance of immature fish on the EBS shelf region compared to observations during the late 1970's. It may be that the high level of abundance during this period was unusual and the current level is typical for Greenland turbot life history pattern. Without further information on where different life-stages are currently residing, the plausibility of this scenario is speculation. Several major predators on the shelf were at relatively low stock sizes during the late 1970's (e.g., Pacific cod, Pacific halibut) and these increased to peak levels during the mid 1980's. Perhaps this shift in abundance has reduced the survival of juvenile Greenland turbot on the EBS shelf. Alternatively, the shift in recruitment patterns for Greenland turbot may be due to the documented environmental regime that occurred during the late 1970's. That is, perhaps the critical life history stages are subject to different oceanographic conditions that affect the abundance of juvenile Greenland turbot on the EBS shelf.

http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIturbot.pdf

GOA Flathead Sole

Flathead sole in the Gulf of Alaska are caught in a directed fishery using bottom trawl gear. Typically 25 or fewer shore-based catcher vessels from 58-125' participate in this fishery, as do 5 catcher-processor vessels (90-130'). Fishing seasons are driven by seasonal halibut PSC apportionments, with approximately 7 months of fishing occurring between January and November. Catches of flathead sole occur only in the Western and Central management areas in the gulf (statistical areas 610 and 620 + 630, respectively). Bycatch of groundfish species, non target, other and PSC species is presented below.

Table 47. Groundfish bycatch for GOA flathead sole target (in mt; AKFIN, as of November 4th, 2013)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Arrowtooth Flounder	1477	1756	839	723	801	1337	2650	842	815	1013
Atka Mackerel	8.5	1.8	17.4	35.6	2.7	17.1	10.5	10.3		
Central GOA Skate, Big and Longnose	36.4									
Flathead Sole	909	632	522	423	572	696	1242	371	419	470
GOA Deep Water Flatfish	0.1	2	2.7		4.5	17.9	45.4	18.8	11.6	1.8
GOA Dusky Rockfish									2.5	2.3
GOA Pelagic Shelf Rockfish					1.7	3.8	9.2	1.6		
GOA Rex Sole	242	332	68.1	110	86.3	184	397	103	178	78.7
GOA Rougheye Rockfish		1.3	2.1			2.7	15.3	0.9	18.4	16.4
GOA Shallow Water Flatfish	40.2	2.5	28.7	26.2	41	94.9	122	78.4	150	48.2
GOA Shortraker Rockfish		0.7	7.1			2.6	1.3			1.7
GOA Shortraker/Rougheye Rockfish	2.3									
GOA Skate, Big		21.1	30.3	22.7	65.6	53.2	112	30.8	57.4	14.6
GOA Skate, Longnose		10.9	11.5	13.2	10.8	23.7	30	16.6	59.7	7.9
GOA Skate, Other	52.5	37.8	11.8	19.8	4.7	12.6	18.9	12.5	17	7.9
GOA Thornyhead Rockfish	7.1	1.1	5.7	7.1		7.5	12.6			8.1
Northern Rockfish	4.5	11.4			0.4	1.1	6	7.1	1.6	13.3
Octopus										
Other Rockfish					2.2		1.7			0.3
Other Species	59.5	73.9	16.1	34.7	13.9	9.2	21.5			
Pacific Cod	194	153	38	131	125	279	297	93.7	134	102
Pacific Ocean Perch	16	8.5	4.1	10.8	1.8	1.8	74.3	1.9	2	19.2
Pollock	20.5	10.7	33.4	27	45.4	136	319	101	181	108
Sablefish	6.2	1.5	3.8	4.2	0.7	19	13.7	3.7	6.5	12.5
Sculpin								13.6	4.7	3
Shark								0.3		

Table 48. Bycatch of other species in GOA flathead sole target (in mt; AKFIN, as of November 4th, 2013)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Large Sculpins	10	2	0	0	16	3	4.4	6	5	3
Octopus	0	0	0	0	0	0	0.7	0	0	0
Other Sculpins	0	0	0	0	0	0	0.3	0	0	0
Shark, Other	4	5	0	0	0	0	0	0	0	0
Shark, pacific sleeper	29	48	3	19	0	0	1.3	0	0	0
Shark, salmon	0	0	0	0	0	0	0	0	0	0
Shark, spiny dogfish	0	1	0	0	0	0	13	0	0	0
Skate, Alaska	0	0	0	0	0	0	0	3	0	2
Skate, Aleutian	0	0	0	0	0	0	0	4	7	1
Skate, Big	38	21	30	23	66	53	112	31	57	15
Skate, Longnose	7	11	12	13	11	24	30	17	60	8
Skate, Other	44	38	12	20	5	13	19	6	10	5

Table 49. Catch of non-target species in the flathead sole target fishery (in mt; AKFIN, as of November 4th, 2013)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Benthic urochordata	0.01	0	0	0	0	0	0	0.06	0.18	0
Bivalves	0.61	0.8	0.49	0.02	0.4	0.01	0.04	0.38	0	0.06
Brittle star unidentified	0	0	0	0	0	0	1.19	0.02	0	0
Capelin	0	0	0	0	0	0	0	0	0.01	0
Corals Bryozoans	0	0	0	0	0.15	0	0.02	0	0	0
Dark Rockfish	0	0	0	0	0	0.61	0	0	0	0
Eelpouts	0.12	0.46	0.12	0.11	0.01	0	12	2.09	0.04	0.11
Eulachon	0.05	20.4	1.62	0	0.21	0.07	0.28	0.13	0	0.39
Giant Grenadier	0	0	0	0	0	3.32	36	0	0	0
Greenlings	0.01	0	0	0	0	0	0.06	0.22	0	0
Grenadier	64.2	0.57	42.9	0	0	0	0	0.01	31.5	0
Gunnels	0	0	0.03	0	0.01	0	0	0	0	0
Hermit crab unidentified	0	0	0	0	0.21	0	0.01	0.05	0	0
Invertebrate unidentified	0.15	0	0.04	0	0	0	0	0.33	0	0
Misc crabs	0.18	0	0	0	0	0.01	0.09	0.02	0	0
Misc fish	1.11	0.46	0.41	0.15	5.66	3.91	17.3	2.28	5.05	4.42
Other osmerids	0	0	13.9	0	0	0	0	0.02	0	0
Pandalid shrimp	0.04	0.83	0.42	0	0.03	0.02	0.59	0.09	0.28	0.07
Polychaete unidentified	0	0	0	0	0	0	0	0.01	0	0
Scypho jellies	0.05	0	0.26	0	0	0.04	0.25	0	0	0
Sea anemone unidentified	0.21	0	0.02	0	0	0.06	0.69	0.46	0	0.03
Sea pens whips	0	0	0	0	0	0	0.04	0.03	0	0
Sea star	11.4	26.8	1.63	0.55	1.62	0.7	4.65	6.02	0.53	3.66
Snails	0.03	0.53	0.11	0	0.23	0.11	0.25	0.19	0.22	0.11
Sponge unidentified	0.98	0	0	0	0	0	0.09	0.01	0	0
Stichaeidae	0	1.65	0.5	0	0	0.02	0.16	0	0	0.02
urchins dollars cucumbers	0.01	0.12	0	0	0	0	0.08	0.1	0	0

Table 50. Prohibited species catch in the flatfish target fishery (in numbers or mt; AKFIN, as of November 4th, 2013)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Bairdi Tanner Crab	7,514	43,956	25,884	254	6,515	7,683	6,497	5,240	3,120
Blue King Crab	0	0	0	0	0	0	0	0	0
Chinook Salmon	1,446	16	56	0	0	118	496	36	53
Golden (Brown) King Crab	0	0	0	0	0	0	0	0	0
Halibut	105	70	37	27	95	100	257	92	190
Herring	0	0	0	0	0	0	1	0	0
Non-Chinook Salmon	91	0	0	0	0	0	0	0	0
Opilio Tanner (Snow) Crab	0	0	0	0	273	0	0	0	0
Red King Crab	0	0	0	0	0	0	0	0	0

