FAO-BASED RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The

Alaska Pacific Cod Commercial Fisheries (200 mile EEZ)

Facilitated By the

Alaska Fisheries Development Foundation (AFDF)

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I. Summary and Recommendations

The Alaska Seafood Marketing Institute (ASMI) originally requested an assessment of the Alaska Pacific cod (Gadus macrocephalus) commercial fisheries according to the FAO Based Responsible Fisheries Management (RFM) Certification Program. The application was made in April 2010. After Validation Assessment was completed in March 2012, a full Assessment Team was formed to undertake the assessment and final certification determination was given on the 17th April 2013.

This report is the 2nd Surveillance Report (ref: AK/PCOD/001.2/2015) for the Alaska Pacific cod commercial fisheries following Certification award against the FAO-Based RFM Program, on the 17th April 2013. The objective of the Surveillance Report is to monitor for any changes/updates (after 12 months) in the management regime, regulations and their implementation since the previous assessment and to determine whether these changes (if any) and current practices remain consistent with the overall confidence rating scorings of the fishery allocated during initial certification. In addition to this, 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.

Alaska Pacific cod (*Gadus macrocephalus*) is the species of focus in this Assessment and Certification Report. The Pacific cod commercial fisheries employ bottom trawl gear, longline gear, pot gear and jig gear within Alaska jurisdiction (200 nautical miles EEZ) are subjected to federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] management.

The FAO Code of Conduct for Responsible Fisheries (CCRF) in conjunction with the FAO Ecolabelling Guidelines for Marine Capture Fisheries was presented to an ISO 65/EN45011 accredited Certification Body, Global Trust Certification Ltd, to be used as the Standard for the assessment of Alaska Fisheries. The conformance reference points from the published FAO CCRF (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 2nd Surveillance Assessment (2015) of the Alaska Pacific cod commercial fisheries originally certified on April 17th 2013, and presents the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

The Pacific cod commercial fisheries employing bottom trawl gear, longline gear, pot gear and jig gear within Alaska jurisdiction (200 nautical miles EEZ), subjected to federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] management, underwent their 2nd surveillance assessment against the requirements of the FAO-Based RFM Conformance Criteria Version 1.2 Fundamental Clauses.

This 2nd Surveillance Report documents the assessment result for the continued certification of commercially exploited Pacific cod 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. Since 2015, the new client group for this assessment is the Alaska Fisheries Development Foundation (AFDF).

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 2nd Surveillance Assessment, in 2015, 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 Alaska Pacific cod (*Gadus macrocephalus*) fishery employing bottom trawl gear, longline gear, pot gear and jig gear within Alaska jurisdiction (200 nautical miles EEZ), subject to federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] management.

2. Fishery Applicant Details

Applicant Contact Information			
Organization/ Company Name:	**Alaska Fisheries Development Foundation**	Date:	**April 2015**
Correspondence Address:	Alaska Fisheries Development Foundation Wrangell, AK 99929-2223		
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3. Unit of Certification

Unit of Certification			
U.S. ALASKA Pacific Cod Commercial (Federal and State) Fisheries			
Fish Species (Common & Scientific Name)	***Geographical Location of Fishery***	***Gear Type***	***Principal Management Authority***
Pacific cod (Gadus macrocephalus)	*Gulf of Alaska and Bering Sea & Aleutian Islands*	*Bottom trawl, Longline, Pot and Jig gear.*	*National Marine Fisheries Service (NMFS)* *North Pacific Fishery Management Council (NPFMC)* *Alaska Department of Fish and Game (ADFG) &* *Board of Fisheries (BOF)*

4. Surveillance Meetings

Date, time	Organization	Representatives	Item discussed
December 8th to 12th 2014	North Pacific Fishery Management Council, Hilton Downtown Hotel, Anchorage, Alaska	Public meetings	• Final BSAI and GOA Pacific cod and other groundfish harvest specifications: Approve; PT reports (w/data tables of TLAS/AM 80 catch) • 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 • OA Skate MRA revisions: Final Action
2.00 pm, Tuesday the 28th April 2015, Seattle WA	Alaska Seafood Cooperative	Jason Anderson, Manager, Industry Representation	Points Discussed • Significant changes in regulations or management over the past 12 months. • 2015 Steller sea lion protection measures and effects on the AI Pacific cod fishery. • Operations of the fleet in 2014 and differences from the previous year. • Change in the spatial pattern of fishing in 2014 from the previous year to allow for avoidance of PSC species or for other reasons? • Any recent habitat or bycatch reduction type research funded by industry? • Has there been any input from industry in helping update the Essential Fish Habitat report review due for 2015, specific to Pacific cod? • Has there been any significant change in the incidental catch species profile (FMP, non –FMP, non specified) encountered in

			2014 in the Pacific cod fishery of the BSAI? • Has the restructuring of the observer program impacted the Pacific cod fishery in the BSAI in any way? • Prohibited species catch for 2013. Was any PSC species instrumental in causing early fishery shutdown in the Pacific cod fishery (i.e. halibut PSC)? • Any updates on the use of halibut/salmon excluders affecting the Pacific cod fishery? • Have there been significant enforcement type violations within the Pacific cod fleet in 2013/14? • Has there been any interaction with ETP species within the fleet (e.g. Steller sea lions, short tailed Albatross or other species) • Gear loss (pot and longline) affecting the Pacific cod fleet.
9.00 am, Wednesday the 29th of April, Juneau, AK.	United States Coast Guard	LCDR Courtney Sergent Captain Phil Thorne, Seventeenth Coast Guard District	Points discussed: • Enforcement legislation, rules or proposals. Significant changes and updates over the past 12 months. • Enforcement of management measures that support reduction of bycatch and discards, reduction of impacts on habitat, changes and updates over the past 12 months? • Number of boardings, number of violations detected, types of violations for the fishery under assessment. General level of compliance. Changes and updates over the past 12 months. • Gear loss concerns? Updates for the last 12 months (mostly related to longline and pot gear). • Relationships and interaction with AWT for enforcement activities? Significant prosecutions of mention on federal waters from NMFS OLE over the past 12 months? • Dixon Entrance: foreign fleet fishing activities? Russian federation

			line, foreign vessel encroachment?
10.45 am, Wednesday 29th April 2015, Juneau, AK.	Alaska Wildlife Troopers, Juneau Office	Lieutenant Streifel (State Enforcement Authorities)	Points Discussed: • Enforcement legislation, rules or proposals. Significant changes and updates over 2014 affecting the state Pacific cod fisheries (specifically state fisheries in Cook Inlet, Kodiak, Chignik, South Alaska Peninsula, Aleutian Islands, Dutch Harbor etc..)? • Enforcement of management measures that support reduction of bycatch and discards, 2014? • Number of boardings, number of violations detected, types of violations in the past 12 months? Overall level of compliance? • Gear marking regulations, checking and concern relating the loss of gear (pot and longline)? • Relationships with USCG for federal waters enforcement?
10:30 am, Thursday 30th April 2015, Juneau AK	Alaska Fisheries Development Foundation	Julie Decker, Director, Client Group	Discussion points: • Current Assessment

5. Assessment Outcome Summary

Summary of Fundamental Clauses

1. *There is an effective legal (MSA, FMPs) and administrative framework (NMFS/NPFMC – ADFG/BOF) established at the local and national level (state/federal) appropriate for fishery resource conservation and management.*

2. *Management organizations 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. The NPFMC and the BOF are required to manage the Pacific cod trawl, longline, pot and jig fisheries in a sustainable and transparent manner, as mandated by the MSA National Standards and the Alaska Constitution respectively.*

3. *The BSAI and GOA FMPs present long-term management objectives for the Alaska Pacific cod fisheries. Seven state-managed Pacific cod fisheries are subject to an annually-published FMP.*

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

5. *Alaska ensures that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science (NMFS, ADFG, ASMI). The research is disseminated accordingly. Alaska also ensures the availability of research facilities and provides appropriate training, staffing and institution building to conduct the research.*

6. *The EBS, AI, and GOA groundfish management plans define target and limit reference points for Pacific cod and other groundfish. Each SAFE report describes the current fishing mortality rate, stock biomass relative to target and limit reference points.*

7. *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.*

8. *Alaska Pacific cod 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.*

9. *Specific management measures are designed and implemented to maintain stocks at levels capable of producing maximum sustainable levels. 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.*

10. *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.*

11. *The Alaska Pacific cod 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).*

12. *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*.

13. *Alaska's fisheries management organizations conduct assessments and research on the ecosystem effects of groundfish fisheries. Findings and conclusions are published in SAFE document, annual Ecosystem Considerations SAFE documents, and other research reports.*

6. Conformity Statement

The Assessment Team recommends that continued certification under the FAO Based Responsible Fisheries Management Program is granted to the Alaska Pacific cod (*Gadus macrocephalus*) commercial fishery employing bottom trawl gear, longline gear, pot gear and jig gear within Alaska jurisdiction (200 nautical miles EEZ), subjected to federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] management.

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

There is an effective legal (MSA, FMPs) and administrative framework (NMFS/NPFMC – ADFG/BOF) established at the local and national level (state/federal) appropriate for fishery resource conservation and management.

The primary layer of governance for the Alaska Pacific cod fisheries is dictated by the MSA. The main agencies involved in Pacific cod 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 (FMP) must be consistent. Under the MSA, the NPFMC is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, an FMP and any necessary amendments, for each fishery under its authority that requires conservation and management actions, i.e. the annual setting of ABC/TAC/ACL. While the State of Alaska mostly adopts complimentary regulations, even imposing an annual State Emergency Order that adopts federal Regulations in most management areas, state regulations are used to manage 0-3 nm & inside waters (areas not subject to MSA).

The federal FMPs, more specifically, 1) the GOA Groundfish FMP, and 2) the BSAI Groundfish FMP govern the management of the Pacific cod federal fisheries, among the rest of the groundfish fisheries in Alaska. In federal waters (3-200 nm), Alaska Pacific cod fisheries are managed by the NPFMC and the NMFS Alaska Region. The NPFMC is one of eight regional councils established by the MSA to oversee management of the nation's fisheries. With jurisdiction over the million square mile EEZ off Alaska, the NPFMC has primary responsibility for groundfish management in the GOA and BSAI, including Pacific cod, pollock, flatfish, Atka mackerel, sablefish, and (offshore) rockfish. These species are 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. 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, NMFS Alaska Regional Office conducts biological studies, stock survey and stock assessment reports. NOAA Fisheries 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 USCG is responsible for enforcing these FMPs at sea, in conjunction with NMFS enforcement ashore. Also, the USCG enforce 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/wp-content/PDFdocuments/fmp/BSAI/BSAI_FMP_APR_2015.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOA_FMP_APR_2015.pdf

In state waters (0-3 nm), Alaska Pacific cod fisheries are managed by the ADFG and the Alaska Board of Fisheries (BOF). There are eight state-managed Pacific cod regions: Kodiak, Chignik, South Alaska Peninsula, Aleutian Islands, Dutch Harbor Subdistrict, Southeast Alaska, Prince William Sound, and Cook Inlet. Each area supports two distinct Pacific cod fisheries. The first fishery is managed concurrent to the federal BSAI or GOA fishery, and is referred to as the parallel fishery. The second fishery in each area is referred to as the state-waters (or state-managed) fishery.

A parallel groundfish fishery occurs where the State allows the federal species total allowable catch (TAC) to be harvested in State waters. Parallel fisheries occur for pollock, Pacific cod, and Atka mackerel species, for some or all gear types. Opening state waters allows the effective harvesting of fishery resources because many fish stocks straddle state and federal jurisdiction and in some cases a significant portion of the overall federal TAC is harvested within State waters. Although the state cannot require vessels fishing inside state waters during the Federal fishery to hold a federal permit, it usually adopts regulations similar to those in place for the federal fishery if those regulations are approved by the Board of Fisheries and meet state statute. The parallel fishery is managed by the state adopting most of the NMFS rules and management actions (5 AAC 28.087), including seasons, and catch in this fishery is counted towards federal quotas. The second fishery in each area is referred to as the state-waters (or state-managed) fishery. The state-waters fishery is managed independently of the federal/parallel fishery by the ADFG under guidelines developed by the BOF (guiding principles for groundfish fishery regulations 5 AAC 28.089 and BOF groundfish FMP 5 AAC 28.081).

Seven of the eight state-water fisheries are subject to an annual Guideline Harvest Level (GHL) calculated as a percentage of federal fishery quotas. At present, the Kodiak GHL is set at 12.5% of the federal Central Gulf of Alaska (CGOA) ABC; the Chignik GHL is set at 8.75% of the federal CGOA ABC; the South Alaska Peninsula GHL is set at 30%% of the federal Western Gulf of Alaska ABC; the Aleutian Islands GHL is set at 3% of the federal BSAI TAC (when BSAI TAC I split in two Subregions, the BS and AI in late 2014, 3% will be set for each subregion); the Prince William Sound GHL is set at 25% of the federal Eastern Gulf of Alaska (EGOA) ABC; the Cook Inlet GHL is set at 3.75% of the total CGOA ABC and the Dutch Harbor District is set at 3% of the combined BSAI Pacific cod ABCs. GHLs are allocated, by regulation, between gear types. The Southeast Alaska state-water fishery has been subject to a Guideline Harvest Range (GHR) of 750,000 – 1,250,000 lb (340 – 567 mt) since 1994.

The vast majority of Alaska Pacific cod is harvested in the federal BSAI and GOA fisheries, and is therefore studied, managed, and enforced under the federal GFMPs.

http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf
http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf
http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf
http://www.adfg.alaska.gov/FedAidPDFs/FMR15-01.pdf
http://www.adfg.alaska.gov/FedAidPDFs/FMR15-03.pdf
http://www.adfg.alaska.gov/FedAidPDFs/FMR14-58.pdf
http://www.adfg.alaska.gov/FedAidPDFs/FMR14-59.pdf
http://www.adfg.alaska.gov/FedAidPDFs/FMR14-55.pdf
http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/508203729.pdf
http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/527777968.pdf
http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/507476951.pdf
http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/507259721.pdf

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

Management organizations 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. The NPFMC and the BOF are required to manage the Pacific cod trawl, longline, pot and jig fisheries in a sustainable and transparent manner, as mandated by the MSA National Standards and the Alaska Constitution respectively.

NEPA

The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes, a socio-economic and biological/ environmental impact assessment of various proposed scenarios, before the path of action is decided. This occurs whenever resources under their management may be affected by other developments and each time they create, renew or amend regulations. 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. First, each significant NPFMC fisheries package must go through the NEPA review process. Second, 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 can be and are accounted for. The state is a cooperating agency in the NEPA process for federal actions, so that gives the State of Alaska a seat at the table for federal actions. This includes decision-making processes and activities relevant to the fishery resource and its users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users. Virtually every development affecting the natural environment, by regulation, has to go through the NEPA environmental impact assessment process, which identifies its potential environmental, social, and economic impacts and/or benefits. The NEPA processes provide public information and opportunity for public and agencies involvement that are robust and inclusive at both the state and federal levels (https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf).

DEC

The 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's Endangered Species program.
http://www.adfg.alaska.gov/index.cfm?adfg=habitatregulations.main

DNR

The 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 with 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 Program 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, and help of foreign governments with their international conservation efforts. Additionally, the USFWS distributes hundreds of millions of dollars, collected through the Sport Fish and Restoration Program. These funds are derived from excise taxes on fishing equipment, motorboat and small engine fuels and import duties. Funds are distributed to State fish and wildlife agencies for fishery projects, boating access and aquatic education (http://www.fws.gov/help/about_us.html).

ANILCA

The Alaska National Interest Lands Conservation Act (ANILCA) conveyed large sections of federal land to settle Alaska native lands claims and provide the State of Alaska title to other large sections promised under Statehood. Additionally, it enclosed large swaths of land into federal parks and monuments for ecological protection for future generations. ANILCA directs federal agencies to consult and coordinate with the state of Alaska. State agencies responsible for natural resources, tourism, and transportation work as a team to provide input throughout federal planning processes (http://dnr.alaska.gov/commis/opmp/anilca/).

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/).

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
http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf

The assessment team considers that the collectivity of: the NEPA process, existing agencies and processes (e.g. ADFG, ADEC, DNM, USFWS, ANILCA and OPMP), 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. However, effects of the failure to re-establish a coastal management program have yet to be determined. Essentially, the coastal management plan would formalize and centralize better the role of the state in the decision making, but otherwise, the agencies in Alaska have shown to be capable of this type of planning as well as allowing stakeholder input in the process even without the ACMP.