Prohibited Species Catch estimate reported in kilograms for halibut and herring, counts of fish for crab and salmon, by gear for a given target fishery. Source: NMFS AKRO Blend/Catch Accounting System, PSC Estimates
http://www.afsc.noaa.gov/REFM/Docs/2013/GOAflathead.pdf

GOA Northern and Southern Rock Sole

Due to the 2013 government shutdown and the 2014 off-survey year for the GOA Region, no new ecosystem impacts and bycatch type evaluation is available for these two species in the shallow water flatfish SAFE assessment.
The most recent evaluation was provided in the FAO RFM AK Flatfish Full Assessment Report http://certification.alaskaseafood.org/pdf/FAO_Based_RFM_Assessment_AK_Flatfish_Full_Assessment_Report_FINAL_Jan%202014.pdf

GOA Arrowtooth Flounder

The directed fishery for arrowtooth flounder takes place throughout the GOA, but is primarily in the central GOA (NMFS area 630). Arrowtooth flounder are typically caught with bottom trawl nets. Their area of highest abundance, and catch, is in the central and western GOA. Outside of the directed fishery, they are primarily caught as bycatch in the other flatfish fisheries. Substantial amounts of flatfish are discarded overboard in the various trawl target fisheries. Under current fishing practices, the percent retained has increased from below 10% in the early 1990's to over 70% since 2010.

Ecosystem Considerations

Arrowtooth flounder are important predators of other groundfish in Alaskan ecosystems. While arrowtooth flounder are present in the Aleutian Islands (AI) and Eastern Bering Sea (EBS), the density of arrowtooth flounder as measured in survey-estimated tons per square kilometer is by far the greatest in the GOA. Although the density of arrowtooth differs between ecosystems, the relative effects of fishing and predation mortality as estimated within food web models constructed for each ecosystem (Aydin et al. in press) are similar between the AI, EBS, and GOA.

Nearly half of arrowtooth production as estimated by the stock assessment appears to be "unused" in the AI and GOA, which is consistent with results for other predator species such as Pacific cod and halibut. In the EBS, considerably more mortality is accounted for; please see the discussion of arrowtooth mortality rates in the EBS in the BSAI arrowtooth assessment (Wilderbuer et al. 2007). Of the accounted sources of mortality, fishing mortality is generally lower for arrowtooth flounder than predation mortality in all three ecosystems. This is consistent with the currently low fishing effort directed at this species.

Arrowtooth flounder have a varied diet comprised of zooplankton, fish, and benthic invertebrates as both juveniles (0-20 cm TL fish) and adults (>20 cm TL). Capelin, euphausiids, adult and juvenile pollock, Pandalid shrimp, herring, and other forage fish comprise the majority of adult arrowtooth flounder diet, but none of these prey account for more than 22% of diet. As juveniles, arrowtooth prey mainly on euphausiids, which make up nearly 60% of diet, followed by capelin at 24%. When the uncertainty in food web model parameters is included (see Aydin et al in press for Ecosense methods), the SAFE authors estimate fairly high annual consumption of these prey by arrowtooth flounder. For example, estimated consumption of all forage fish (capelin, sandlance, eulachon, etc...) by adult arrowtooth ranges from 300,000 to 1.2 million metric tons, and estimated consumption of pollock by adult arrowtooth ranges from 400,000 to 800,000 metric tons. Consumption of euphausiids by adult arrowtooth is estimated to range from 100,000 to 800,000 tons annually, with another 60,000 to 490,000 tons consumed annually by juvenile arrowtooth flounder.

Using diet data for all predators of arrowtooth flounder and consumption estimates for those predators, as well as fishery catch data, they next estimate the sources of arrowtooth mortality in the GOA. As described above, sources of mortality are compared against the total production of arrowtooth as estimated in the GOA stock assessment model for the early 1990s. There are few sources of mortality for arrowtooth flounder in the GOA as both adults and juveniles, as indicated by the large proportion of unexplained mortality (76% for adults, 88% for juveniles). Predators explain more mortality than fisheries for arrowtooth flounder (at least in this model based on early 1990s data where the fishery for arrowtooth flounder was extremely limited).

Pacific halibut, Steller sea lions, and Pacific cod together explain about 10% of adult arrowtooth mortality, while the flatfish trawl fishery accounts for 2%. Juvenile arrowtooth flounder mortality is caused by adult arrowtooth flounder, and both adult and juvenile pollock in the GOA, but the total of these mortality sources is less than 7% of juvenile arrowtooth production. The total tonnage consumed by predators of arrowtooth flounder is low relative to their biomass for both adults and juveniles: the most important predators of arrowtooth, pinnipeds and halibut, are each estimated to consume between 13,000 and 30,000 or 20,000 tons of arrowtooth annually, respectively. Adult arrowtooth flounder are estimated to consume 4,000 to 12,000 tons of juvenile arrowtooth flounder annually, with pollock consuming nearly the same small amount. Few mortality sources for arrowtooth flounder are consistent with an increasing population, which has been observed in the Gulf of Alaska since the 1960s.

After comparing the different diet compositions and mortality sources of arrowtooth flounder, the SAFE authors shift focus slightly to view them within the context of the larger GOA food webs. Arrowtooth flounder occupy a relatively high trophic level in the GOA, and represent the highest biomass single species group at that high trophic level. Visually, it is apparent that arrowtooth's direct trophic relationships in each ecosystem include a majority of species groups. In the GOA, the significant predators of arrowtooth include the halibut, sea lions, sharks, and fisheries. Significant prey of arrowtooth include several fish groups, Euphausiids, and Pandalid shrimp. The most interesting interaction may be with pollock, which are both prey of adult arrowtooth, and predators on juvenile arrowtooth. This situation is also observed in the EBS, but there the biomass of pollock overwhelms that of arrowtooth so the impact of this interaction on the two populations is very different between ecosystems.

Arrowtooth biomass appears strongly influenced by changes in bottom up production, with decreases in survival for large and small phytoplankton and euphausiids having similar biomass effects as direct effects from arrowtooth and juvenile. While euphausiids are direct prey of arrowtooth, phytoplankton are not. Smaller effects on arrowtooth biomass are seen due to decreased survival of capelin (direct prey), but these are uncertain compared with those due to phytoplankton and euphausiids. There are more unequivocal bottom up effects related to arrowtooth flounder in these simulations than top down effects of arrowtooth on other species.

In general, while changes in the amount of consumption have been noted, the arrowtooth diet remains diverse and focused on euphausiids, pollock, capelin, and other fish throughout the time series.

http://www.afsc.noaa.gov/REFM/Docs/2013/GOAatf.pdf

GOA Rex Sole

Due to the 2013 government shutdown and the 2014 off-survey year for the GOA Region, no new ecosystem impacts and bycatch type evaluation is available for GOA Rex Sole in the relevant SAFE assessment.
The most recent evaluation was provided in the FAO RFM AK Flatfish Full Assessment Report
http://certification.alaskaseafood.org/pdf/FAO_Based_RFM_Assessment_AK_Flatfish_Full_Assessment_Report_FINAL_Jan%202014.pdf

Endangered Species Interactions

Accountability measures allow close monitoring of overall catch levels, as well as seasonal and area apportionments. They might close designated areas, or fisheries, if bycatch limits for prohibited species are attained. They also allow monitoring of any endangered or threatened mammals or seabirds and provide a database for evaluating likely consequences of future management actions. Bycatch is recorded in detail and endangered species interactions with Steller sea lions and short-tailed albatross are tightly monitored and regulated. The flatfish fisheries in Alaska prosecuted with modified bottom trawl gear do not interact directly with any of the key endangered species in Alaska such as Steller sea lion and short tailed albatross. The Greenland Turbot fishery in the Bering Sea uses longline gear for half of his small catches.