The NPFMC process

The Council system was designed so that fisheries management decisions were made at the regional level to allow input from affected stakeholders which assures that the rights of coastal communities and their historic access to the fishery is included in the decision process. Council meetings are open, and public testimony - both written and oral - is taken on each and every issue prior to deliberations and final decisions. Public comments are also taken at all Advisory Panel and Scientific and Statistical Committee meetings. While there is not a formal "call for proposals," interested stakeholders are welcome to draft letters to the Council (http://www.npfmc.org/).

The BOF process

The BOF main role is to conserve and develop the fishery resources of the state. The board is also charged with making allocative decisions, and ADFG is responsible for management based on those decisions. The BOF meets four to six times per year in communities around the state to consider proposed changes to fisheries regulations around the state. The board uses the biological and socioeconomic information provided by the Alaska Department of Fish and Game, public comment received from people inside and outside of the state, and guidance from the Alaska Department of

Public Safety and Alaska Department of Law when creating regulations that are sound and enforceable. Advisory committees are the local "grass roots" groups that meet to discuss fish and wildlife issues and to provide recommendations to the boards. There are 82 committees throughout the state each with expertise in a particular local area. This process ensures that the local communities' customary uses and practices are considered. Advisory Committees (AC) are local "grass roots" citizen groups intended to provide a local voice for the collection and expression of public opinions and recommendations on matters relating to the management of fish and wildlife resources in Alaska. ADFG staff regularly attends the AC meetings in their respective geographic areas to provide information to the public and hear local opinions on fishery related activities. Currently, there are 82 advisory committees in the state. Of these, approximately 80% to 85% are "active," meaning they regularly meet, write proposals, comment, and attend BOF meetings. The enabling statute for the AC system is AS 16.05.260. Regulations governing the ACs are found in the Alaska Administrative Code (AAC) Title 5, Chapters 96 – 97 http://www.boards.adfg.state.ak.us/bbs/what/prps.php.

CDQs

The Community Development Quota (CDQ) Program began in December of 1992 with the goal of promoting fisheries related economic development in western Alaska. The program is a federal fisheries program that involves eligible communities who have formed six regional organizations, referred to as CDQ groups. There are 65 communities within a fifty-mile radius of the Bering Sea coastline who participate in the program. The CDQ program allocated a portion of the Bering Sea and Aleutian Island harvest amounts to CDQ groups, including halibut, groundfish (Pollock, Pacific cod, flatfish and rockfish), crab and bycatch species. The CDQ program was granted perpetuity status during the 1996 reauthorization of the Magnuson-Stevens Act.

The Economic status of the fisheries off the BSAI and GOA area can be found in the Economic SAFE. These reports are published yearly along with the Ecosystem SAFEs and the various fishery Stock Assessment and Resource Evaluation (SAFE) reports.
http://www.afsc.noaa.gov/refm/docs/2014/economic.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 BSAI and GOA FMPs present long-term management objectives for the Alaska Pacific cod fisheries. Seven state-managed Pacific cod fisheries are subject to an annually-published FMP.

Under the MSA, the NPFMC is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a FMP and any necessary amendments, for each fishery under its authority that requires conservation and management.

FMPs for Pacific cod fisheries in the GOA and the BSAI.

Both FMPs present long-term management objectives for the Alaska Pacific cod fisheries. These include sections that describe a Summary of Management Measures and Management and Policy Objectives.

National Standards for Fishery Conservation and Management

The Sustainable Fisheries Act (SFA) substantially amended the MSA in 1996. Among other things, the SFA placed increased emphasis on ending overfishing and rebuilding overfished stocks. The SFA also added three new national standards to the seven existing standards in the MSA to focus attention on specific areas of concern – impacts of management actions on fishing communities, bycatch reduction, and safety at sea. 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. They are:

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

2. Conservation and management measures shall be based upon the best scientific information available.

3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

4. Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be A) fair and equitable to all such fishermen; B) reasonably calculated to promote conservation; and C) carried out in such manner that no particular individual,

corporation, or entity acquires an excessive share of such privileges.

5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

8. Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to A) provide for the sustained participation of such communities, and B) to the extent practicable, minimize adverse economic impacts on such communities.

9. Conservation and management measures shall, to the extent practicable, A) minimize bycatch and B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

Management Objectives

Under the direction of the NPFMC, the GOA and BSAI FMPs define nine management and policy objectives that are reviewed annually. They are:

- Prevent Overfishing
- Promote Sustainable Fisheries and Communities
- Preserve Food Webs
- 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
- 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 management plans.

Management measures detailed in the two FMPs include:

- Quotas, allocated by region and by gear type
- Permit requirements
- Seasonal restrictions and closures
- Geographical restrictions and closed areas
- Gear restrictions
- Prohibited species
- Retention and utilization requirements
- Recordkeeping and reporting requirements
- Observer requirements
- FMP review process

The Alaska Groundfish Programmatic Supplemental Environmental Impact Statement

This Programmatic SEIS has multiple purposes. First, it serves as the central environmental document supporting the FMPs for the groundfish fisheries in the BSAI and GOA. The historical and scientific information and analytical discussions contained are intended to provide a broad, comprehensive analysis of the general environmental consequences of fisheries management in the EEZ off Alaska. This document also provides agency decision-makers and the public with information necessary for making informed decisions in managing the groundfish fisheries, and sets the stage for future management actions. In addition, it describes and analyzes current knowledge about the physical, biological, and human environment in order to assess impacts resulting from past and present fishery activities. Significant changes have occurred in the environment since the original Environmental Impact Statements (EISs) for the GOA and BSAI FMPs were published approximately 25 years ago. While Environmental Assessments (EA) and several EISs have been prepared for FMP amendments over the ensuing years, none have examined the groundfish FMPs at a programmatic level. The NEPA requires preparation of an EIS or Supplemental EIS (SEIS) when significant environmental changes have occurred. Significant changes have certainly occurred in the environment as well as within the fisheries themselves. This Programmatic SEIS is intended to bring both the decision-maker and the public up-to-date on the current state of the environment, while describing the potential environmental consequences of different policy approaches to managing the groundfish fisheries off Alaska. In doing so, it serves as the overarching analytical framework that will be used to define future management policy with a range of potential management actions. (http://www.fakr.noaa.gov/sustainablefisheries/seis/final062004/Exec_sum.pdf)

Seven of the eight state-managed Pacific cod fisheries are subject to an annually-published FMP. These FMPs include details of the following management measures:

- GHLs
- Gear restrictions
- Seasonal restrictions
- Vessel restrictions that limit and control access
- Buoy marking, pot storage and landing requirements
- Permissible bycatch proportions

- Reporting requirements

"5 AAC 28.081. Gulf of Alaska Pacific cod Management Plans" sets the regulations for the directed state Pacific cod fisheries. This applies to the management plans for Pacific cod as set out for the Prince William Sound Area (5 AAC 28.267) , Cook Inlet Area (5 AAC 28.367) , Kodiak Area (5 AAC 28.467) , Chignik Area (5 AAC 28.537) , and the South Alaska Peninsula Area (5 AAC 28.577) .

Others state fisheries

The Aleutian Islands

The Aleutian Islands District state-waters Pacific cod Gadus macrocephalus season is prosecuted in state waters of the Aleutian Islands west of 170 W longitude and is managed by ADFG. The guideline harvest level (GHL) for the Aleutian Islands District state-waters season is 3% of the estimated acceptable biological catch (ABC) of Pacific cod for the federal Bering Sea and Aleutian Islands Area. The state-waters fishery is divided into an A and B season: A season is allocated 70% of the GHL and B season is allocated 30% of the GHL. Legal gear for the state-waters season includes nonpelagic trawl, groundfish pot, longline, mechanical jig, and hand troll gear. ADFG also manages a parallel Pacific cod season in the Aleutian Islands District concurrent with federal Pacific cod seasons. Harvest in the parallel season accrues toward the federal Pacific cod total allowable catch (TAC). Effective inseason management is dependent upon timely and accurate communication between fishermen and fish processors with the ADFG. In the absence of reliable inseason harvest information, ADFG will adopt conservative management measures that may result in lost fishing opportunity.

Dutch Harbor

The 2015 Dutch Harbor Subdistrict state-waters Pacific cod season was scheduled to open seven days after closure of the initial Bering Sea and Aleutian Islands federal Pacific cod season for the hook and line/pot catcher vessel less than 60 feet in overall length (OAL) sector. Vessels participating in the state-waters Pacific cod season may not exceed 58 feet OAL, and legal gear is limited to groundfish pot gear. No more than 60 pots may be operated from a vessel. The Guideline Harvest Level (GHL) for the Dutch Harbor District state waters Pacific cod season is 3% of the estimated acceptable biological catch (ABC) of Pacific cod for the federal BSAI area.

Southeast Alaska (no formal FMP given the small tonnage of this fishery)

In Southeast Alaska, the Pacific cod harvests occur almost exclusively within inside waters and are not part of the federal TAC. The BOF, with 28 years of landings records, has set an annual GHR for this fishery of 340 to 567 mt (the harvest has never exceeded 408 mt). Gear is limited to hooks and line or pot gear and ADFG conducts inseason management closures to spread fishing effort over the available Pacific cod habitat. Because no stock assessment is conducted on this stock, it is considered to be either tier 5 or 6, and even with extensive landing records, it receives a conservative harvest approach.

http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section367.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section267.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section081.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section467.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section537.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter028/section577.htm
http://www.arlis.org/docs/vol1/H/904772637.pdf
http://library.alaska.gov/asp/edocs/2015/02/ocn904772357.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). The NMFS and the ADFG collect fishery data and conduct fishery independent surveys to assess Pacific cod fisheries and ecosystems in GOA and BSAI areas. GOA and BSAI SAFE documents provide complete descriptions of data types and years collected.

Starting in 2013, separate stock assessments as well as separate (BS-AI) total allowable catch (TAC) recommendations were made for the Aleutian Islands and Bering Sea Pacific cod. The annual age-based assessment for Bering Sea and Aleutian Islands regions as well as GOA Pacific cod uses data collected from commercial landings and transhipment reports, port and at-sea observer length sampling and length and age data from fishery independent surveys in the EBS, the AI and the GOA. The RACE division of the AFSC is 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, 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 overshot http://www.fakr.noaa.gov/2014/2014.htm.

Fishery dependent data

Pacific cod are distributed across a wide area in the North Pacific in both federal and state managed waters. The species is fished with a range of gear types, including trawl, lines and traps. Pacific cod are associated with three (formerly two) federally managed fisheries, the GOA, and the EBS and AI

(formerly the BSAI) and eight state-managed (within 3 nm) fisheries management areas. Each management area is subject to its own fisheries management plan. For catch reporting purposes, fisheries areas are subdivided into coastal areas (3 nm) managed under the jurisdiction of ADFG and offshore reporting areas under the jurisdiction of NMFS (Figure 1).

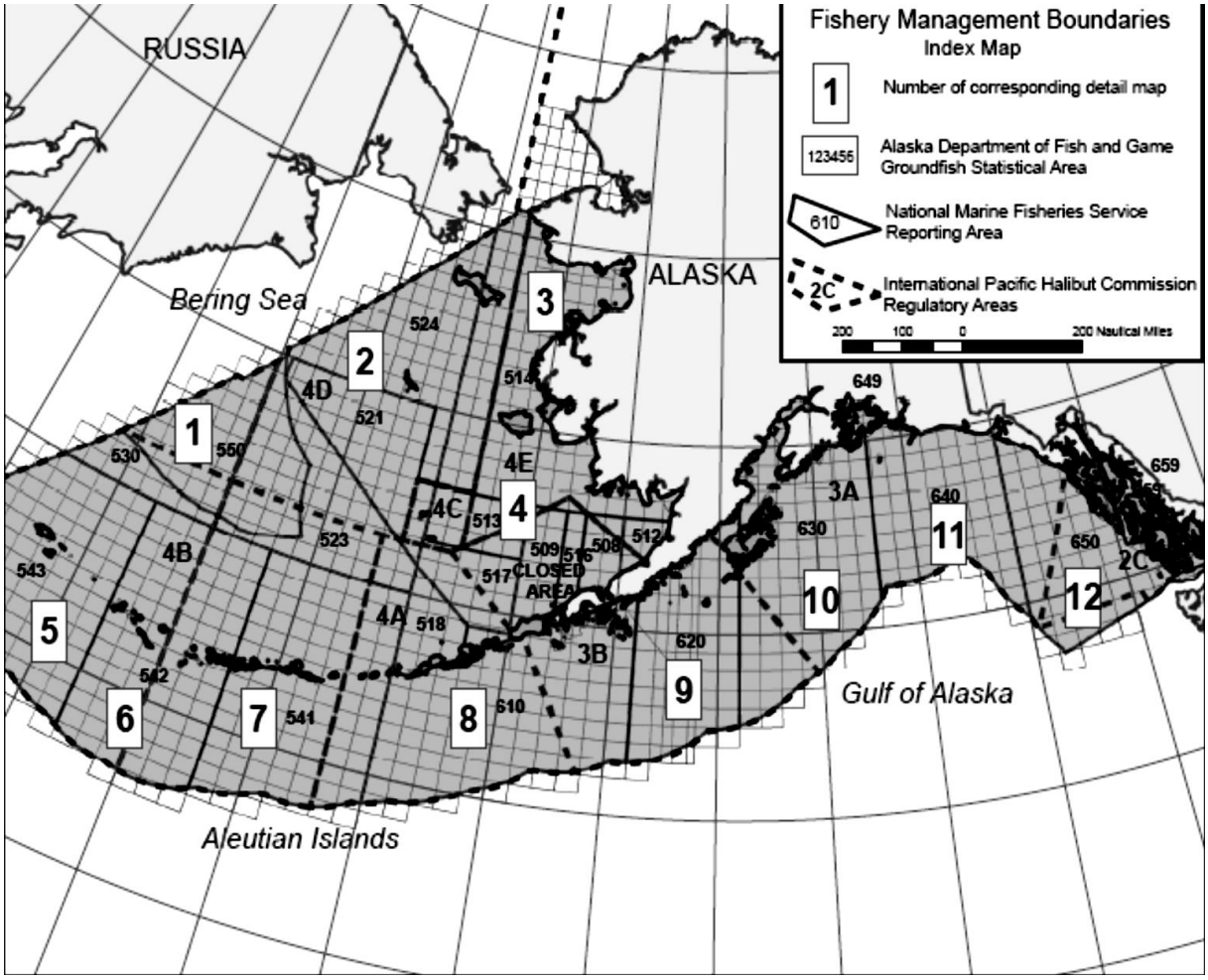


Figure 1. State and Federal groundfish reporting areas in the BSAI and the GOA.
Source: http://www.fakr.noaa.gov/maps/reporting_areas/index.pdf

The Fisheries Monitoring and Analysis Division (FMA) of the NMFS monitors 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.

Fishery Dependent Data

The newly restructured Pacific Groundfish Observer Program

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 debriefer 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/manual2015.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.

Were 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 Pacific cod 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		Jig		Non-Pelagic Trawl		Pot		Pelagic Trawl	
			Retained	Discard	Retained	Discard	Retained	Discard	Retained	Discard	Retained	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		Jig		Non-Pelagic Trawl		Pot		Pelagic Trawl	
			Retained	Discard	Retained	Discard	Retained	Discard	Retained	Discard	Retained	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_t*N_t))/ sum (N_t).
[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

Given the extensive observer coverage, its recent restructuring to correct issues, bias and coverage levels, the cost recovery model used, the breadth of scientific data collected and its use, the BSAI and GOA groundfish observer program are considered adequate for data collections needs.
http://www.afsc.noaa.gov/REFM/Stocks/assessments.htm
http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-205.pdf
http://icesjms.oxfordjournals.org/content/68/8/1769.full.pdf

Recording of catches

For all operations under Federal jurisdiction, all US vessels catching Pacific cod within the US EEZ, land based and stationary floating processor and factory (motherships) receiving catches of Pacific cod are legally obliged to maintain records of all transactions. 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.

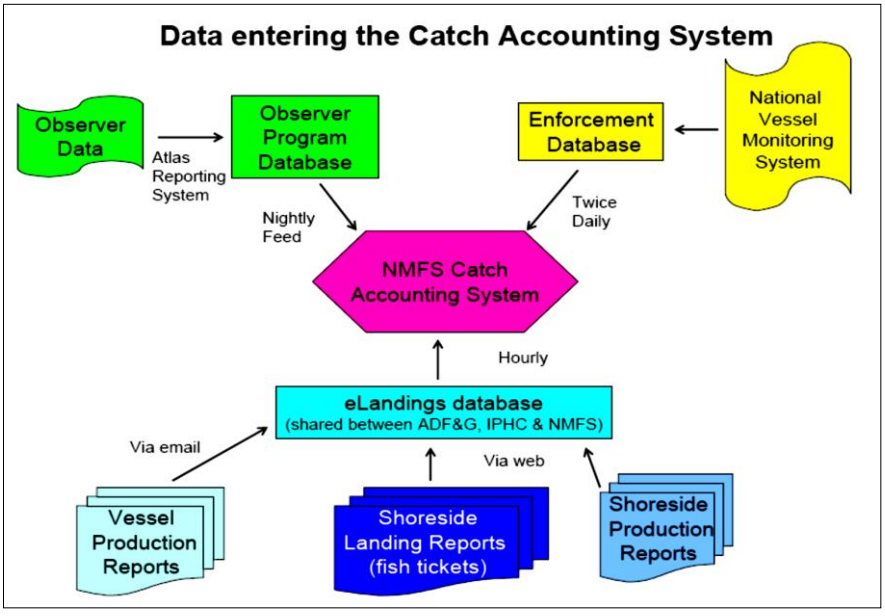


Figure 2. Schematic of the inter-agency Catch Accounting System (CAS).

A detailed description of the catch sampling and catch estimation procedures used for 2015 groundfish fisheries of Alaska can be found at:
http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-286.pdf

And the 2015 observer sampling manual can be found at:
http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2015.pdf

Fishery independent survey data

The RACE division undertakes a very extensive survey program covering the EBS, the GOA and the AI (http://www.afsc.noaa.gov/RACE/groundfish/survey_data/).

Annual NOAA EBS groundfish survey and biannual AI survey data are used for the BSAI stock assessments. Previously, the EBS and AI Pacific cod were managed as a combined stock, where only the EBS stock was subject to a formal analytical assessment. The AI stock was quantified by inflating and extrapolating the results of the EBS assessment and the last available biomass ratios from each surveys used to scale up the assessment of the EBS stock to the BSAI area. In late 2013 It was decided to formally conduct separate assessments for the BS and AI Pacific cod stocks, and this resulted in the use of appropriate survey data for each area in each stock assessment.

The NOAA biennial GOA groundfish survey data is used for the assessment for Pacific cod in the GOA. All 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 survey schedule in the AI has been one trawl survey every 3 years from 1991 to 2000, and every two years from 2000 to 2014, with the exception of 2008 (no survey). The survey schedule in the GOA has been a trawl survey every 3 years from 1984 to 1999 and since 1999 the trawl survey is biennial. The NOAA survey schedule alternates each year between the GOA (Figure 3) and the AI survey areas (Figure 4).

The GOA and EBS surveys both use a stratified survey design. The annual EBS survey program follows a systematic stratified design with two geographic strata: NW (arctic area) and SE (sub-arctic area) and three depth strata (inner shelf < 50 m; mid-shelf between 50 and 200 m; and outer shelf > 200 m). Due to the relatively narrow shelf area around the AI, the AI survey design differs from the GOA and EBS surveys in that a fixed station approach is used. EBS surveys use 30 minute tows at each station, at a speed of 3.0 knots, while the GOA and AI survey currently employ 15-minute tows. The nominal survey abundance index is standardized with the area swept for each survey.

In the GOA for each survey year prior to 2011, an average of about 820 stations have been surveyed by three boats. The number of stations declined to 670 and 548 in the 2011 and 2013 surveys, mainly due to a reduction to two in the number of chartered vessels used. Although some concerns were noted, particularly with the number of stations in 2013, the CV of the biomass estimate for Pacific cod in the GOA was very similar in the 2007, 2011, and 2013 surveys. http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-297.pdf

In the EBS, 376 survey stations have been completed annually survey since 1988, covering approx.

140,350 square nautical mile (nmi^2) of the EBS, with station depths ranging from 20 to 200 m. The most recent survey was in 2014 http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-282.pdf, using two vessels, and the methodology was unchanged from the previous few surveys.

In the AI Region, the 2014 survey consisted of the standard number (420) of stations surveyed by two boats http://www.iphc.int/publications/rara/2014/rara2014_40nmfsaitrawl.pdf following protocols used in previous years.

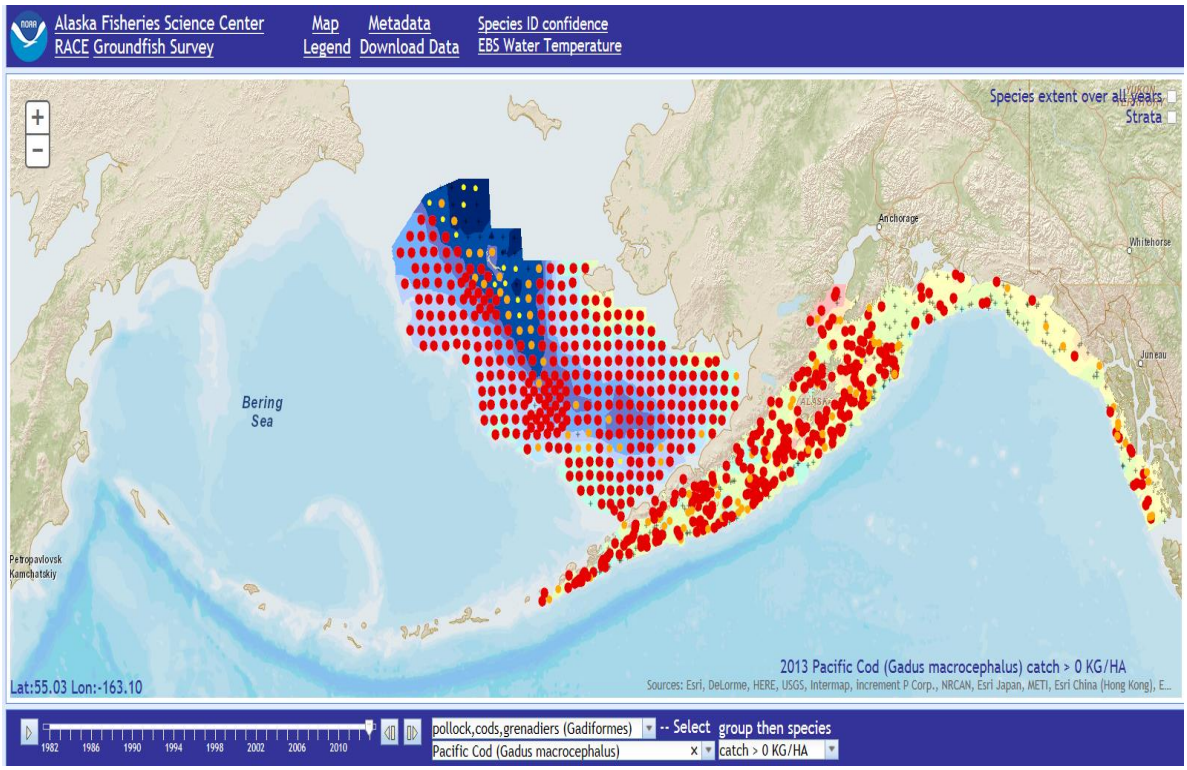


Figure 3. Survey positions for the 2013 RACE groundfish survey covering the EBS and GOA. http://www.afsc.noaa.gov/RACE/groundfish/survey_data/

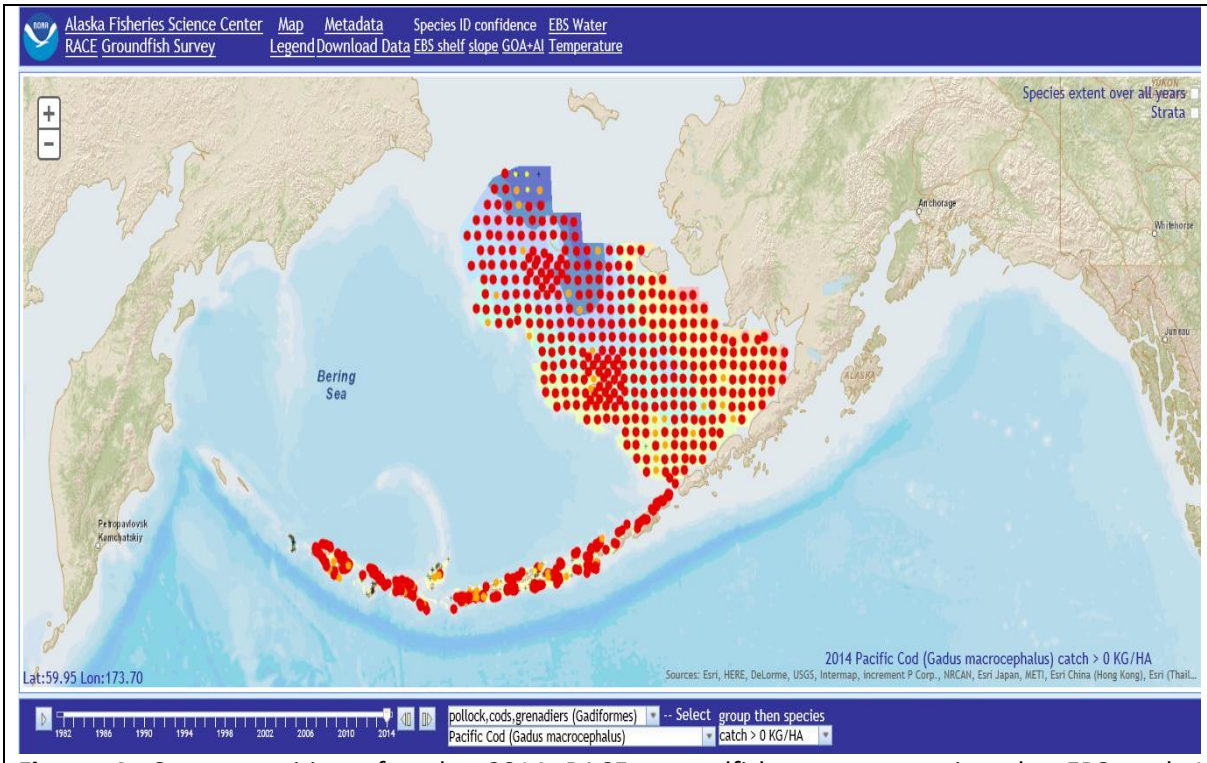


Figure 4. Survey positions for the 2014 RACE groundfish survey covering the EBS and AI. http://www.afsc.noaa.gov/RACE/groundfish/survey_data/

The RACE groundfish survey program follows well-defined and detailed survey protocols. The EBS survey was subject to an independent review in 2012 (http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/912Chapters/ChenReview912.pdf) 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.*" The latest surveys were in 2014 in the EBS and AI areas, and in 2013 in the GOA; the survey results were reviewed during the most recent stock assessments in 2014 and are published in SAFE and other documents.

In addition to the GOA and BSAI groundfish surveys undertaken by the AFSC, the ADFG also undertake an annual inshore bottom trawl survey. Inter-calibration studies between the NMFS and ADFG have been undertaken to explore the possibility of generating a combined survey index. http://www.adfg.alaska.gov/static/home/library/PDFs/afrb/vonsv8n2.pdf

Details on the 2013 ADFG bottom trawl survey for crab and groundfish in the Kodiak-Chignik-South Alaska Peninsula area can be found in http://www.adfg.alaska.gov/FedAidpdfs/FMR14-34.pdf. This document notes that NMFS is currently working on methods to incorporate the results of this survey in the Pacific cod SAFE process.

History of Management in Pacific Cod in GOA Region

The history of acceptable biological catch (ABC) and total allowable catch (TAC) levels is summarized and compared with the time series of aggregate commercial catches in Table 4. During the period 1978-1981, catch limits varied between 34,800 and 70,000 t, settling at 60,000 t in 1982. Prior to 1981 these limits were assigned for "fishing years" rather than calendar years. In 1981 the catch limit was raised temporarily to 70,000 t and the fishing year was extended until December 31 to allow for a smooth transition to management based on calendar years, after which the catch limit returned to 60,000 t until 1986, when ABC began to be set on an annual basis. From 1986 (the first year in which an ABC was set) through 1996, TAC averaged about 83% of ABC and catch averaged about 81% of TAC. In 8 of those 11 years, TAC equaled ABC exactly. In 2 of those 11 years (1992 and 1996), catch exceeded TAC.

To understand the relationships between ABC, TAC, and catch for the period since 1997, it is important to understand that a substantial fishery for Pacific cod has been conducted during these years inside State of Alaska waters, mostly in the Western and Central Regulatory Areas. To accommodate the State- managed fishery, the Federal TAC was set well below ABC (15-25% lower) in each of those years. Thus, although total (Federal plus State) catch has exceeded the Federal TAC in all but three years since 1997, this is basically an artifact of the bi-jurisdictional nature of the fishery and is not evidence of overfishing. At no time since the separate State waters fishery began in 1997 has total catch exceeded ABC, and total catch has never exceeded OFL. In 2014, the reported catch of Pacific cod in GOA (through mid-October) was well below the ABC and OFL levels (Table 4).

Changes in ABC over time are typically attributable to three factors: 1) changes in resource abundance, 2) changes in management strategy, and 3) changes in the stock assessment model. Assessments conducted prior to 1988 were based on survey biomass alone. From 1988-1993, the assessment was based on stock reduction analysis (Kimura et al. 1984). From 1994-2004, the assessment was conducted using the Stock Synthesis 1 modeling software (Methot 1986, 1990) with length-based data. The assessment was migrated to Stock Synthesis 2 in 2005 (Methot 2005b), at which time age-based data began to enter the assessment. Several changes have been made to the model within the SS2 framework (renamed "Stock Synthesis," without a numeric modifier, in 2008) each year since then.

Historically, the majority of the GOA catch has come from the Central regulatory area. To some extent the distribution of effort within the GOA is driven by regulation, as catch limits within this region have been apportioned by area throughout the history of management under the MFCMA. Changes in area-specific allocation between years have usually been traceable to changes in biomass distributions estimated by Alaska Fisheries Science Center trawl surveys or management responses to local concerns. Currently, the ABC allocation follows the average biomass distribution estimated by the three most recent trawl surveys, and the TAC allocation is within one percent of this distribution on an area-by-area basis.

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

Table 4. History of GOA Pacific cod catch (t, includes catch from State waters), Federal TAC (does not include State guideline harvest level), ABC, and OFL. ABC was not used in management of GOA groundfish prior to 1986. Catch for 2014 is current through 2014-10-14. The values in the column labeled "TAC" correspond to "optimum yield" for the years 1980- 1986, "target quota" for the year 1987, and true TAC for the years 1988-present. The ABC value listed for 1987 is the upper bound of the range. Source: NPFMC staff.

Year	Catch	TAC	ABC	OFL
1980	35,345	60,000	-	-
1981	36,131	70,000	-	-
1982	29,465	60,000	-	-
1983	36,540	60,000	-	-
1984	23,898	60,000	-	-
1985	14,428	60,000		-
1986	25,012	75,000	136,000	-
1987	32,939	50,000	125,000	-
1988	33,802	80,000	99,000	-
1989	43,293	71,200	71,200	-
1990	72,517	90,000	90,000	-
1991	76,328	77,900	77,900	-
1992	80,747	63,500	63,500	87,600
1993	56,488	56,700	56,700	78,100
1994	47,485	50,400	50,400	71,100
1995	68,985	69,200	69,200	126,000
1996	68,280	65,000	65,000	88,000
1997	77,018	69,115	81,500	180,000
1998	72,525	66,060	77,900	141,000
1999	81,785	67,835	84,400	134,000
2000	66,560	59,800	76,400	102,000
2001	51,542	52,110	67,800	91,200
2002	54,483	44,230	57,600	77,100
2003	52,579	40,540	52,800	70,100
2004	56,625	48,033	62,810	102,000
2005	47,585	44,433	58,100	86,200
2006	47,854	52,264	68,859	95,500
2007	51,428	52,264	68,859	97,600
2008	58,949	50,269	64,493	88,660
2009	52,931	41,807	55,300	66,000
2010	78,027	59,563	79,100	94,100
2011	84,841	65,100	86,800	102,600
2012	78,022	65,700	87,600	104,000
2013	68,593	60,600	88,500	107,300
2014	74,388	-	117,200	140,300

EBS/AI Management History

The history of acceptable biological catch (ABC), overfishing level (OFL), and total allowable catch (TAC) levels is summarized and compared with the time series of aggregate (i.e., all-gear, combined area) commercial catches in Table 5. Catches split by EBS and AI regions are shown in Tables 5 and 6. From 1980 through 2013, TAC averaged about 83% of ABC (ABC was not specified prior to 1980), and from 1980 through 2013 aggregate commercial catch averaged about 91% of TAC (remembering that 2013 catch data are not yet final).