The National Marine Fisheries Service (NMFS) confirms the take of a second endangered short-tailed albatross (STAL) in the hook-and-line groundfish fishery of the Bering Sea/Aleutian Islands Management Area (BSAI). On September 16, 2014, NMFS reported the verified take of a STAL and the take of a second unidentified albatross in the same haul. US Fish & Wildlife Service seabird experts, Washington Sea Grant, and NMFS interviewed the observer, reviewed all available information of the incident, and concluded that the previously unidentified bird was also a short-tailed albatross. The last three documented STAL takes in Alaska were in August 2010, September 2010, and October 2011. This is the second take in the two-year period that began on September 16, 2013. To date, the incidental take levels have not been reached during the current or any previous Biological Opinions.
https://alaskafisheries.noaa.gov/protectedresources/seabirds/stal_sept14bulletin.pdf

No takes or direct interaction with albatrosses has been recorded for the Greenland turbot fishery in the 2013-2014 fishing season.

2014 Steller Sea Lion Biological Opinion

Section 7 Consultation Biological Opinion – Authorization of Alaska groundfish fisheries under the Proposed Revised Steller Sea Lion Protection Measures, April 2014.

NOAA Fisheries stated that proposed changes to fishing restrictions in the Aleutian Islands are not likely to jeopardize the continued existence of the endangered western population of Steller sea lions or adversely modify Steller sea lion critical habitat, according to a biological opinion issued on April 2nd 2014 under the Endangered Species Act.
The agency estimates that the proposed fishery management changes would relieve roughly two-thirds of the economic burden imposed on Aleutian Islands' fishermen by sea lion protection measures that took effect in 2011. Fishermen could see new regulations in place by January 2015.
The agency's previous biological opinion on the effects of fisheries, issued in 2010, found that the ongoing groundfish fisheries in the western and central Aleutian Islands were likely to jeopardize the continued existence of Steller sea lions and adversely modify their critical habitat. This led NOAA Fisheries to develop a "Reasonable and Prudent Alternative" under the ESA, which closed the Atka mackerel and Pacific cod fisheries (that are prosecuted in conjunction with the flatfish fisheries) in

the western Aleutians in 2011, and further restricted these fisheries in the central Aleutians. The 2010 opinion underwent two external reviews—one commissioned by NOAA and undertaken by the Center for Independent Experts, and a second provided by the states of Alaska and Washington. NOAA Fisheries conducted several new analyses in response to the reviews, which are incorporated into the new 2014 opinion.

The new biological opinion was developed based on the best available scientific information and notes that considerable changes have occurred in the Aleutian Islands fisheries, coupled with new data and analyses that help give the agency a better picture of the potential for commercial fisheries to compete with sea lions for Pacific cod, Atka mackerel and pollock.

Beginning in 2014, NOAA and the North Pacific Fishery Management Council split the total allowable catch for Pacific cod between the Bering Sea fishing grounds and the Aleutian Islands, resulting in far less allowable Pacific cod harvest in the Aleutians. Additional changes that are being considered would limit the amount, timing and location of Atka mackerel, Pacific cod and pollock harvests inside Steller sea lion critical habitat in the Aleutians. NOAA Fisheries remains concerned that large fishery harvests from important areas in the Aleutians over a short amount of time has the potential to deplete concentrations of fish that Steller sea lions depend upon. However, the proposed measures would limit and spread out the catch enough to meet the requirements of the Endangered Species Act, and are consistent with NOAA Fisheries' views on dispersing the harvest in space and time to avoid localized depletion of fish that are prey species for Steller sea lions.

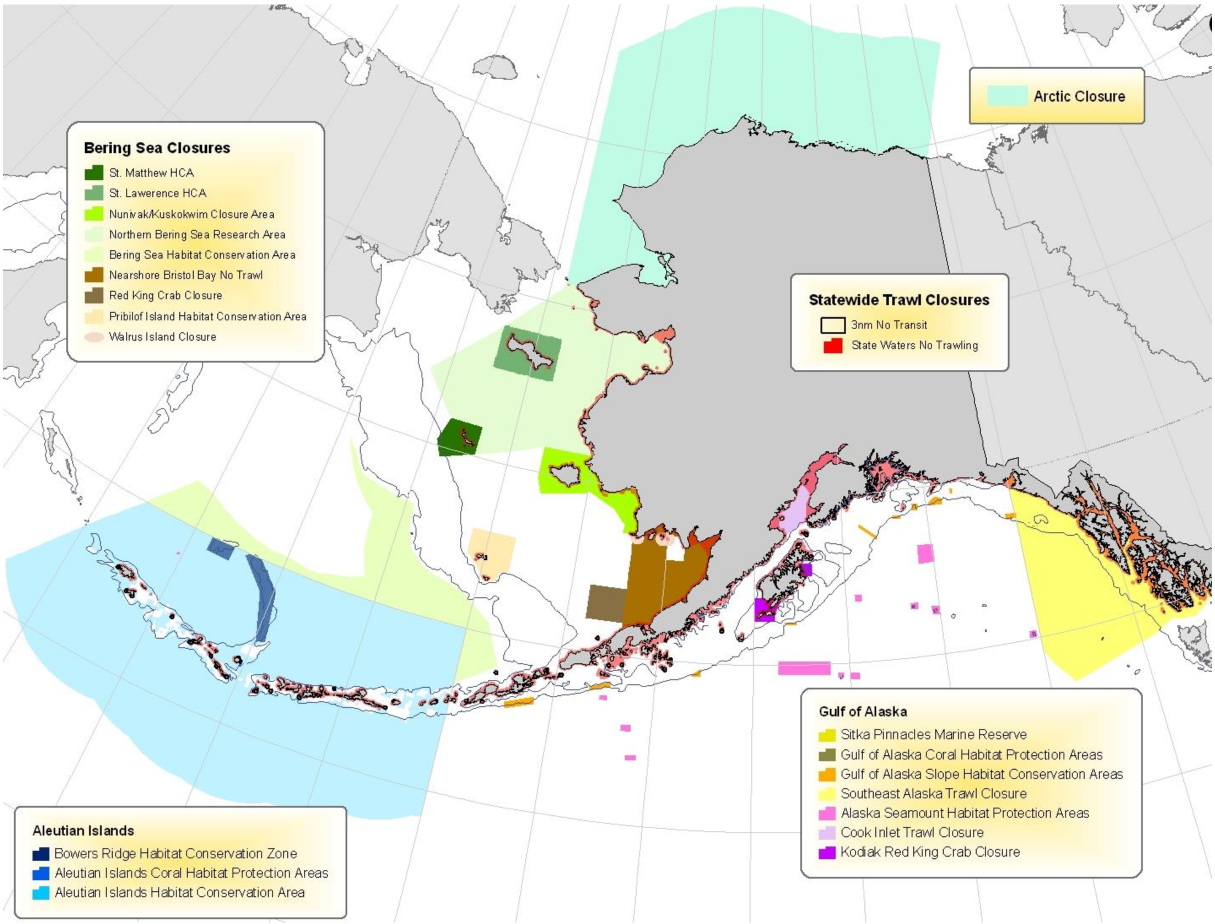
NOAA Fisheries is completing an environmental impact statement on the new fishery management measures, and expects to implement the new regulations in January 2015.
http://alaskafisheries.noaa.gov/newsreleases/2014/ssl040214.htm

Habitat Interactions

Ocean habitat is essential for maintaining productivity of fishery resources, and is a key component of an ecosystem-oriented management approach. Habitat that provides structural relief on an otherwise featureless bottom can be particularly important to fish for food, reproduction, and shelter from predators. Structural habitat includes boulders, corals, anemones, kelp, and other living organisms attached to the ocean bottom. Because fishing gear has the potential to disturb structural habitat, regulations have been implemented to protect areas where this habitat type is known to occur.