In 10 of these 33 years (29%), TAC equalled ABC, and in 8 of these 34 years (24%), catch exceeded

TAC (by an average of 3%). However, three of those overages occurred in 2007, 2008, and 2010, when TAC was reduced by 3% to account for a small, State-managed fishery inside State of Alaska waters (similar reductions have been made in all years since 2006); thus, while the combined Federal and State catch exceeded the Federal TAC in 2007, 2008, and 2010 by 2% or less, the overall target catch (Federal TAC plus State GHL) was *not* exceeded. Total (BSAI) catch has been less than OFL in every year since 1993. In 2014, reported catches through mid-October were well below TAC, ABC, and OFL levels in both the EBS and AI areas.

Changes in ABC over time are typically attributable to three factors: 1) changes in resource abundance, 2) changes in management strategy, and 3) changes in the stock assessment model. Assessments conducted prior to 1985 consisted of simple projections of survey numbers at age. In 1985, the assessment was expanded to consider all survey numbers at age from 1979-1985. From 1985-1991, the assessment was conducted using an *ad hoc* separable age-structured model.

In 1992, the assessment was conducted using the Stock Synthesis modeling software (Methot 1990) with age-based data. All assessments from 1993 through 2003 continued to use the Stock Synthesis modeling software, but with length-based data. Age data based on a revised ageing protocol were added to the model in the 2004 assessment. At about that time, a major upgrade in the Stock Synthesis architecture resulted in a substantially new product, labeled "SS2" (Methot 2005). The assessment was migrated to SS2 in 2005, and several changes have been made to the model in most years since then. Since late 2013, due to recommendations from the SSC, there has been a split in stock assessment and management allocation for EBS and AI Region. Details on the stock assessment methodologies used in 2014 for both the EBS and AI components are described below in Section 5.

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

Table 5. History of BSAI Pacific cod catch, TAC, ABC, and OFL (t). Catch for 2014 is through October 14. Note that assessment specifications through 2013 were for the combined BSAI region, so combined BSAI catch is shown. The catches for 2014, split by EBS and AI, are shown separately in the last 2 lines of the table. Source for historical specifications: NPFMC staff.

Year	Catch	TAC	ABC	OFL
1977	36,597	58,000	-	-
1978	45,838	70,500	-	-
1979	39,354	70,500	-	-
1980	51,649	70,700	148,000	-
1981	63,941	78,700	160,000	-
1982	69,501	78,700	168,000	-
1983	103,231	120,000	298,200	-
1984	133,084	210,000	291,300	-
1985	150,384	220,000	347,400	-
1986	142,511	229,000	249,300	-
1987	163,110	280,000	400,000	-
1988	208,236	200,000	385,300	-
1989	182,865	230,681	370,600	-
1990	179,608	227,000	417,000	-
1991	220,038	229,000	229,000	-
1992	207,278	182,000	182,000	188,000
1993	167,391	164,500	164,500	192,000
1994	193,802	191,000	191,000	228,000
1995	245,033	250,000	328,000	390,000
1996	240,676	270,000	305,000	420,000
1997	257,765	270,000	306,000	418,000
1998	193,256	210,000	210,000	336,000
1999	173,998	177,000	177,000	264,000
2000	191,060	193,000	193,000	240,000
2001	176,749	188,000	188,000	248,000
2002	197,356	200,000	223,000	294,000
2003	207,907	207,500	223,000	324,000
2004	212,618	215,500	223,000	350,000
2005	205,635	206,000	206,000	265,000
2006	193,025	194,000	194,000	230,000
2007	174,486	170,720	176,000	207,000
2008	171,277	170,720	176,000	207,000
2009	175,756	176,540	182,000	212,000
2010	171,875	168,780	174,000	205,000
2011	220,109	227,950	235,000	272,000
2012	250,899	261,000	314,000	369,000
2013	250,274	260,000	307,000	359,000
2014 EBS	200,729	246,897	255,000	299,000
2014 AI	6,085	6,997	15,100	20,100

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

Table 6. Summary of 1991-2014 catches (t) of Pacific cod in the AI. To avoid confidentiality problems, longline and pot catches have been combined. The small catches taken by "other" gear types have been merged proportionally with the catches of the gear types shown. Catches for 2014 are through October 13.

	Federal			State	
Year	Trawl	Long.+pot	Subtotal	Subtotal	Total
1991	3,414	6,383	9,798		9,798
1992	14,587	28,481	43,068		43,068
1993	17,328	16,876	34,205		34,205
1994	14,383	7,156	21,539		21,539
1995	10,574	5,960	16,534		16,534
1996	21,179	10,430	31,609		31,609
1997	17,411	7,753	25,164		25,164
1998	20,531	14,196	34,726		34,726
1999	16,478	11,653	28,130		28,130
2000	20,379	19,306	39,685		39,685
2001	15,836	18,372	34,207		34,207
2002	27,929	2,872	30,801		30,801
2003	31,478	977	32,456		32,456
2004	25,770	3,103	28,873		28,873
2005	19,624	3,075	22,699		22,699
2006	16,963	3,535	20,498	3,714	24,211
2007	25,714	4,497	30,211	4,146	34,357
2008	19,404	7,507	26,910	4,319	31,229
2009	20,277	6,245	26,522	2,060	28,582
2010	16,757	8,277	25,034	3,967	29,001
2011	9,359	1,233	10,592	266	10,858
2012	9,789	3,201	12,991	5,232	18,223
2013	6,966	1,812	8,778	4,793	13,572
2014	5,656	429	6,085	4,451	10,536

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

Table 7. Summary of 1991-2014 catches (t) of Pacific cod in the EBS. The small catches taken by "other" gear types have been merged proportionally with the catches of the gear types shown. Catches for 2013 are through October 6.

Year	Trawl	Longline	Pot	Total
1991	129,393	77,505	3,343	210,241
1992	77,276	79,420	7,514	164,210
1993	81,792	49,296	2,098	133,186
1994	85,294	78,898	8,071	172,263
1995	111,250	97,923	19,326	228,498
1996	92,029	88,996	28,042	209,067
1997	93,995	117,097	21,509	232,601
1998	60,855	84,426	13,249	158,529
1999	51,939	81,520	12,408	145,867
2000	53,841	81,678	15,856	151,376
2001	35,670	90,394	16,478	142,542
2002	51,118	100,371	15,067	166,555
2003	46,717	108,775	19,959	175,451
2004	57,866	108,614	17,264	183,745
2005	52,638	113,184	17,114	182,936
2006	53,236	96,610	18,969	168,814
2007	45,700	77,181	17,248	140,129
2008	33,497	89,183	17,368	140,048
2009	36,959	96,606	13,609	147,174
2010	41,297	81,855	19,723	142,875
2011	64,085	117,103	28,063	209,250
2012	75,424	128,516	28,737	232,676
2013	81,619	124,823	30,261	236,702
2014	69,921	97,256	33,552	200,729

2013 GOA Survey Abundance Estimates
http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

Estimates of total abundance (both in biomass and numbers of fish) obtained from the trawl surveys are shown in Table 8 and in Figure 5. The highest biomass ever observed by the survey was the 2009 estimate of 752,651 t, and the low point was the preceding (2007) estimate of 233,310 t. The 2009 biomass estimate represented a 223% increase over the 2007 estimate. The 2011 biomass estimate was down 33% from 2009, but still 115% above the 2007 estimate. The 2013 biomass estimate is a small increase (1%) from the 2011 estimate.

In terms of population numbers, the record high was observed in 2009, when the population was estimated to include over 573 million fish. The 2005 estimate of 140 million fish was the low point in the time series. The 2009 abundance estimate represented a 199% increase over the 2007 estimate. The 2011 abundance estimate was a decrease of 39% from 2009, but still 81% above the 2007 estimate. The 2013 total abundance estimate is a small decrease (3%) from the 2011 estimate, and the 2013 estimate has a lower coefficient of variation (CV), 0.151, than the 2011 estimate. The 2013 abundance estimate for fish 27 cm and above is a decrease of 24% from the 2011 estimate, with a lower CV, 0.139, than in 2011. The 2013 abundance estimate for fish less than 27 cm is an increase of over 800% from the 2011 estimate, with a higher CV, 0.437, than in 2011. The total, 27-plus, and sub-27 abundance estimates for 2013 are a decrease of at least 39% from the 2009 estimates.

Table 8. Pacific cod abundance measured in biomass (t) and numbers of fish (1000s), as assessed by the GOA bottom trawl survey. Point estimates are shown along with coefficients of variation. The two right-hand sections show the total abundance divided into fish 27 cm or larger and fish smaller than 27 cm (totals are very slightly different in the first four years due to exclusion of tows with no length data from the strata extrapolations).

		All lengths			27-plus		Sub-27cm	
Year	Biomass(t)	CV	Abundance	CV	Abundance	CV	Abundance	CV
1984	550,971	0.145	320,525	0.156	296,057	0.175	19,526	0.596
1987	394,987	0.129	247,020	0.185	238,165	0.234	6,772	0.374
1990	416,788	0.152	212,132	0.208	193,577	0.243	14,739	0.412
1993	409,848	0.178	231,963	0.190	214,244	0.210	17,021	0.372
1996	538,154	0.198	319,068	0.215	234,528	0.172	84,540	0.615
1999	306,413	0.126	166,584	0.112	157,019	0.118	9,565	0.272
2001	257,614	0.202	158,424	0.180	137,041	0.203	21,384	0.270
2003	297,402	0.149	159,749	0.129	153,895	0.134	5,854	0.231
2005	308,091	0.258	139,852	0.208	127,282	0.221	12,570	0.388
2007	233,310	0.138	192,025	0.175	134,261	0.163	57,764	0.425
2009	752,651	0.296	573,509	0.286	422,370	0.239	151,139	0.867
2011	500,975	0.135	348,060	0.177	339,410	0.178	8,650	0.347
2013	506,362	0.148	337,992	0.151	257,315	0.139	80,677	0.437

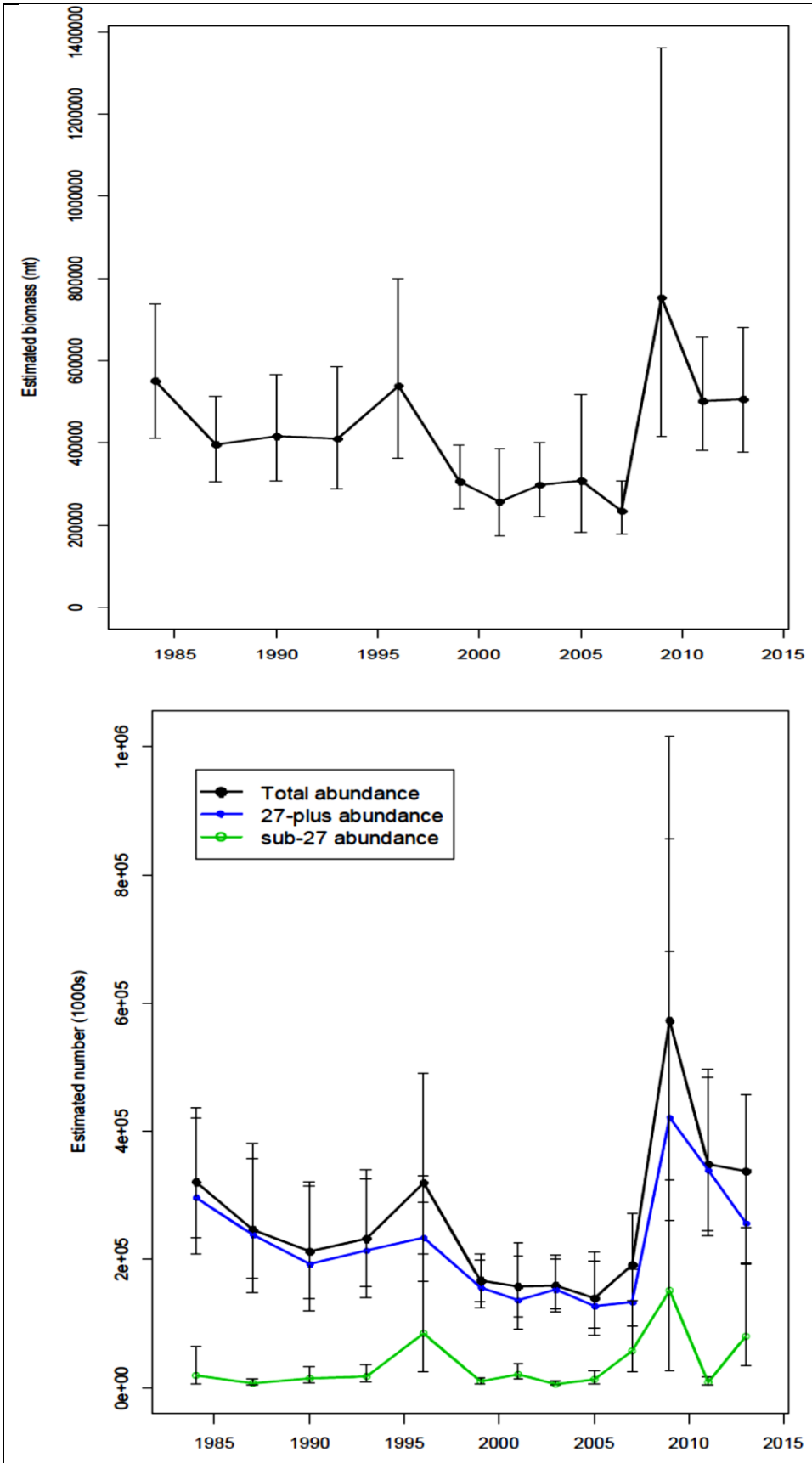


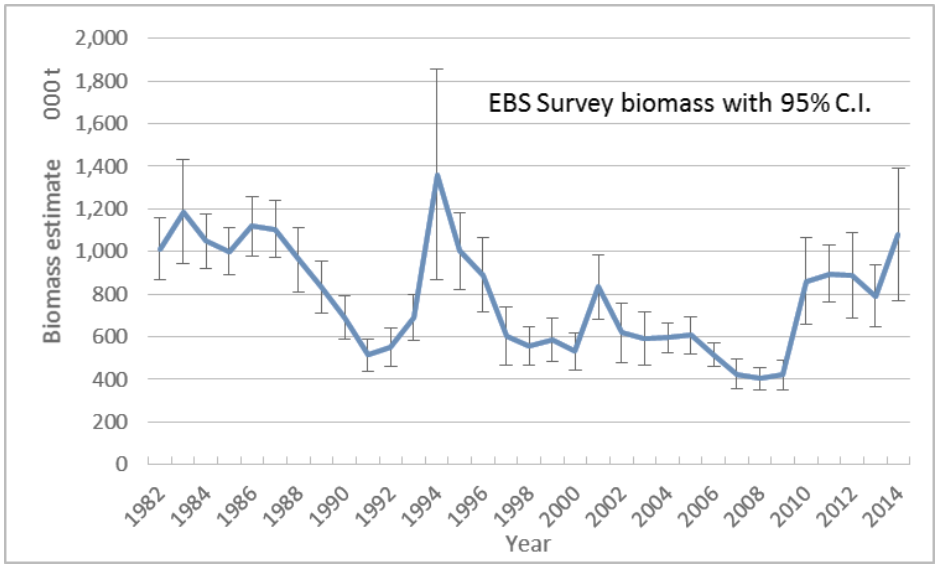
Figure 5. GOA NMFS Biomass (upper panel) and Abundance estimates (lower panel) for Pacific cod, with 95% confidence intervals.