Vast areas of the North Pacific have been permanently closed to groundfish trawling and scallop dredging to reduce potential adverse impacts on sensitive habitat and to protect benthic invertebrates. These marine protected areas comprise a relatively large portion of the continental shelf, and in many respects, serve as marine reserves. In addition, fishery closures established in nearshore areas to reduce interactions with Steller sea lions have ancillary benefits of reducing habitat impacts as well.

All fishery management plans include a description and identification of essential fish habitat, adverse impacts, and actions to conserve and enhance habitat. Maps of essential fish habitat areas are useful for understanding potential effects of proposed development and other activities.



http://www.npfmc.org/habitat-protections/

Aleutian Islands

In February 2005, the Council adopted several new closure areas to conserve EFH. To minimize the effects of fishing on EFH, and more specifically to address concerns about the impacts of bottom trawling on benthic habitat (particularly on coral communities) in the Aleutian Islands, the Council took action to prohibit all bottom trawling in the Aleutians, except in small discrete "open" areas. Over 95% of the management area is closed to bottom trawling (277,100 nm^2). Additionally, six Habitat Conservation Zones with especially high density coral and sponge habitat were closed to all bottom-contact fishing gear (longlines, pots, trawls). These "coral garden" areas, which total 110 nm^2, are essentially marine reserves. To improve monitoring and enforcement of the Aleutian Island closures, a vessel monitoring system is required for all fishing vessels in the Aleutian management area.

Additionally, the Council adopted several new Habitat Areas of Particular Concern (HAPCs). The Alaska Seamount Habitat Protection Area encompasses all 16 seamounts in Federal waters off Alaska, named on NOAA charts, of which one occurs in the Aleutian Islands (Bowers). Bottom-contact fishing is prohibited in this HAPC. The Aleutian Islands Coral Habitat Protection Area designates six areas where submersible observations of high density coral have been made. All bottom-contact gear (longlines, trawls, pots, dinglebar gear, etc.) is prohibited in these areas. Additionally, the relatively unexplored Bowers Ridge is also identified as a HAPC. As a precautionary measure, the Council prohibited mobile fishing gear that contacts the bottom within this 5,286 nm^2 area.

Bering Sea

In June 2007, the Council adopted precautionary measures to conserve benthic fish habitat in the Bering Sea by "freezing the footprint" of bottom trawling by limiting trawl effort only to those areas more recently trawled. Implemented in 2008, the new measures prohibit bottom trawling in a deep slope and basin area (47,000 nm^2), and three habitat conservation areas around St Matthew Island, St Lawrence Island, and an area encompassing Nunivak Island-Etolin Strait-Kuskokwim Bay. The Council also established the Northern Bering Sea Research Area that includes the shelf waters to the north of St. Matthew Island (85,000 nm^2). The entire Northern Bering Sea Research Area will be closed to bottom trawling while a research plan is developed.

Gulf of Alaska

Also in February 2005, bottom trawling for all groundfish species was prohibited in 10 designated areas along the continental shelf of the Gulf of Alaska. The GOA Slope Habitat Conservation Areas, which are thought to contain high relief bottom and coral communities, total 2,086 nm^2. Additionally, the Council adopted several new HAPCs. The Alaska Seamount Habitat Protection Area encompasses all 16 seamounts in Federal waters off Alaska, named on NOAA charts, fifteen of which are in the Gulf of Alaska (Brown, Chirkikof, Marchand, Dall, Denson, Derickson, Dickins, Giacomini, Kodiak, Odessey, Patton, Quinn, Sirius, Unimak, and Welker). Bottom-contact fishing is prohibited in all of these HAPCs, an area which totals 5,329 nm^2. In Southeast Alaska, three sites with large aggregations ("thickets") of long-lived Primnoa coral are also identified as HAPCs. These sites, in the vicinity of Cape Ommaney and Fairweather grounds, total 67 nm^2. The Gulf of Alaska Coral Habitat Protection Area designates five zones within these sites where submersible observations have been made, totaling 13.5 nm^2. All bottom-contact gear (longlines, trawls, pots, dinglebar gear, etc.) is prohibited in this area.

Arctic

In 2009, an Arctic Fisheries Management Plan was implemented. The plan covers the Arctic waters of the United States in the Chukchi and Beaufort seas. Warming ocean temperatures, migrating fish stocks and shifting sea ice conditions from a changing climate may potentially favor the development of commercial fisheries. The plan establishes a framework for sustainably managing Arctic marine resources. It initially prohibits commercial fishing in the Arctic waters of the region until more information is available to support sustainable fisheries management (an area roughly 150,000 sq nm^2).

http://www.npfmc.org/habitat-protections/

New in 2014

C9 Bering Sea Canyons Motion – North Pacific Fishery Management Council
April 13, 2014

The purpose of the Bering Sea Canyons Motion adopted in April 2014 is to determine whether and how the Council should recommend amendment of the BSAI Groundfish and Crab FMPs to protect known, significant concentrations of deep-sea corals in the Pribilof Canyon and the adjacent slope from fishing impacts under the appropriate authorities of the MSA.
This action may identify a discrete area or areas of significant abundance of deep sea corals in, and directly adjacent to, the Pribilof canyon, assess the potential for fishing impacts on the identified area or areas of significant coral abundance, evaluate the historical and current patterns of fishing effort and fish removals in and adjacent to the Pribilof Canyon, consider the types of management measures that would be appropriate to conserve discrete areas of significant coral abundance while minimizing impacts on established fishing activity, and identify the appropriate authority under which the Council may take action.

The North Pacific Fishery Management Council has taken significant steps to protect coral and coral habitats in the Aleutian Islands and Gulf of Alaska. Recent models and data have shown that Pribilof Canyon and some areas along the Bering Sea slope may also contain deep sea coral. Results of surveys planned for summer 2014 should further refine the understanding of coral occurrence within the canyons and slope habitats, and this information will be useful in refining alternatives developed in response to this purpose and need. There is historical fishing activity that occurs within and around the Pribilof Canyon. Deep sea corals may be important habitat for several commercially important fish species managed by the Council, and may provide important ecosystem services for the maintenance of healthy Bering Sea ecosystems. Consistent with the Council's adopted policy for incorporating the Ecosystem Approach to fisheries management and the authorities of the MSA, the Council intends to initiate action to investigate where and how to protect coral in the Pribilof Canyon and directly adjacent slope (http://www.npfmc.org/bering-sea-canyons/).

Gear modifications

In 2011, a trawl sweep modification requirement was implemented for vessels participating in the Bering Sea flatfish fishery. Elevating devices (e.g., discs or bobbins) are required to be used on the trawl sweeps, to raise the sweeps off the seabed and limit adverse impacts of trawling on the seafloor. Research has demonstrated that this gear modification reduces unobserved mortality of red king crab, Tanner crab, and snow crab. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basket stars and sea whips. Trawl sweep gear modification resulted in a decrease of the trawl sweeps contact with seabed by about 90% and was effective in reducing trawl sweep impact effects to basket stars and sea whips. Some contact with living habitat species would continue from the elevating devices contacting the bottom. Therefore, fishery-wide adoption of devices to reduce seafloor contact with trawl sweeps is expected to be significantly positive.

Dr. Rose's research at the Alaska Fishery Science Center has shown some recovery of sea whips one year after exposure to modified sweeps. Because potential recovery of some living habitat species after exposure to nonpelagic trawling may occur, and trawling will continue in areas already impacted, the overall impacts on habitat complexity is not expected to be a substantial change. However trawl sweep modifications would likely have a less adverse effect on benthic habitat compared to the "no sweep modification" because the flatfish trawl sweep modification would radically decrease the amount of surface directly contacted per hour of nonpelagic trawling.

Effective February 18th 2014, after appropriate trials in the region, this requirement was extended to all central GOA flatfish fisheries. First, this rule (Amendment 89 of the GOA Groundfish FMP) establishes a protection area in Marmot Bay, northeast of Kodiak Island, and closes that area to fishing with trawl gear except for directed fishing for pollock with pelagic trawl gear. The closure will reduce bycatch of Tanner crab (*Chionoecetes bairdi*) in Gulf of Alaska (GOA) groundfish fisheries. Second, this rule requires that nonpelagic trawl gear used in the directed flatfish fisheries in the Central Regulatory Area of the GOA be modified to raise portions of the gear off the sea floor.

The modifications to nonpelagic trawl gear used in these fisheries will reduce the unobserved injury and mortality of Tanner crab, and will reduce the potential adverse impacts of nonpelagic trawl gear on bottom habitat. Finally, this rule makes a minor technical revision to the modified nonpelagic trawl gear construction regulations to facilitate gear construction for those vessels required to use modified nonpelagic trawl gear in the GOA and Bering Sea groundfish fisheries. This rule is intended to promote the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the GOA groundfish FMP, and other applicable law.

http://www.gpo.gov/fdsys/pkg/FR-2014-01-16/html/2014-00780.htm

Structural Epifauna (HAPC Biota)

Given that bottom trawl gear impacts to some degree structural epifauna, current trends are provided below to show the status of those in the Eastern Bering Sea, Aleutian Islands and the Gulf of Alaska. These have been taken from the 2014 Ecosystem SAFE available at: http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf

Structural Epifauna (HAPC Biota) - Eastern Bering Sea

Description of Index. Groups considered to be structural epifauna include: seapens/whips, corals, anemones, and sponges. Corals are rarely encountered on the Bering Sea shelf so they were not included. Relative CPUE was calculated and plotted for each species group by year for 1982-2014. Relative CPUE was calculated by setting the largest biomass in the time series to a value of 1 and scaling other annual values proportionally. The standard error (±1) was weighted proportionally to the CPUE to produce a relative standard error.

Status and trends: It is difficult to detect trends of structural epifauna groups in the Bering Sea shelf from the RACE bottom trawl survey results because there is taxonomic uncertainty within the groups and because the quality and specificity of field identifications have varied over the course of the time series (Stevenson and Hoff, 2009). Moreover, relatively large variability in the relative CPUE values makes trend analysis difficult (Figure 10). However, catch rates generally show increasing trends in anemones and sponges in recent years. Catch rates of seawhips have been variable.

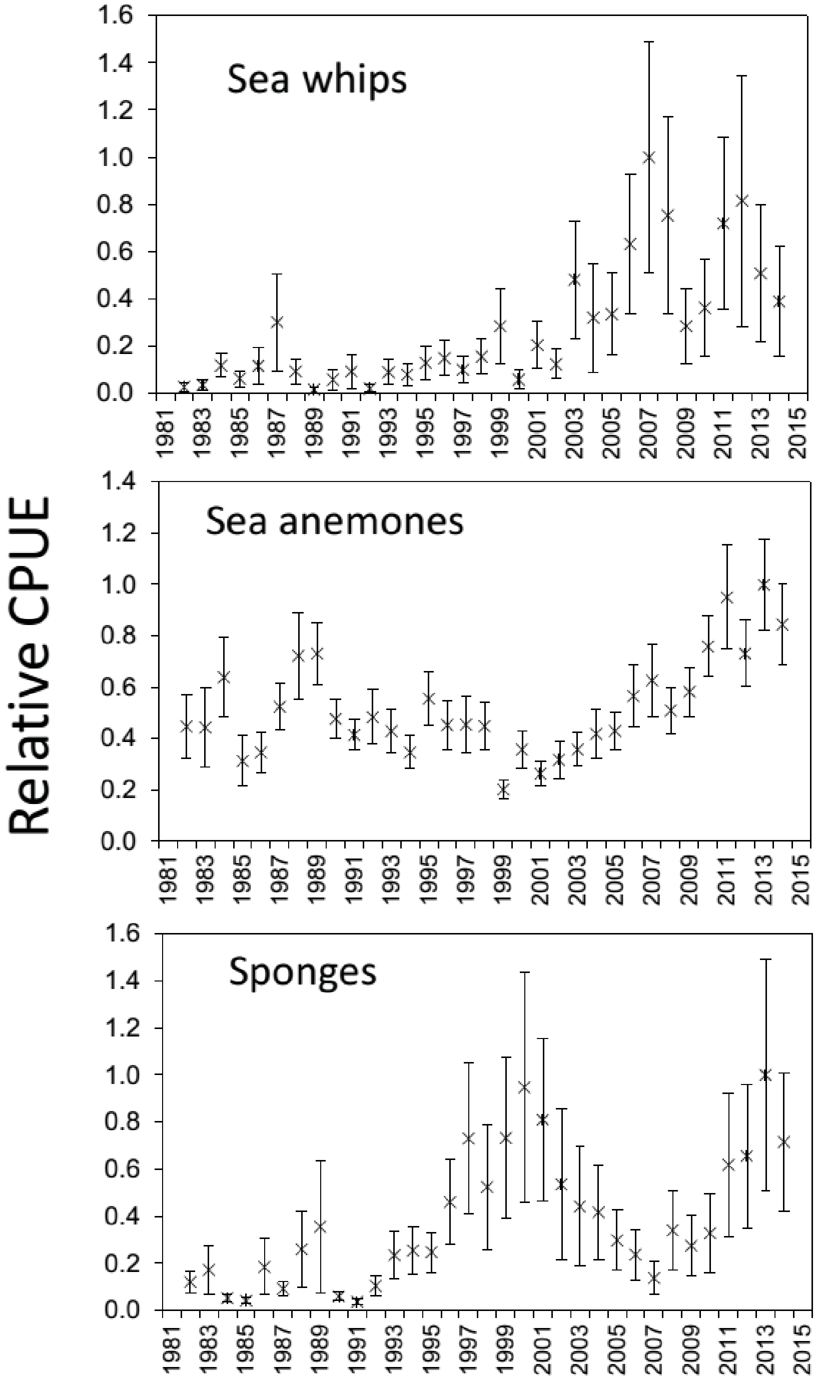


Figure 10: Relative CPUE trends of structural epifauna from the AFSC bottom trawl survey of the eastern Bering Sea shelf during the May to August time period from 1982-2014. Data points are shown with standard error bars.

Factors influencing observed trends: Further research in several areas would benefit the interpretation of structural epifauna trends including systematics and taxonomy of Bering Sea shelf invertebrates; survey gear selectivity; and the life history characteristics of the epibenthic organisms captured by the survey trawl.

Implications: Changes in structural epifauna CPUE may indicate changes in habitat, but at present no research has demonstrated definitive links.

Structural Epifauna (HAPC Biota)- Aleutian Islands

Description of index: Groups considered to be Habitat Area of Particular Concern (HAPC) biota include seapens/seawhips, corals, anemones, and sponges. The biennial survey in the Aleutian Islands (AI) does not sample any of the HAPC fauna well. The survey gear does not perform well in many of the areas where these groups are likely to be more abundant and survey effort is quite limited in these areas. In tows where they are encountered, the standard survey gear is ill-suited for efficient capture of these groups. As a result, CPUE is often strongly influenced by a very small number of catches with a resulting high variance.