EBS Shelf Bottom Trawl Survey
http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf

Estimates of total abundance (both in biomass and numbers of fish) obtained from the trawl surveys are shown in Table 9 and Figure 6, together with their respective standard errors. Upper and lower 95% confidence intervals are also shown for the biomass estimates. Survey results indicate that biomass remained relatively constant from 1982 through 1988. The highest biomass ever observed by the survey was the 1994 estimate of 1.36 million t. Following the high observation in 1994, the survey biomass estimate declined steadily through 1998. The survey biomass estimates remained in the 596,000-619,000 t range from 2002 through 2005. However, the survey biomass estimates dropped after 2005, producing an all-time low in 2007 and again in 2008. Estimated biomass more than doubled between 2009 and 2010, then remained relatively stable for the next three years, followed by another large increase (36%) in 2014, with the current estimate of 1.08 million tons being the fifth highest in the time series. Numerical abundance has shown more variability than biomass, with the estimates since 2007 generally well above average pre-2007 levels (with the exception of 2008, estimates since 2007 have all been at least 15% above the pre-2007 average). The 2013 estimate was down 24% from the 2012 estimate, but the 2014 estimate is up 49% from the 2013 estimate, and is the second highest estimate in the time series.

Table 9. Total biomass and abundance, with standard deviations, as estimated by EBS shelf bottom trawl surveys, 1982-2014. For biomass, lower and upper 95% confidence intervals are also shown.

	Biomass (t)				Abundance (1000s of fish)	
Year	Estimate	Std. deviation	L95% CI	U95% CI	Estimate	Std. deviation
1982	1,013,061	73,621	867,292	1,158,831	583,781	38,064
1983	1,187,096	120,958	942,640	1,431,553	752,456	80,566
1984	1,048,493	63,632	922,501	1,174,484	680,883	49,913
1985	1,001,112	55,845	890,540	1,111,684	841,108	113,438
1986	1,118,006	69,626	980,146	1,255,866	838,217	83,855
1987	1,104,868	68,304	969,627	1,240,109	728,974	48,488
1988	960,962	76,961	808,579	1,113,344	507,560	35,581
1989	833,473	62,713	709,300	957,645	292,247	19,986
1990	691,256	51,455	589,376	793,136	423,835	36,466
1991	514,407	38,039	439,090	589,725	488,892	51,108
1992	551,369	45,780	460,725	642,013	601,795	70,551
1993	691,494	54,580	583,425	799,562	852,837	106,923
1994	1,360,790	247,737	865,316	1,856,263	1,232,175	152,212
1995	1,002,961	91,622	821,550	1,184,372	757,910	75,473
1996	889,366	87,521	716,076	1,062,657	607,198	88,384
1997	604,439	68,120	468,199	740,678	485,643	70,802
1998	558,510	45,182	469,050	647,970	537,342	48,429
1999	584,884	50,616	484,664	685,104	501,554	46,620
2000	531,171	43,160	445,714	616,627	483,808	44,188
2001	833,626	76,247	681,133	986,119	985,569	94,981
2002	618,680	69,082	480,516	756,845	566,471	57,676
2003	590,973	62,121	466,732	715,214	498,873	62,220
2004	596,279	35,216	526,552	666,007	424,662	36,140
2005	606,415	43,047	521,182	691,648	450,918	63,358
2006	517,698	28,341	461,583	573,813	394,051	23,784
2007	423,703	34,811	354,080	493,326	733,374	195,955
2008	403,125	26,822	350,018	456,232	476,697	49,413
2009	421,291	34,969	352,053	490,530	716,637	62,705
2010	860,210	102,307	657,642	1,062,778	887,836	117,022
2011	896,039	66,843	763,690	1,028,388	836,822	79,207
2012	890,665	100,473	689,718	1,091,612	987,973	91,589
2013	791,958	73,952	644,054	939,862	750,889	124,917
2014	1,079,712	153,299	769,895	1,389,528	1,122,144	143,618



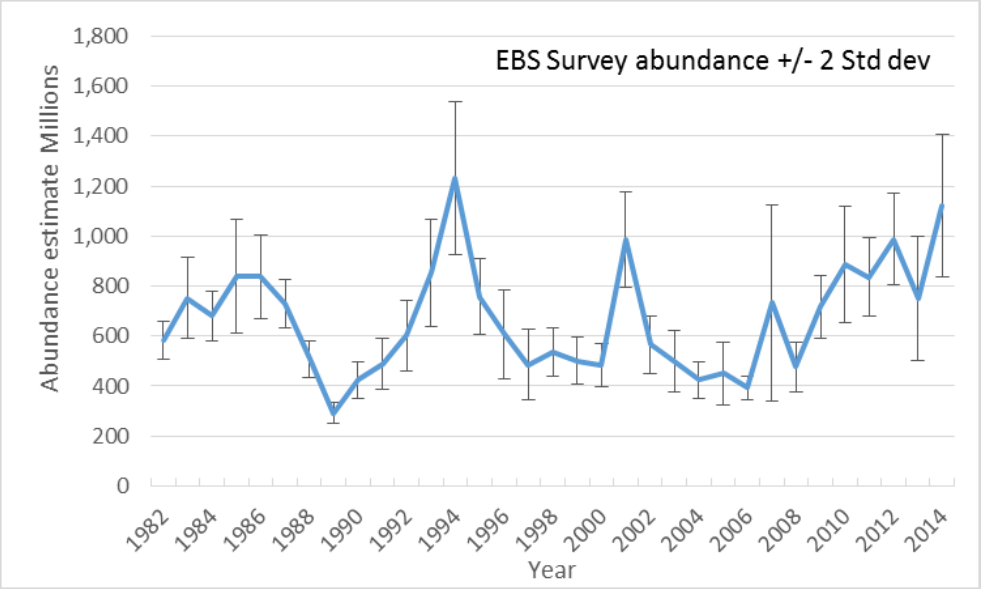


Figure 6. Pacific cod, EBS survey biomass estimates (000 t) with 95% confidence intervals (upper panel), and abundance estimates (millions of fish) with error bars showing +/- 2 standard deviations (lower panel). Data from Table 9.

AI NMFS Bottom Trawl Survey

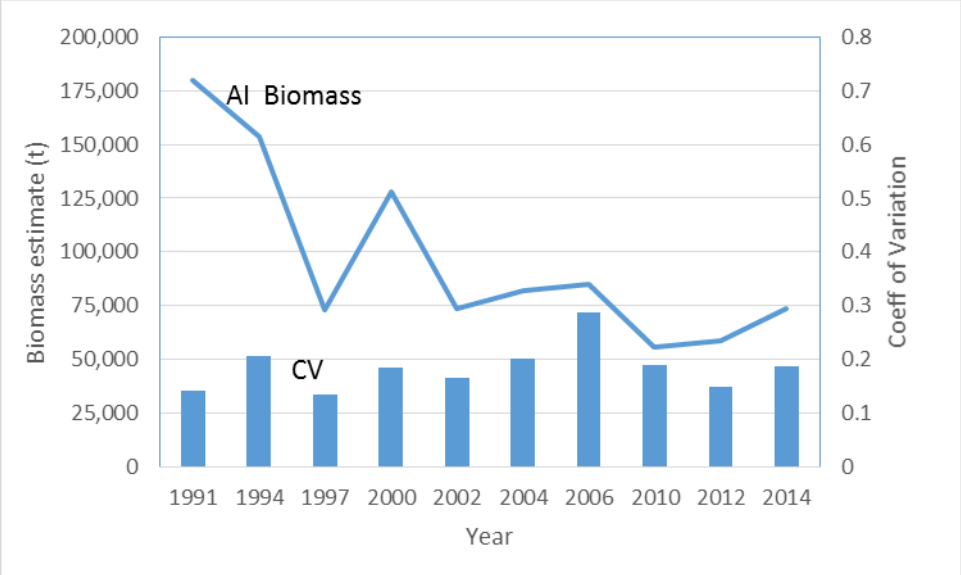
http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf

The time series of trawl survey biomass and numerical abundance are shown for Areas 541-543 (Eastern, Central, and Western AI, respectively), together with their respective coefficients of variation, in Table 10 and Figure 7. These estimates pertain to the Aleutian Islands management area, and so are smaller than the estimates pertaining to the Aleutian survey area that have been reported in BSAI Pacific cod stock assessments prior to 2013. Both the biomass and numerical abundance data indicate very consistent declines throughout the time series. Simple linear regressions on both time series estimate negative slope coefficients that are statistically significant at the 1% level.

Table 10. Total biomass and abundance, with coefficients of variation, as estimated by AI shelf bottom trawl surveys, 1991-2014.

	Biomass (t)				Population (1000s)			
Year	Western	Central	Eastern	All	Western	Central	Eastern	All
1991	75,514	39,729	64,926	180,170	18,679	13,138	33,669	65,486
1994	23,797	51,538	78,081	153,416	4,491	12,425	37,284	54,201
1997	14,357	30,252	28,239	72,848	4,000	12,014	8,859	24,873
2000	44,261	36,456	47,117	127,834	13,899	10,661	18,819	43,379
2002	23,623	24,687	25,241	73,551	6,840	6,704	12,579	26,123
2004	9,637	20,731	51,851	82,219	3,220	5,755	13,040	22,016
2006	19,734	21,823	43,348	84,905	6,521	6,243	8,882	21,646
2010	21,341	11,207	23,277	55,826	5,323	5,169	9,577	20,068
2012	13,514	14,804	30,592	58,911	4,100	5,596	9,480	19,176
2014	18,088	8,488	47,032	73,608	5,090	2,705	12,994	20,789

	Biomass coefficient of variation				Population coefficient of variation			
Year	Western	Central	Eastern	All	Western	Central	Eastern	All
1991	0.092	0.112	0.370	0.141	0.149	0.128	0.439	0.231
1994	0.292	0.390	0.301	0.206	0.245	0.202	0.444	0.310
1997	0.261	0.208	0.230	0.134	0.249	0.281	0.163	0.153
2000	0.423	0.270	0.222	0.185	0.544	0.305	0.291	0.228
2002	0.245	0.264	0.329	0.164	0.297	0.168	0.277	0.160
2004	0.169	0.207	0.304	0.200	0.166	0.173	0.241	0.152
2006	0.230	0.194	0.545	0.288	0.317	0.165	0.332	0.173
2010	0.409	0.257	0.223	0.189	0.338	0.173	0.216	0.144
2012	0.264	0.203	0.241	0.148	0.136	0.199	0.208	0.122
2014	0.236	0.276	0.275	0.187	0.153	0.216	0.220	0.145



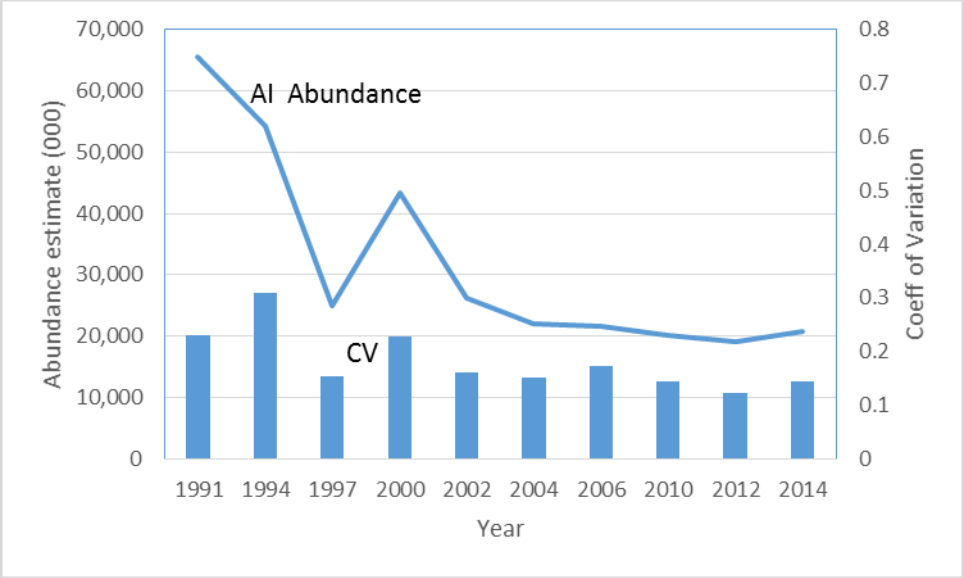


Figure 7. Pacific cod, AI management area, survey biomass estimates (000 t) with coefficient of variation (upper panel), and abundance estimates (thousands of fish) with coefficient of variation (lower panel). Data from Table 10.

For the most recent (Dec. 2014) Pacific cod stock assessments, details can be found at:
GOA stock assessment http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf;
EBS stock assessment http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf;
AI stock assessment http://www.afsc.noaa.gov/REFM/Docs/2014/aipcod.pdf

State Fisheries Data Collection

Details on the 2013 ADFG bottom trawl survey for crab and groundfish in the Kodiak-Chignik-South Alaska Peninsula area can be found in http://www.adfg.alaska.gov/FedAidpdfs/FMR14-34.pdf.

Data from state fisheries, such as catch-at-length, by gear type and month, has been incorporated into the stock assessments where possible/necessary.
http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

Socioeconomic data collection

The Economic and Social Sciences Research Program (ESSRP) within NMFS's Resource Ecology and Fisheries Management (REFM) Division provides economic and socio-cultural information that assists NMFS in meeting its stewardship programs. The REFM division presents an annual Economic Status Report of the Groundfish fisheries in Alaska.

The ESSRP report provides estimates of total groundfish catch, groundfish discards and discard rates, prohibited species catch (PSC) and PSC rates, the ex-vessel value of the groundfish catch, the ex-vessel value of the catch in other Alaska fisheries, the gross product value of the resulting groundfish seafood products, the number and sizes of vessels that participated in the groundfish fisheries off

Alaska, vessel activity, and employment on at-sea processors. The report also contains analysis and comment of the performance of a range of indices for different sectors of the North Pacific fisheries relate changes in value, price, and quantity, across species, product and gear types, to aggregate changes in the market. The NPFMC, the AFSC, and community stakeholder organizations have identified ongoing collection of community-level socio-economic information that is specifically related to commercial fisheries as a priority.

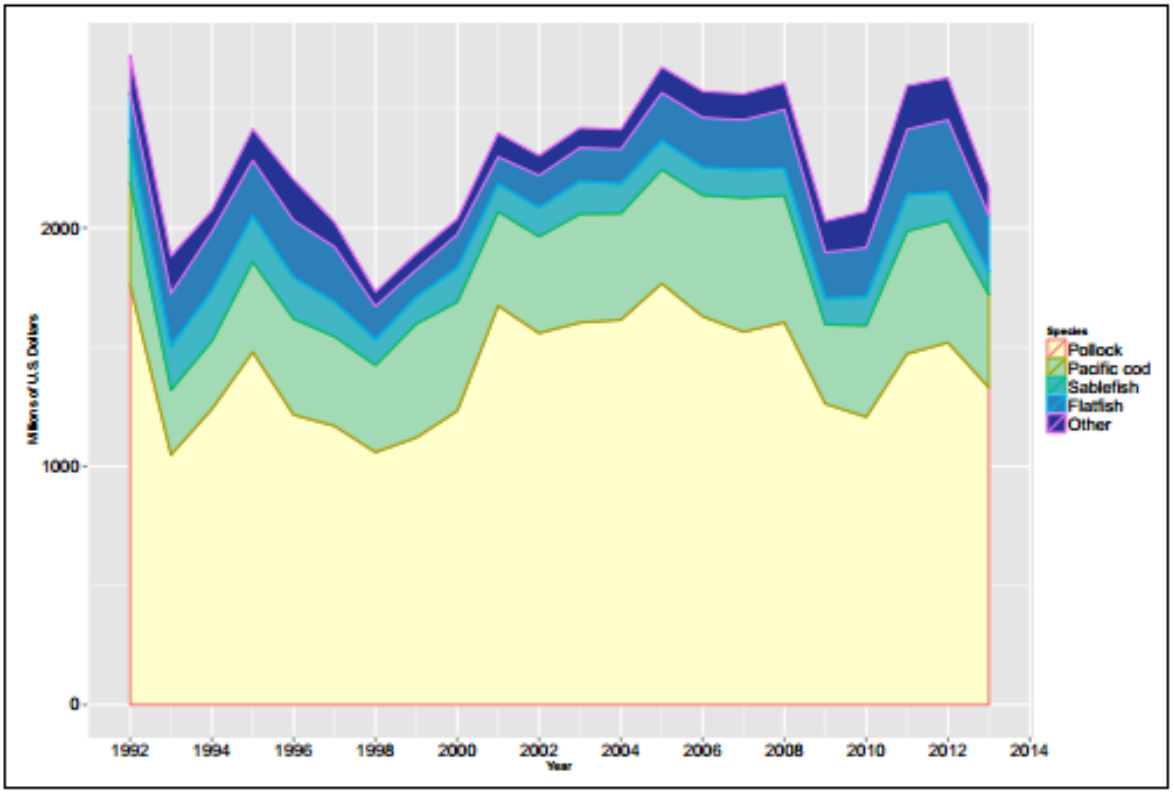


Figure 8. Real gross product value of the groundfish catch off Alaska by species, 1992-2013 (base year = 2013). http://www.afsc.noaa.gov/REFM/docs/2014/economic.pdf.