Another complicating factor in interpreting these results is that the gears used by the Japanese vessels in the surveys prior to 1991 were quite different from the survey gear used aboard U.S. vessels in subsequent surveys and likely resulted in different catch rates for many of these groups. In recent years, more emphasis has been placed on the collection of more detailed and accurate data on HAPC species and it is likely that this increased emphasis influenced the results presented here. For each species group, the largest catch over the time series was arbitrarily scaled to a value of 100 and all other values were similarly scaled. The standard error (±) was weighted proportionally to the CPUE to get a relative standard error.

Status and trends: A few general patterns are clearly discernible (Figure 11). Sponges are caught in most tows in the Aleutians west of the southern Bering Sea. Interestingly, the frequency of occurrence of sponges in the southern Bering Sea is relatively high, but sponge abundance is much lower than other areas. The sponge estimates for the 1983 and 1986 surveys are much lower than other years, probably due to the use of different gear, including large tire gear that limited the catch of most sponges. Stony corals are commonly captured outside of the southern Bering Sea and their abundance appears to be highest in the central Aleutians. Soft corals are caught much less frequently and the survey likely does not provide a reliable estimate of soft coral abundance.

Sea anemones are also common in survey catches but abundance trends are not clear for most areas. Sea pens are much more likely to be encountered in the southern Bering Sea and eastern AI than in areas further west. Abundance estimates are low across the survey area and large apparent increases in abundance, such as that seen in the eastern AI in 1997, are typically based on a single large catch. There has been a decline in CPUE for sponges, stony corals, and anemones from the 2010 survey to the 2014 survey, but trends have been generally inconsistent or level since 2000 for most species and areas.

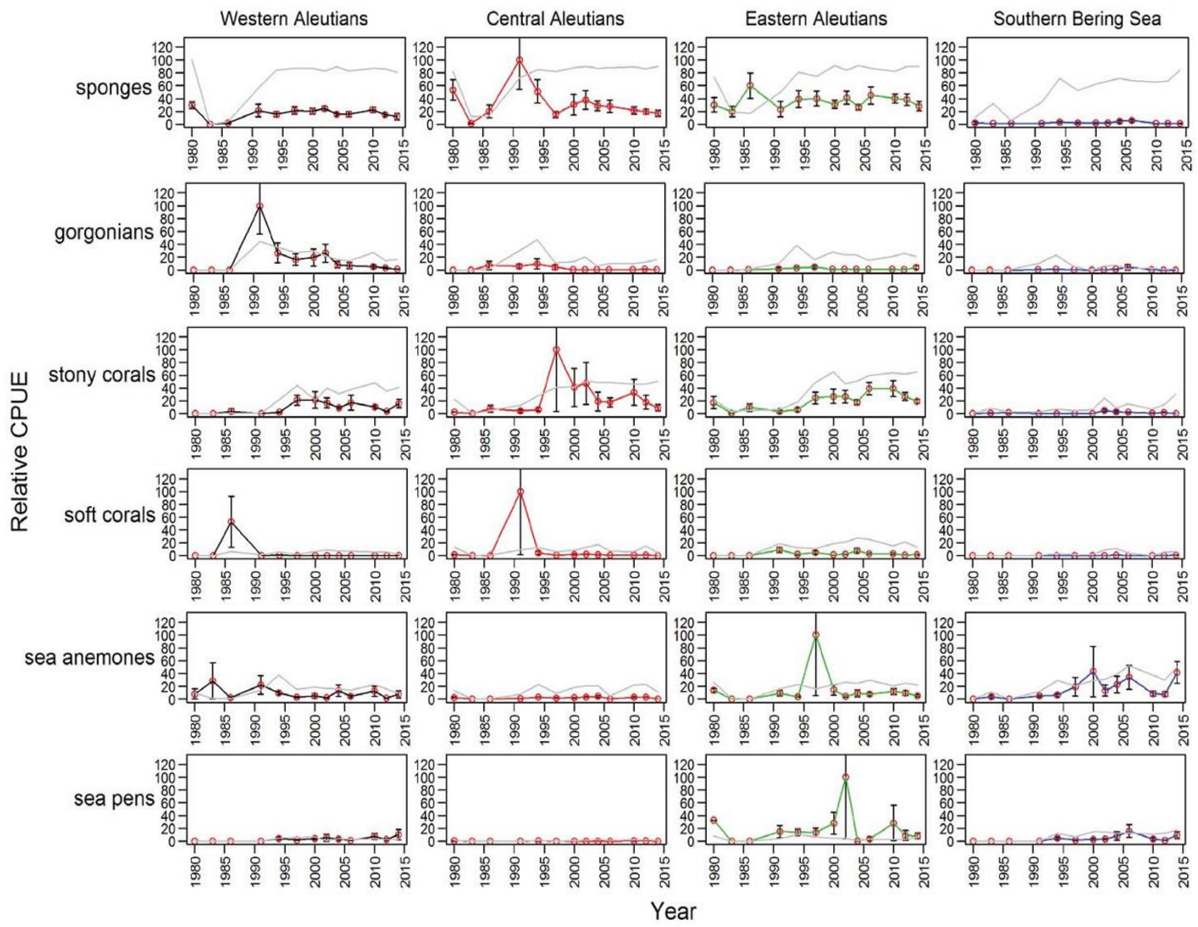


Figure 11. Mean CPUE of HAPC species groups by area from RACE bottom trawl surveys in the Aleutian Islands from 1980 through 2014. Error bars represent standard errors. The gray lines represent the percentage of non-zero catches. The Western, Central, and Eastern Aleutians correspond to management areas 543, 542, and 541, respectively. The Southern Bering Sea corresponds to management areas 519 and 518.

Factors influencing observed trends: Unknown.

Implications: AI survey results provide limited information about abundance or abundance trends for these organisms due to problems in catchability and areas sampled relative to areas of greatest HAPC abundance as discussed above. Therefore the indices presented are likely of limited value to fisheries management.
http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf

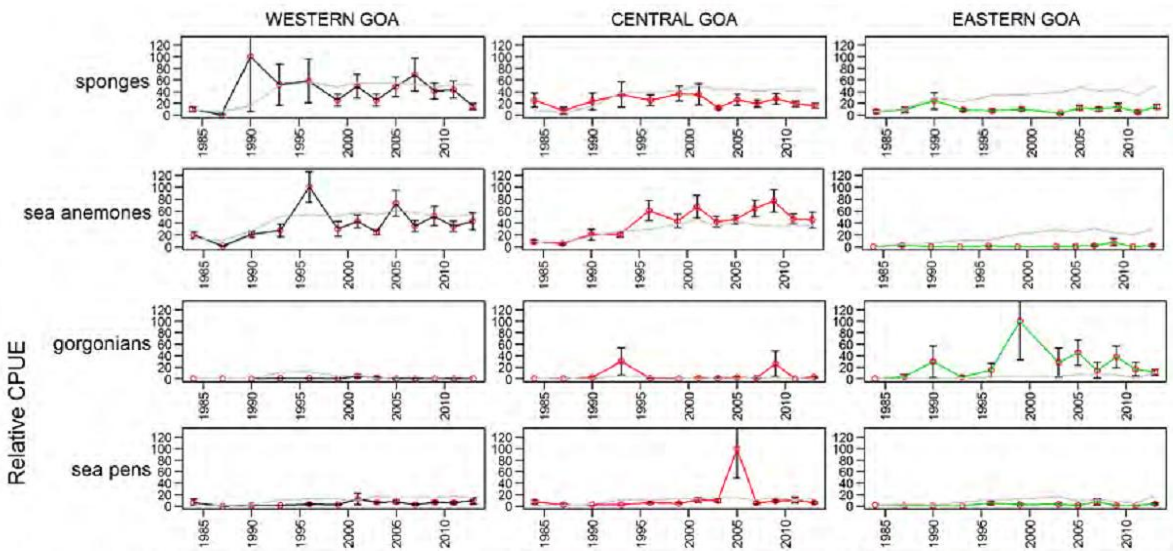
Structural Epifauna (HAPC Biota)- Gulf of Alaska

Description of index: Structural epifauna groups considered to be Habitat Area of Particular Concern (HAPC) biota include sponges, anemones, gorgonians (sea fans/ sea whips), sea pens, and corals (both hard and soft). NOAA collects data on structural epifauna during the largely biennial RACE summer surveys in the Gulf of Alaska from 1984 - 2013. For each species group, the catches for each year were scaled to the largest catch over the time series (which was arbitrarily scaled to a value of

100). The standard error (1) was weighted proportionally to the CPUE to get a relative standard error. The percentage of positive catches in the survey bottom trawl hauls was also calculated.

Status and trends: A few general patterns are clearly discernible (Figure 12). Sponges are caught in about 50% of bottom trawl survey hauls in all areas of the GOA. However, the CPUE is generally highest in the western GOA and decreases to the east. Sponge CPUE has generally declined in the western GOA during the time series, while CPUE has remained fairly constant in the two other areas. Anemones are caught in low abundance in the eastern GOA, while they are common (occur in more than 50% of tows) at a relatively constant abundance in the western and central GOA. Gorgonian corals show an opposite pattern, as they are in highest abundance in the eastern GOA, although they are relatively uncommon in catches for all areas. A peak abundance occurred in 1999 in the eastern GOA, and catches have declined in recent surveys. The sea pen time series is dominated by a large CPUE in 2005 in the central GOA, but they occur uncommonly in bottom trawl tows (<10% occurrence). Stony coral CPUE's have been highest and highly variable in the western GOA. Soft coral CPUE has been uniformly low with the exception of a large catch in the western GOA in the 1984 survey.

Factors influencing observed trends: The Gulf of Alaska survey does not sample any of these fauna well. The survey gear does not perform well in many of the areas where these groups are likely to be more abundant and survey effort is quite limited in these areas. In tows where they are encountered, the standard survey gear is ill-suited for efficient capture of these groups. Another complicating factor in interpreting these results is that the gears used by the Japanese vessels in the surveys prior to 1994 were quite different from the survey gear used aboard American vessels in subsequent surveys and likely resulted in different catch rates for many of these groups. In recent years, more emphasis has been placed on the collection of more detailed and accurate data on structural epifauna, and it is likely that this increased emphasis influenced the results presented here.



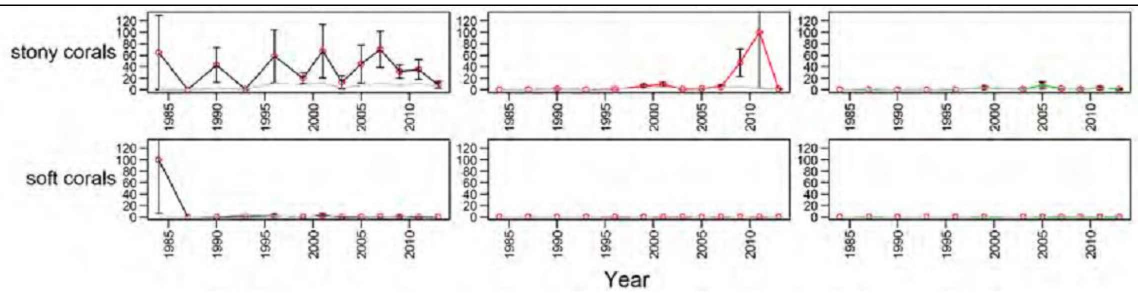
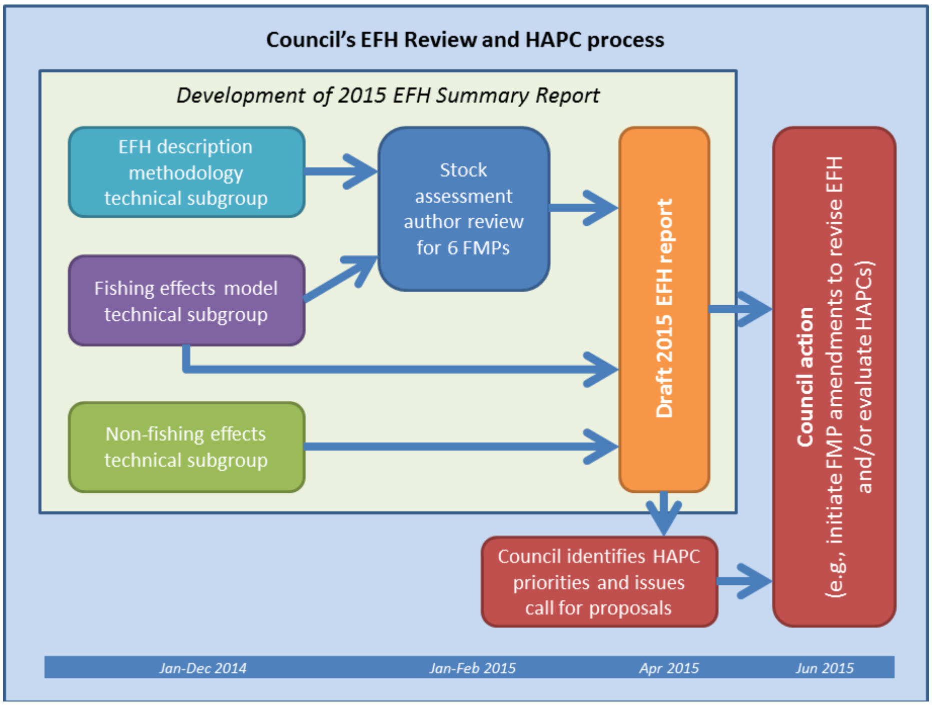


Figure 12: Mean CPUE of HAPC species groups by area from RACE bottom trawl surveys in the Gulf of Alaska from 1984 through 2013. Error bars represent standard errors. The gray lines represent the percentage of non-zero catches.

Implications: Changes in structural epifauna CPUE may indicate changes in habitat, but at present no research has demonstrated definitive links.

http://www.afsc.noaa.gov/REFM/Docs/2013/ecosystem.pdf

Based on the above evidence, habitat interaction are currently not considered significant in the flatfish fisheries, partly due to the recently developed trawl sweep modifications, implemented in the BSAI Region in 2011 and in the central GOA in 2014. The NPFMC has and will continue to consider habitat protection measures. They are particularly tasked with the assessment of Essential Fish Habitats (EFH) as it pertains to managed species (i.e., Alaskan flatfish). (http://www.npfmc.org/habitat-protections/). The NPFMC has already started review to finalize the 2015 EFH Summary Report, and should be available by mid June 2015 as shown in the figure below.



Broader ecosystem considerations

The AFSC also produces an annual ecosystem considerations report as an appendix to the SAFE reports and covering all Alaskan groundfish fisheries.

The 2014 Ecosystem SAFE summarizes the following information for fishing and fisheries trends.