Community Profiles for North Pacific Fisheries – Alaska

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.
http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/CPU.php

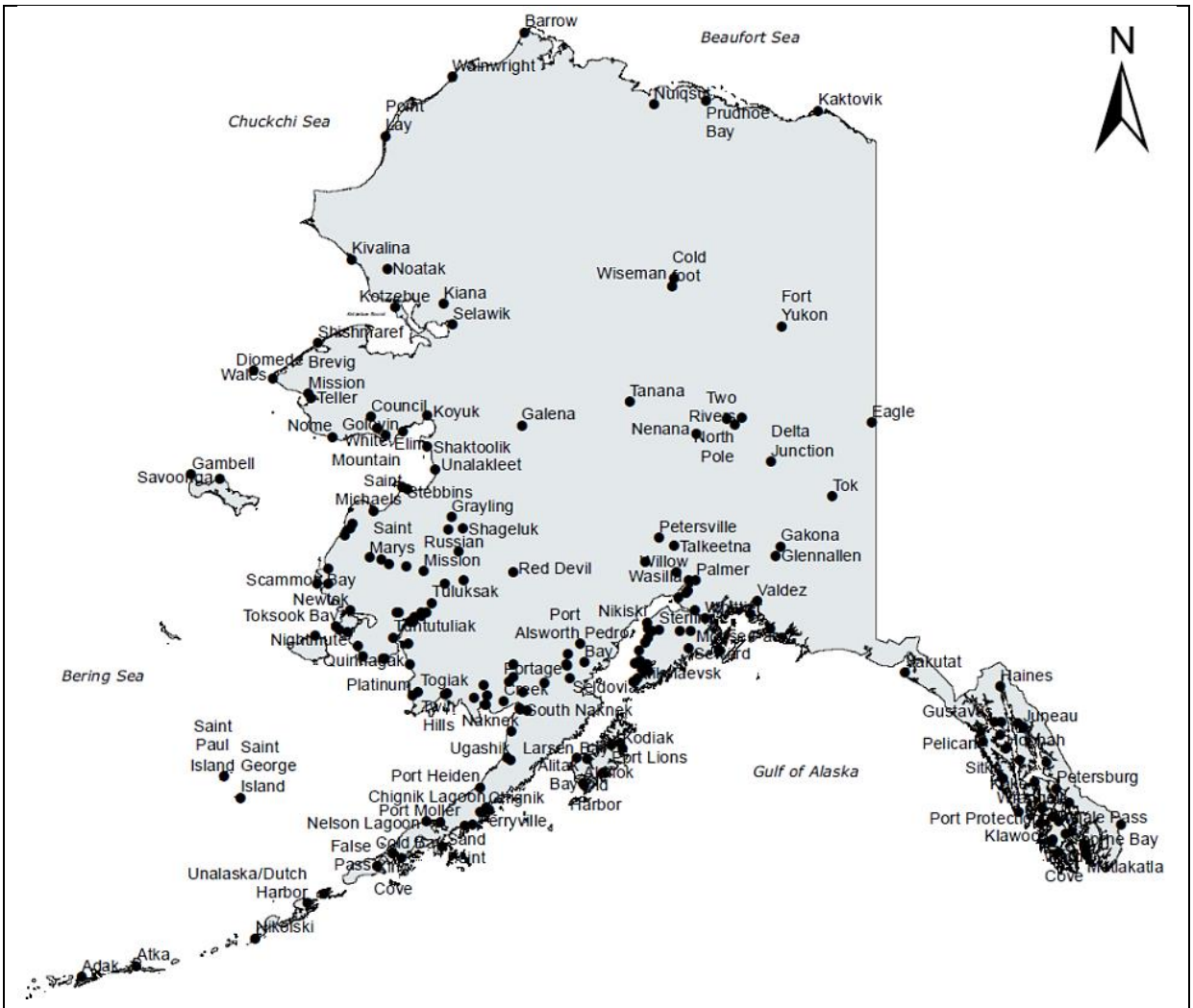


Figure 9. Alaska communities profiled.
http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/communityprofiles/Introduction_Methods_Overview.pdf

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

Alaska ensures that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science (NMFS, ADFG, ASMI). The research is disseminated accordingly. Alaska also ensures the availability of research facilities and provides appropriate training, staffing and institution building to conduct the research.

The nationally funded research into marine living resources in the North Pacific is primarily undertaken by the AFSC, although there are also a number of important research and monitoring programs undertaken by ADFG and academic institutions. The AFSC is a branch of the NMFS. The mission of the AFSC is to "*plan, develop, and manage scientific research programs which generate the best scientific data available for understanding, managing, and conserving the region's living marine resources and the environmental quality essential for their existence*".

The staff of the AFSC, amounting to over 400, (not all working on Pacific cod) is engaged in a broad arena of science covering fishery resources, oceanography, marine mammal, and environmental research including impacts of global warming and the impact of receding ice cover in the North Pacific. Figure 10 shows the structure of the organization and the various programs that AFSC undertake.

AFSC is primarily engaged in providing scientific and technical advice for the NPFMC and state bodies such as ADFG.

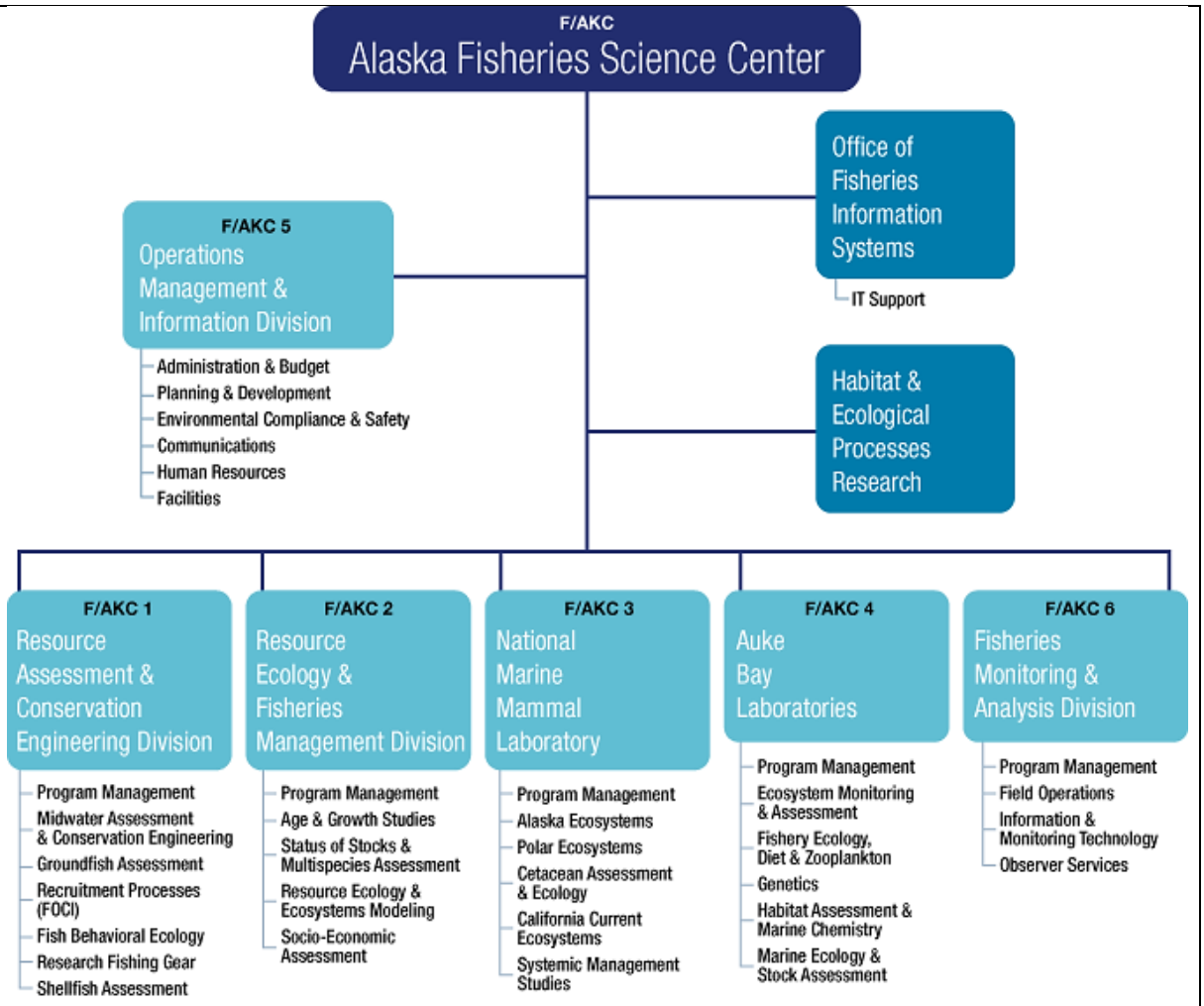


Figure 10. AFSC structure.

Within AFSC, REFM is responsible for the provision of stock assessment. REFM scientists work as part of Plan Teams who have the primary responsibility of presenting the outcomes of stock assessments to the SSC of the NPFMC. The Age and Growth Program of the REFM division are responsible for age determination from samples taken by at-sea and shore based observers and from fishery independent surveys. In addition, the Age Determination Unit of the ADFG also provides age information for Pacific cod caught in state waters.

Specifically relating to the assessment and management of Pacific cod, the RACE division is responsible for annual groundfish surveys, develop by-catch reduction techniques to enable the commercial fisheries manage and limit catches of PSC species and other unwanted catches, assess and quantify discard mortality and to undertake research into benthic impact of commercial gears.

The Auke Bay Laboratories conducts scientific research on fish stocks, fish habitats, and the chemistry of marine environments. Information from this research is widely used by commercial interests such as fishing industries, and governmental agencies involved in managing natural resources.

The National Marine Mammal Laboratory conducts research on marine mammals, with particular

attention to issues related to marine mammals off the coasts of Oregon, Washington and Alaska. Information is provided to various U.S. governmental and international organizations to assist in developing rational and appropriate management regimes for marine resources under NOAA's jurisdiction.

The FMA division monitors groundfish fishing activities in the EEZ off Alaska and conducts research associated with sampling commercial fishery catches, estimation of catch and bycatch mortality, and analysis of fishery-dependent data. The Division is responsible for training, briefing, debriefing and oversight of observers who collect catch data on-board fishing vessels and at onshore processing plants and for quality control/quality assurance of the data provided by observers.

NOAA operates an extensive research programme into resource economics and social sciences. http://www.afsc.noaa.gov/REFM/Socioeconomics/current_research.php The current areas of research include:

- Markets and Trade
- Data Collection and Synthesis
- Recreational Fisheries and Non-Market Valuation
- Models of Fishermen Behavior, Management and Economic Performance
- Models with Interactions Across Species
- Regional Economic Modeling
- Socioeconomic, Cultural and Community Analyses
- Catch Share Programs and Quota Markets

The entire data collation, analysis and assessment procedures are periodically subject to extensive external peer review through the Center for Independent Experts (CIE) http://alaskafisheries.noaa.gov/protectedresources/stellers/esa/biop/final/cie/about.htm. That includes reviews of species assessments, survey assessments and status of protected species and the action taken to conserve and manage them. A CIE review of the BSAI and GOA pacific cod assessments was conducted by a three-person panel in 2011, and resulted in 128 unique recommendations pertaining to the assessments of the stocks https://www.st.nmfs.noaa.gov/science-quality-assurance/cie-peer-reviews/cie-review-2011.

State management occurs from 0-3 miles from the coastline. The state of Alaska establishes seasons and GHLs through the BOF process. State scientists, managers and regulators determine research priorities during annual Policy and Planning Committee (PPC) meetings. ADFG scientists conduct research associated with sampling commercial fishery catches, conducting trawl surveys, estimation of catch, and analysis of fishery-dependent data, and collect biological and economic data as basis for the setting of Pacific cod management objectives. ADFG also provides to Divisions of Sport Fish and Commercial Fisheries staff technical fisheries reports policies, standard and guidance. http://www.adfg.alaska.gov/FedAidPDFs/SP12-14.pdf.

The following links provide information on the management of the state fisheries for P. cod in 2014 and 2015.

http://www.adfg.alaska.gov/FedAidPDFs/FMR15-01.pdf (Chignik)

http://www.adfg.alaska.gov/FedAidPDFs/FMR15-03.pdf (S Alaska Pen)

http://www.adfg.alaska.gov/FedAidPDFs/FMR14-58.pdf (A I District)

http://www.adfg.alaska.gov/FedAidPDFs/FMR14-59.pdf (Dutch Hr)

http://www.adfg.alaska.gov/FedAidPDFs/FMR14-55.pdf (Kodiak)

http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/508203729.pdf (Kod-Chig_SAl GHL)

http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/527777968.pdf (SE AL)

http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/507476951.pdf (Dutch Hr)

http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/507259721.pdf (Al Isl)

Guided by MSA standards, and other legal requirements, the NMFS has a well-established institutional framework for research developed within the AFSC. Scientists at the AFSC conduct research and stock assessments on Pacific cod in Alaska each year, producing annual Stock Assessment and Fishery Evaluation (SAFE) reports for the federally managed BS, AI, and GOA Pacific cod stocks. These SAFE reports summarize the best-available science, including the fishery dependent and independent data, document stock status, significant trends or changes in the resource, marine ecosystems, and fishery over time, assess the relative success of existing state and Federal fishery management programs, and produce recommendations for annual quotas and other fishery management measures. The annual stock assessments are peer reviewed by experts and recommendations are made annually to improve the assessments.

The *National Standard Guidelines for Fishery Management Plans* published by the NMFS require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). To satisfy this requirement, an annual groundfish SAFE is published for both the BSAI and GOA groundfish fisheries. The SAFE reports summarize the best available scientific information concerning the past, present, and possible future condition of the groundfish stocks and their associated ecosystems. The information contained within the SAFE reports forms the basis for Council decisions on annual harvest levels, technical measures and other management actions.

The SAFE assessments are peer reviewed by experts and recommendations are made to improve the assessments through directed research. These recommendations are made by the assessment Plan Teams, the SSC, and during periodic reviews by the CIE. The recommendations from previous meetings are highlighted in the introductions of the assessment SAFE documents and progress on recommended research is noted accordingly. The groundfish SAFE reports are divided into sections

covering individual stocks. In the case of the Pacific cod, originally the chapters were composed of the Eastern Bering Sea (EBS)/Aleutian Islands (AI), and Gulf of Alaska (GOA) stocks. However, in late 2013 the EBS/AI chapter was split in two stocks, and separate assessments were conducted in 2013 and 2014.

Gulf of Alaska http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

An age-structured model covering the period from 1977 to 2014 is used to assess Gulf of Alaska Pacific cod, and includes individuals from age 0 to age 20+. The same fundamental model structure and assumptions had been used in the 2005-2013 assessments although some considerable changes had been implemented (e.g. change from Stock Synthesis I to Stock Synthesis 2 in ADMODEL BUILDER platform). The 2014 assessment was run using the latest version (3.24S) of the Stock Synthesis software. Pacific cod population dynamics are modeled using standard formulations for mortality and fishery catch.

Summary of changes in assessment inputs as reported in the December 2014 GOA Pacific cod SAFE.

- Federal and state catch data for 1997 – 2013 were updated and preliminary federal and state catch data for 2014 were included
- Commercial federal and state fishery size composition data for 1997 – 2013 were updated, and preliminary commercial federal and state fishery size composition data for 2014 were included.

The 2014 SAFE assessment formulation differed from the 2013 assessment. These differences include:

- Using all of the GOA NMFS bottom trawl survey as a single source of data instead of being split into sub-27 cm and 27+ cm, for the abundance estimates and the length- and age-composition data;
- Using 3 blocks of non-parametric or cubic spline-based survey selectivity-at-age instead of 12 blocks of double normal selectivity-at-age;
- Including the survey age data as conditional age-at-length data instead of age composition and mean size-at-age data; and
- Using the recruitment variability multiplier (sigmaR multiplier) for recent recruits

The new assessment model also allowed for the estimation of more flexible survey selectivity-at-age curves and variability in the length-at-age relationship.

GOA Results

Spawning biomass showed an increase since 2008, followed by a slight decline in 2015. The model projection of spawning biomass in 2015 was 155,400 t, which is 49% of unfished spawning biomass (B100%) and above B40% (126,600 t). The spawning biomass estimated for 2015 in the 2014 assessment is 39% higher that the projected 2015 value from the 2013 assessment. The 2015 ABC recommendation for Pacific cod in the Gulf of Alaska (GOA) was 117,200 t, an increase of 32% from the 2014 ABC. However, the Plan Team for the Groundfish Fisheries of the Gulf of Alaska, as an

intermediate step, recommended that ABC for 2015 be set at a value half way between the maximum permissible ABC in the assessment and the 2014 ABC, which would result in an ABC for 2015 of 102,850 t http://www.afsc.noaa.gov/REFM/Docs/2014/GOAintro.pdf. See the table below for a full summary of the GOA SAFE assessment conclusions, and later figures for trajectories of biomass and fishing mortality.

Table 11. Results of the 2014 Stock Assessment for P. cod in the GOA region.

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

Quantity	As estimated or *specified last* year for:		As estimated or *specified this* year for:	
	2014	2015	2015	2016
M (natural mortality rate)	0.38	0.38	0.38	0.38
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	422,000	397,000	583,800	558,200
Female spawning biomass (t)				
Projected	120,100	111,500	155,400	150,400
Upper 95% confidence interval	142,800	132,500	215,400	210,400
Lower 95% confidence interval	97,500	90,500	95,400	90,400
$B_{100\%}$	227,800	227,800	316,500	316,500
$B_{40\%}$	91,100	91,100	126,600	126,600
$B_{35\%}$	79,700	79,700	110,700	110,700
F_{OFL}	0.69	0.69	0.626	0.626
$maxF_{ABC}$	0.54	0.54	0.502	0.502
F_{ABC}	0.54	0.54	0.502	0.502
OFL (t)	107,300	101,800	140,300	133,100
maxABC (t)	88,500	84,100	117,200	110,700
ABC (t)	88,500	84,100	117,200	110,700
Status	As determined *last* year for:		As determined *this* year for:	
	2012	2013	2013	2014
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

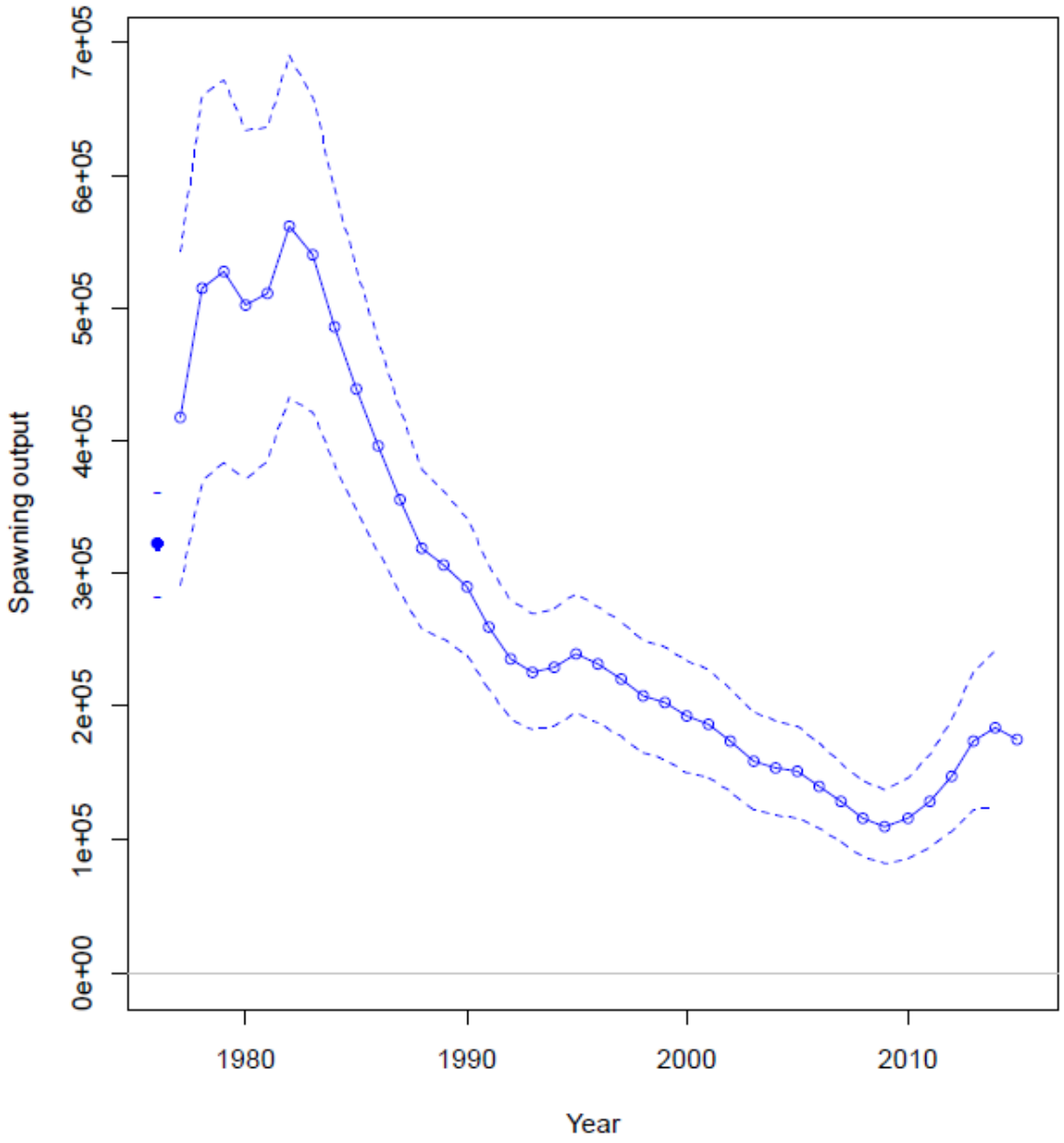


Figure 11. GOA P. cod, time series of female spawning biomass estimates with 95% asymptotic intervals.

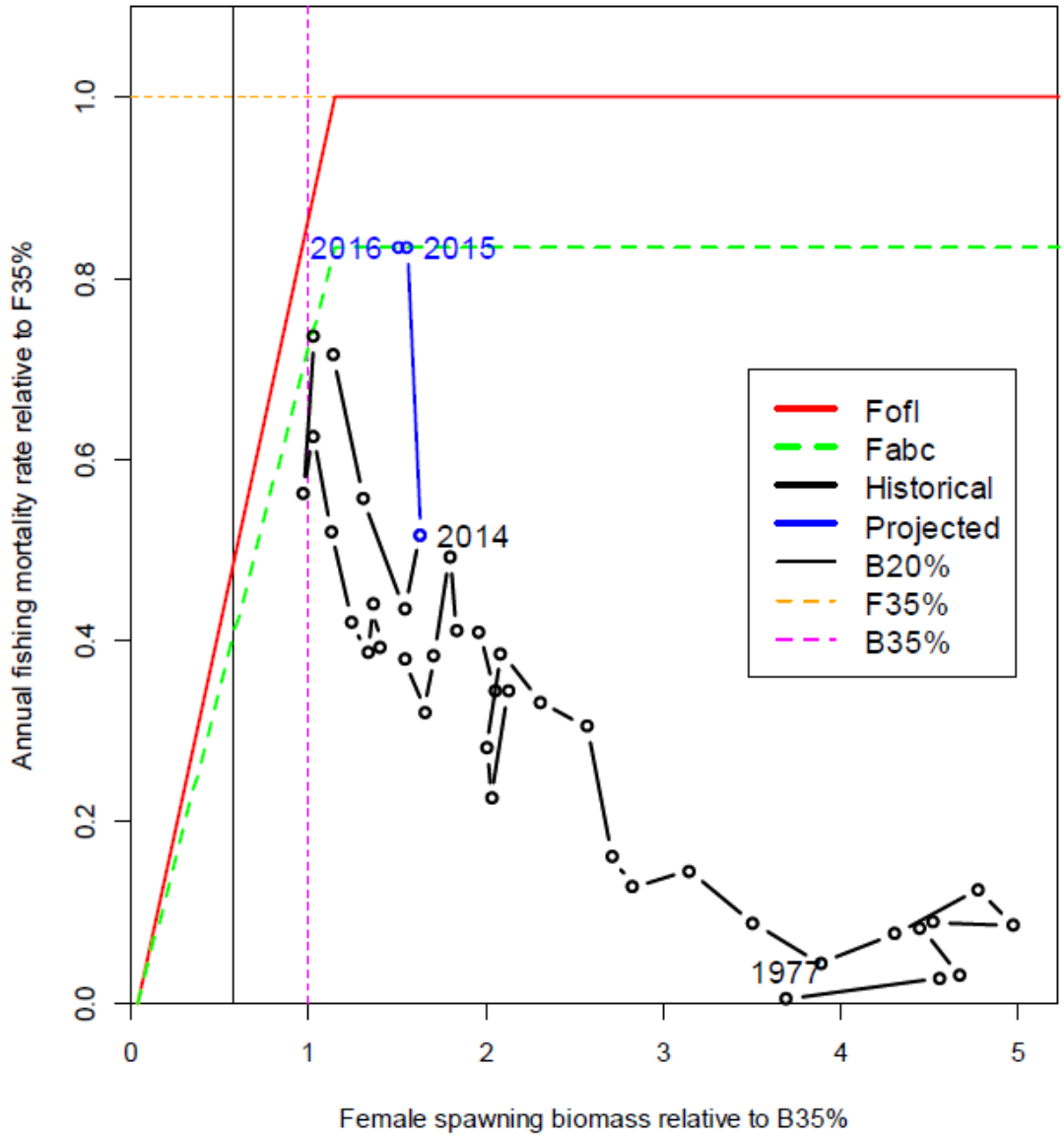


Figure 12. Trajectory of GOA Pacific cod fishing mortality and female spawning biomass as estimated by model used in the 2014 stock assessment.

Eastern Bering Sea http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf

The EBS stock is assessed using a statistical age-structured (Stock Synthesis) assessment model applied over the period 1977-2014. The 2014 assessment used a similar assessment framework as the 2011, 2012 and 2013 assessments. Although Pacific cod in the EBS and AI were managed on a BSAI-wide basis through 2013, the stock assessment model has always been configured for the EBS stock only.

Summary of major changes in data input as reported in the Dec 2014 EBS Pacific cod SAFE:

- Catch data for 1991-2013 were updated, and preliminary catch data for 2014 were

incorporated.

- Commercial fishery size composition data for 2013 were updated, and preliminary size composition data from the 2014 commercial fisheries were incorporated.
- Size composition data from the 2014 EBS shelf bottom trawl survey were incorporated.
- The numeric abundance estimate from the 2014 EBS shelf bottom trawl survey was incorporated (the 2014 estimate of 1,222 million fish was up about 49% from the 2013 estimate).
- Age composition data from the 2013 EBS shelf bottom trawl survey were incorporated.
- Mean length at age data from the 2013 EBS shelf bottom trawl survey were incorporated.
- Seasonal catch per unit effort (CPUE) data for the trawl, longline, and pot fisheries from 2013 were updated, and preliminary CPUE data for the trawl, longline, and pot fisheries from 2014 were incorporated.

Many changes were considered in the stock assessment model since the 2013 assessment, and six models were presented in the 2014 preliminary assessment. However, the base model that has been used for setting harvest specifications in recent years was recommended to be retained in 2014 for the purpose of setting final harvest specifications for 2015 and preliminary harvest specifications for 2016.

EBS Results

The EBS assessment model showed that spawning biomass gradually increased since 2009, to a projected value in 2015 of 409,000 t, which is 49.6% of unfished spawning biomass (B100%) and above B40% (318,000 t). The maximum 2015 ABC in this tier is 295,000 t, but the Team recommend that the ABC be held at the 2014 level of 255,000 t to compensate for the poor retrospective behavior of the standard model http://www.afsc.noaa.gov/REFM/Docs/2014/BSAIintro.pdf. The following table shows a summary of the model results plus harvest fishing strategies for the 2015 season.

Table 12. Results of the 2014 Stock Assessment for P. cod in the EBS region.

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

Quantity	As estimated or *specified last* year for: 2014	2015	As estimated or *recommended this* year for: 2015*	2016*
M (natural mortality rate)	0.34	0.34	0.34	0.34
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	1,570,000	1,640,000	1,680,000	1,770,000
Projected female spawning biomass (t)	361,000	389,000	409,000	473,000
$B_{100\%}$	796,000	796,000	824,000	824,000
$B_{40\%}$	318,000	318,000	330,000	330,000
$B_{35\%}$	279,000	279,000	288,000	288,000
F_{OFL}	0.34	0.34	0.35	0.35
$maxF_{ABC}$	0.28	0.28	0.29	0.29
F_{ABC}	0.28	0.28	0.21	0.20
OFL (t)	299,000	319,000	346,000	389,000
maxABC (t)	255,000	272,000	295,000	316,000
ABC (t)	255,000	272,000	255,000	287,000
Status	As determined *last* year for: 2012	2013	As determined *this* year for: 2013	2014
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

*Projections are based on estimated catches of 212,000 t and 231,000 t for 2015 and 2016, respectively.

Time series of age 0+, age 3+, and female spawning biomass estimates from the model are shown, together with the observed time series of trawl survey biomass, in Figure 13 below.

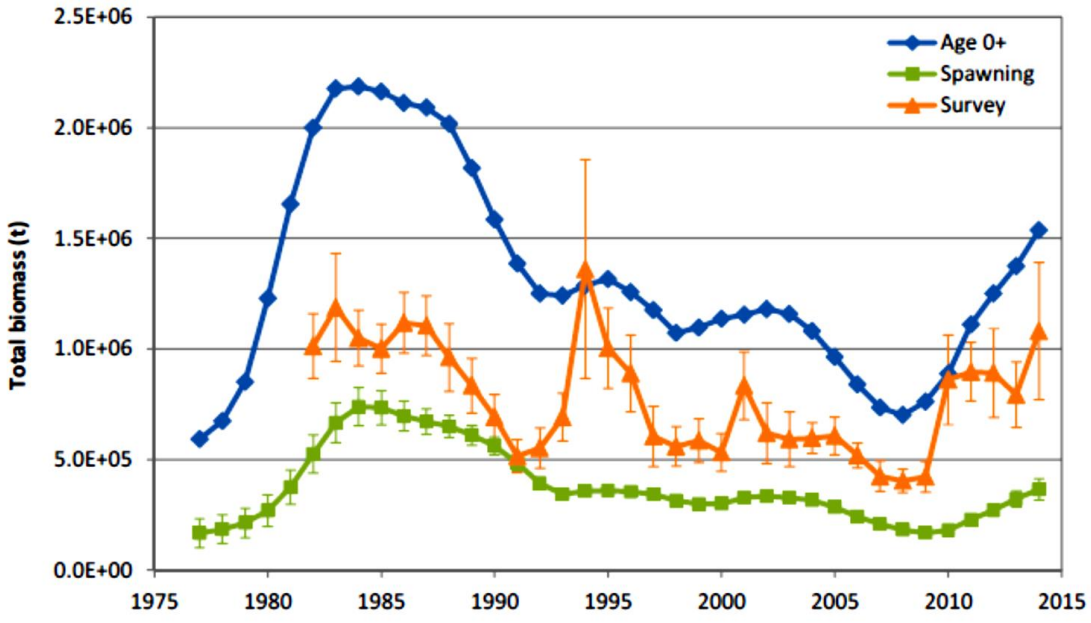


Figure 13. Time series of age 0+, age 3+, and female spawning biomass for EBS Pacific cod as estimated by the assessment model. Survey biomass is shown for comparison.

Figure 14 plots the estimated trajectory of relative fishing mortality and relative female spawning biomass from 1977 through 2016 based on full-selection fishing mortality, overlaid with the current harvest control rules. Note that fishing mortality rates for all years except 2006-2012 appear to have

been lower than the *FOFL* control rule. The values for 2006-2012 may be due to a retrospective bias in the assessment.