Alaska-wide

- With the Arctic FMP closure included, almost 65% of the U.S. EEZ of Alaska is closed to bottom trawling.
- At present, no BSAI or GOA groundfish stock or stock complex is subjected to overfishing, and no BSAI or GOA groundfish stock or stock complex is considered to be overfished or to be approaching an overfished condition.
- The total catch of non-target species groups in commercial groundfish fisheries has been highest in the EBS, compared with the AI and GOA. Scyphozoan jelly catches in the GOA are an order of magnitude lower than the EBS and three orders of magnitude lower in the AI. Catches of HAPC biota are intermediate in the AI and lowest in the GOA. The catches of assorted invertebrates in the GOA are an order of magnitude lower than the EBS, and are lowest in the AI.
- Catch of HAPC biota and assorted invertebrates in 2013 were the highest in the time series.
- The 2013 estimated numbers of bycaught seabirds in groundfish fisheries are the lowest since bycatch estimates began in 1993.
- There seems to be a generally decreasing trend in seabird bycatch since the new estimation procedures began in 2007, indicating no immediate management concern other than continuing the goal of decreased seabird bycatch.
- The pattern of changes in the total number of vessels harvesting groundfish and the number of vessels using hook and line gear have been very similar since 1994. Numbers have generally decreased since 1994 but have remained relatively stable in the last 5 years (2009-2013). The total number of vessels was 1,518 in 1994 and 936 in 2012. The number of vessels using trawl gear decreased from 257 in 1994 to 177 in 2012.

Bering Sea

- The maximum potential area of seafloor disturbed by trawling remained relatively stable in the 2000s, decreased in 2009-2010 but in 2012 returned to levels seen in the early 2000s. In 2013, the estimated area was 94,975 km^2.
- Since 1993, discard rates of managed groundfish species in federally-managed Alaskan groundfish fisheries have generally declined in the trawl pollock and non-pollock fisheries in the Bering Sea/Aleutian Islands (BSAI). Discard rates in the BSAI fixed gear sector fell from around 20% in 1993 to 12% in 1996, and since then have generally fluctuated between 10% and 14%.

- Trends in total non-target catch in the groundfish fisheries have varied in the EBS. The catch of Scyphozoan jellyfish has fluctuated over the last ten years with peaks in 2009, 2011, and 2013. HAPC biota catch decreased from 2003 to 2007 and has been generally steady since. Sea anemones comprised the majority of the catch.

Aleutian Islands

- Since 1993, discard rates of managed groundfish species in federally-managed Alaskan groundfish fisheries have generally declined in the trawl pollock and non-pollock fisheries in the Bering Sea/Aleutian Islands (BSAI). Discard rates in the BSAI fixed gear sector fell from around 20% in 1993 to 12% in 1996, and since then have generally fluctuated between 10% and 14%.
- Trends in total non-target catch in the groundfish fisheries have varied in the AI. The catch of Scyphozoan jellyfish has been variable and shows no apparent trend over time. HAPC biota and assorted invertebrate catches reached new peaks in 2013.

Gulf of Alaska

- 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.

http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf

14. Where fisheries enhancement is utilized, environmental assessment and monitoring shall consider genetic diversity and ecosystem integrity.

FAO CCRF 9.1.2/9.1.3/9.1.4/9.1.5/9.3.1/9.3.5

Evidence adequacy rating:

☐ High ☐ Medium ☐ Low

Fundamental Clause 14 "Where fisheries enhancement is utilized, environmental assessment and monitoring must consider genetic diversity and ecosystem integrity" is not applicable to the Alaska flatfish commercial fisheries.

8. Performance specific to agreed corrective action plans

Not Applicable. This is the 1st FAO RFM Alaska Flatfish surveillance assessment report. Non-conformances were issued during the full assessment or this surveillance assessment.

9. Unclosed, new non-conformances and new corrective action plans

Not applicable as no unclosed or new non-conformances is active or has been issued.

10. Future Surveillance Actions

The assessment team will review the following during the 2015 surveillance assessment:

- Re-instatement of Alaska Coastal Management Plan.
- Coverage of restructured groundfish observer program in the GOA fleet.

11. Client signed acceptance of the action plan

Not applicable.

12. Recommendation and Determination

Following this 1st surveillance assessment, started in late 2014, the assessment team recommends that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fishery, the Alaska flatfish complex distributed in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) and specifically includes: BSAI Alaska plaice (*Pleuronectes quadrituberculatus*), BSAI/GOA arrowtooth flounder (*Atheresthes stomias*), BSAI/GOA flathead sole (*Hippoglossoides elassodon*), BSAI Greenland turbot (*Reinhardtius hippoglossoides*), BSAI Kamchatcka flounder (*Atheresthes evermanni*), BSAI/GOA northern rock sole (*Lepidopsetta polyxystra*), GOA rex sole (*Glyptocephalus zachirus*), GOA southern rock sole (*Lepidopsetta bilineata*) and BSAI yellowfin sole (*Limanda aspera*). The Alaska flatfish complex commercial fisheries employ Alaska flatfish trawl gear and longline gear (Greenland Turbot only) within Alaska's jurisdiction (200 nautical miles EEZ). These fisheries are principally managed by two federal agencies, the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (NPFMC).

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Appendix 1

Based on the technical expertise required to carry out the above fishery assessment, Global Trust Certification Ltd., is pleased to confirm the surveillance assessment team members for the fishery as follows.

Jeff Fargo, Assessor

Jeff Fargo holds a BSc from Simon Fraser University in British Columbia, Canada. He worked as a research biologist for Fisheries and Oceans Canada at the Pacific Biological Station in Nanaimo, Canada from 1978 until his retirement in 2011. He was head of the Groundfish Research Section from 2001 until his retirement. During that tenure he was responsible for directing research and stock assessment activities for groundfish species in the Pacific Region and management of the Section budget and program organization. He was editor of the Canadian Stock Assessment Secretariat Annual Groundfish Stock Assessment Document for 10 years and has over 70 publications dealing with flatfish and groundfish research and stock assessment. He has presented his research results at International Symposia and collaborated with research scientists in Europe and North America.

Dr. Geraldine Criquet, Assessor

Géraldine Criquet holds a PhD in Marine Ecology (École Pratique des Hautes Études, France) which focused on coral reef fisheries management, Marine Protected Areas and fish ecology. She has also been involved during 2 years in stock assessments of pelagic resources in the Biscay Gulf, collaborating with IFREMER. She worked 2 years for the Institut de Recherche pour le Développement (IRD) at Reunion Island for studying fish target species growth and connectivity between fish populations in the Indian Ocean using otolith analysis. She served as Consultant for FAO on a Mediterranean Fisheries Program (COPEMED) and developed and implemented during 2 years a monitoring program of catches and fishing effort in the Marine Natural Reserve of Cerbère-Banyuls (France). Geraldine has joined Global trust Certification in August 2012 as Fisheries Assessment Officer and is involved in FAO RFM and MSC fisheries assessments.

Vito Ciccia Romito, Lead Assessor

Vito Ciccia Romito holds a BSc in Ecology and an MSc in Tropical Coastal Management (Newcastle University, United Kingdom). His BSc studies focused on bycatch, discards, benthic impact of commercial fishing gear and relative technical solutions, after which he spent a year in Tanzania as a Marine Research officer at Mafia Island Marine Park carrying out biodiversity assessments and monitoring studies of coral reef, mangrove and seagrass ecosystems. Subsequently, for his MSc, he worked on fisheries assessment techniques, ecological dynamics of overexploited tropical marine ecosystems, and evaluation of low trophic aquaculture as a support to artisanal reef fisheries. Since 2010, he has been fully involved through Global Trust with the FAO-based RFM Assessment and Certification program covering the Alaska commercial salmon, halibut, sablefish, pollock, crab, cod and flatfish fisheries as well as the Icelandic cod, saithe, haddock and redfish fisheries. Vito is also a lead, third party IRCA approved auditor.