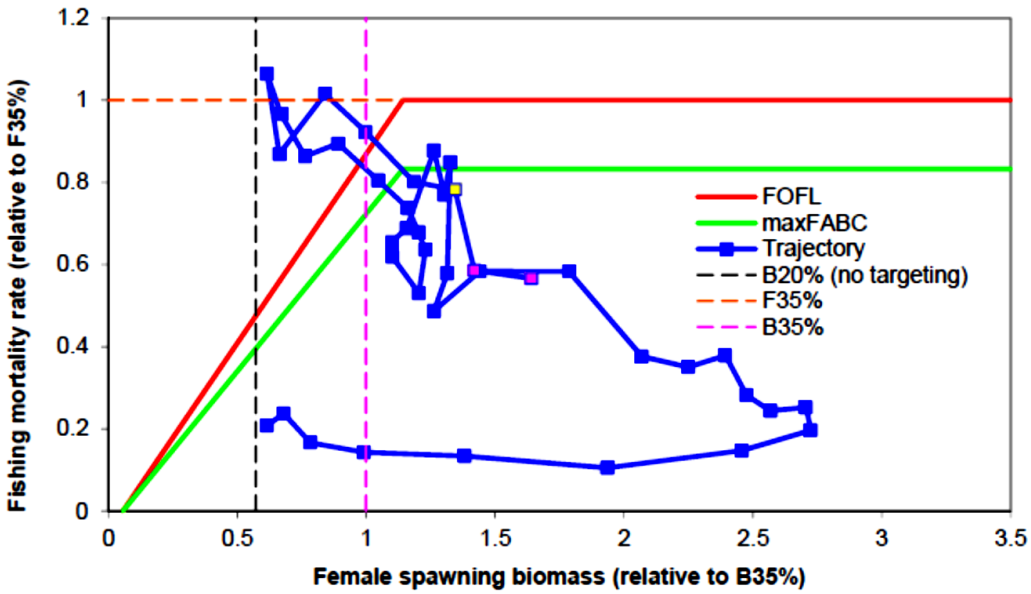


Figure 14. Trajectory of EBS Pacific cod fishing mortality and female spawning biomass as estimated by the stock assessment model, 1977-present (yellow square = 2014, magenta squares = first two projection years, 2015 and 2016).

Aleutian Islands http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf

In late 2013, the BSAI Pacific cod SAFE was split into the eastern Bering Sea (EBS) stock and the Aleutian Islands (AI). Thus, separate harvest specifications were set for the EBS and AI Pacific cod stocks beginning with the 2014 fishery, and models were developed using Tier 3 and 5 criteria. In the 2014 assessment, both types of models were again presented for AI, and it was recommended that the Tier 5 random effects model accepted for use by SSC last year be adopted for setting 2015 and 2016 harvest specifications. Results of all model formulations were included in the SAFE document, but only the Tier 5 model recommended for the management options are discussed below, consistent with the material presented for GOA and EBS stocks previously.

Summary of major changes in data input as reported in the Dec 2014 AI Pacific cod SAFE:

Changes in the Input Data

- Catch data for 1991-2013 were updated, and preliminary catch data for 2014 were incorporated.
- Commercial fishery size composition data for 2013 were updated, and preliminary size composition data from the 2014 commercial fisheries were incorporated.
- All fishery data (catch and size composition) from years prior to 1991 were removed.
- The numeric abundance estimate from the 2014 AI bottom trawl survey was incorporated (the 2014 estimate of 20.8 million fish was up about 8% from the 2012 estimate).

- Age composition data from the 2010 AI bottom trawl survey were incorporated.

The model accepted is a very simple, state-space model of the "random walk" variety, and uses trawl survey biomass data. The only parameter in the model is the log of the log-scale process error standard deviation. When used to implement the Tier 5 harvest control rules, the model also requires an estimate of the natural mortality rate. The principal results of the 2014 assessment, based on the current Tier 5 model, are listed in the table below and compared with the corresponding quantities from last year's assessment as specified by the SSC. As shown in Figure 15, biomass has increased slightly in recent years, but remains close to the series low. The 2015 biomass estimate of 68,900 tons is almost 3 times the OFL, and the recommended ABC for 2015 was 17,200 t.

Table 13. Results of the 2014 Stock Assessment for P. cod in the AI region.

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

Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2014	2015	2015	2016
M (natural mortality rate)	0.34	0.34	0.34	0.34
Tier	5	5	5	5
Biomass (t)	59,000	59,000	68,900	68,900
F_{OFL}	0.34	0.34	0.34	0.34
$maxF_{ABC}$	0.26	0.26	0.26	0.26
F_{ABC}	0.26	0.26	0.26	0.26
OFL (t)	20,100	20,100	23,400	23,400
maxABC (t)	15,100	15,100	17,600	17,600
ABC (t)	15,100	15,100	17,600	17,600
Status	As determined *last* year for:		As determined *this* year for:	
	2012	2013	2013	2014
Overfishing	No	n/a	No	n/a

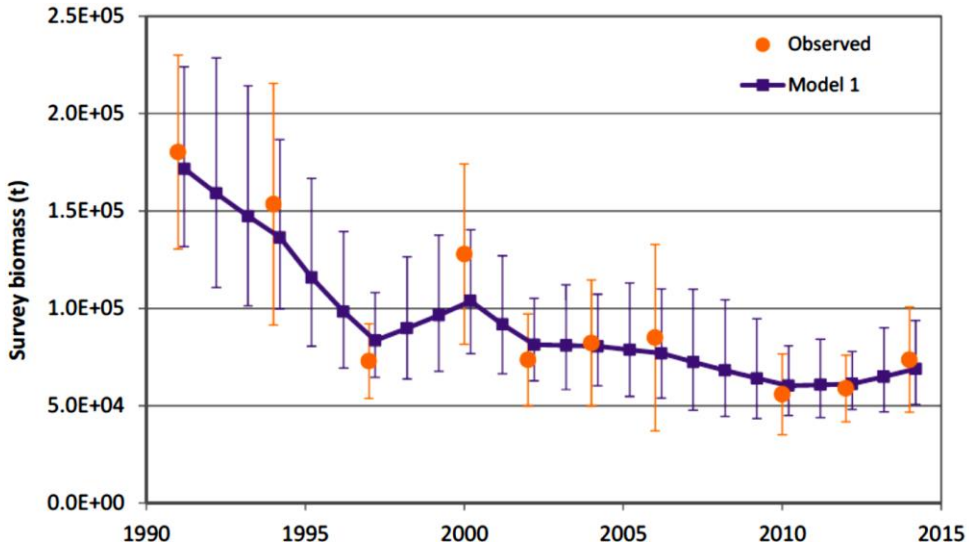


Figure 15. AI Pacific cod, fit of Tier 5 random effects model to survey biomass time series, with 95% confidence intervals for the observations and the estimates. Horizontal axis values have been offset to avoid over-plotting.

State Fisheries

As noted previously, there are eight state-managed fisheries for P. cod in the near shore areas adjacent to the three major stock areas (GOA, EBS, AI). Data collection has been described for these in Section 4 above, and the data are reviewed during the SAFE process for the P cod stocks.

For 2015, the GHL for the eight stocks are given in Table 14. These have been derived as percentages of the ABC for the larger stock areas. For example, 75% of the ABC for the Central GOA P. cod is allocated to the federal + parallel fisheries, while the remaining 25% is allocated as follows: 3.75% to Cook Inlet, 12.5% to Kodiak, and 8.75% to Chignik. The GHLs for each of the Dutch Harbor and Aleutian Island state fisheries are calculated as 3% of the combined EBS + AI ABC. These percentages are contained in the ADFG Fishery Management Plans referred to earlier (e.g. http://www.adfg.alaska.gov/FedAidPDFs/FMR14-55.pdf).

Table 14. 2015 GHLs for P. cod in the eight Alaska state fisheries.
Figures rounded to millions of pounds (2 dec. places), and nearest metric ton.
Value for SE Alaska is upper end of recommended range.
See text for ADFG references for 2015 GHLs.

	Million lbs	Tons
Kodiak	16.90	7666
Chignik	11.83	5366
S Alaska Pen.	25.60	11612
Aleutian Is	18.03	8178
Dutch Hr	18.03	8178
SE Alaska	1.25	567
P W Sound	1.56	708
Cook Inlet	5.07	2300
Total state GHL	98.27	44575

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 EBS, AI, and GOA groundfish management plans define target and limit reference points for Pacific cod and other groundfish. Each SAFE report describes the current fishing mortality rate, stock biomass relative to target and limit reference points.

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, Bmsy, F, Fmsy and Fpr) is shown in Figure 16.

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

1b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

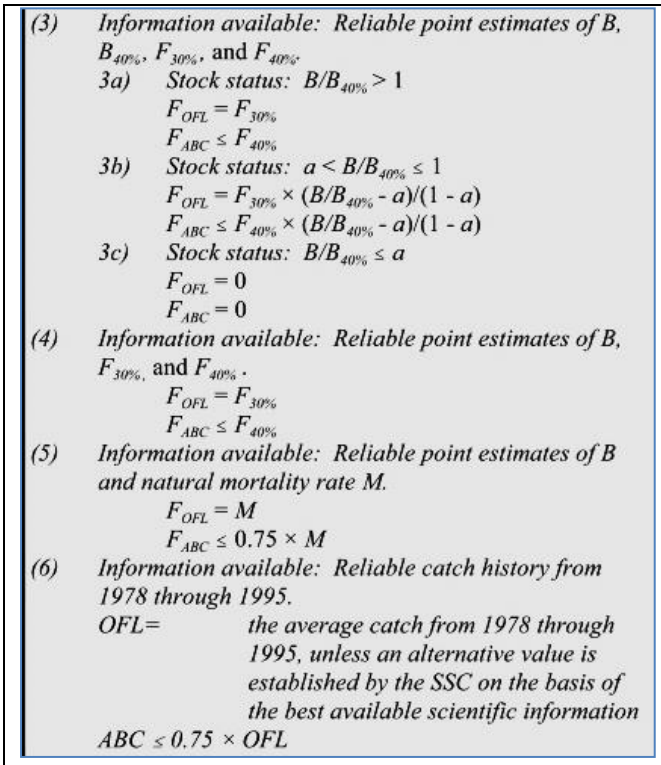
1c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

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

2a) *Stock status:* $B/B_{MSY} > 1$
$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%})$
$F_{ABC} \le F_{MSY}$

2b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%}) \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$

2c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$



(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 16. Tier system used to determine ABC and OFL for groundfish stocks.

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 Bmsy or the biomass $B_{X\%}$ corresponding to the percentage of the equilibrium spawning biomass that would be obtained in the absence of fishing (Tier 1-2; 3).

For Pacific cod, there are no reliable estimates of MSY, but reliable estimates of reference points relative to spawning per recruit are: $B_{40\%}$ which equates to 40% of the equilibrium spawning biomass that would be obtained in the absence of fishing and $F_{35\%}/F_{40\%}$ the fishing mortality rate that reduces the equilibrium level of spawning per recruit to 35%/40% of the level that would be obtained in the absence of any fishing. This places both EBS and GOA Pacific cod into Tier 3. With the 2014 assessment for AI Pacific cod being based on a model of survey biomass, this stock is in Tier 5, resulting in reference points for total biomass and fishing mortality.

GOA Pacific cod stock

The 2015 GOA Pacific cod female spawning biomass was projected by the 2014 SAFE to be 155,400, which is above $B_{40\%}$ of 126,600t. This places the stock into Tier 3a. Figure 16 above shows the position of the 2014 and 2015 biomass levels relative to several reference points, including $B_{35\%}$.. http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

EBS Pacific cod

The 2015 EBS Pacific cod female spawning biomass was projected by the 2014 SAFE to be 409,000 t which is above the $B_{40\%}$ (the B_{MSY} proxy in tier 3 stocks) of 330,000 t. This places the stock into Tier 3a. Figure 16 above shows the position of the 2014 and 2015 biomass levels relative to several

reference points, including $B_{35\%}$. http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf

AI Pacific cod

The 2015 AI Pacific cod biomass was projected by the 2014 SAFE to be 68,900 tonnes which is above the OFL of 23,400. There is no proxy for $B_{40\%}$ (the B_{MSY} proxy in the tier 3 stocks). This places the stock into Tier 5. http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf

Overfishing and overfished determinations.

None of the EBS, AI, or GOA Pacific cod management units was considered overfished or undergoing overfishing based on the 2013 SAFE documents. For both Tier 3 stocks (GOA and EBS), this statement is also true for the 2014 SAFE (See Tables Y10 and Y11 above). For the AI stock, the 2014 SAFE determined that no overfishing occurred, but no statement can be made about its current "overfished" status, as there are now no MSY-based reference points for this Tier 5 stock.

For each stock and stock complex, a determination of status with respect to "overfishing" is made in-season as the fisheries are monitored to prevent exceeding the TAC and annually as follows: If the catch taken during the most recent calendar year exceeded the OFL that was specified for that year, then overfishing occurred during that year; otherwise, overfishing did not occur during that year. In the event that overfishing is determined to have occurred, a remedial action will result. This may be an in-season action, an FMP amendment, a regulatory amendment or a combination of these actions implemented to end such overfishing immediately.

A stock or stock complex is determined to be "overfished" if it falls below the MSST. According to the National Standard Guidelines definition, the MSST equals 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. If a stock is determined to be in an overfished condition, a rebuilding plan would be developed and implemented for the stock, including the determination of an F_{OFL} and F_{MSY} that will rebuild the stock within an appropriate time frame.

The "approaching overfished" determination is made by projecting the numbers-at-age vector from the current year forward two years under the assumption that the stock will be fished at max F_{ABC} in each of those years, then determining whether the stock would be considered "overfished" at that time. In the event that a stock or stock complex is determined to be approaching a condition of being overfished, a remedial action will result. This may be an inseason action, an FMP amendment, a regulatory amendment or a combination of these actions implemented to prevent overfishing from occurring. For the 8 state fisheries, there are no specific overfishing definitions or reference points, but it is important to note that the federal fisheries are not allocated the full ABC for the stocks, and a portion is allocated to state fisheries. These state fisheries appear to be well managed, and in recent years have taken catches of P. cod below the overall state GHL levels (see clause 4 and 5 for evidence).

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

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.

In Alaska waters, Pacific cod fisheries are managed separately. In the Bering Sea, Aleutian Islands, and Gulf of Alaska Pacific cod are managed under groundfish fishery management plans. All these fishery management plans includes the precautionary approach on the management principles and determination of stock status. The following is from the 2015 BSAI FMP, which contains management procedures according to the precautionary approach. This information is is also included in the 2015 GOA FMP.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAI_FMP_APR_2015.pdf

Management Approach for the BSAI Groundfish Fisheries

The Council's policy is to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations. The productivity of the North Pacific ecosystem is acknowledged to be among the highest in the world. For the past 25 years, the Council management approach has incorporated forward looking conservation measures that address differing levels of uncertainty. This management approach has in recent years been labeled the precautionary approach. Recognizing that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, the Council intends to continue to take appropriate measures to insure the continued sustainability of the managed species. It will carry out this objective by considering reasonable, adaptive management measures, as described in the Magnuson-Stevens Act and in conformance with the National Standards, the Endangered Species Act, the National Environmental Policy Act, and other applicable law. This management approach takes into account the National Academy of Science's recommendations on Sustainable Fisheries Policy.

As part of its policy, the Council intends to consider and adopt, as appropriate, measures that

accelerate the Council's precautionary, adaptive management approach through community-based or rights-based management, ecosystem-based management principles that protect managed species from overfishing, and where appropriate and practicable, increase habitat protection and bycatch constraints. All management measures will be based on the best scientific information available. Given this intent, the fishery management goal is to provide sound conservation of the living marine resources; provide socially and economically viable fisheries for the well-being of fishing communities; minimize human-caused threats to protected species; maintain a healthy marine resource habitat; and incorporate ecosystem based considerations into management decisions.

This management approach recognizes the need to balance many competing uses of marine resources and different social and economic goals for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy will use and improve upon the Council's existing open and transparent process of public involvement in decision-making.

Status Determinations

To the extent practicable, two status determinations are made annually for each stock and stock complex. The first is the "overfishing" status, which describes whether *catch* is too *high*. The second is the "overfished" status, which describes whether *biomass* is too *low*.

Determination of "Overfishing" Status

The OFL for a given calendar year is specified at the end of the preceding calendar year on the basis of the most recent stock assessment. For each stock and stock complex, a determination of status with respect to "overfishing" is made inseason as the fisheries are monitored to prevent exceeding the TAC and annually as follows: If the catch taken during the most recent calendar year exceeded the OFL that was specified for that year, then overfishing occurred during that year; otherwise, overfishing did not occur during that year.

In the event that overfishing is determined to have occurred, an inseason action, an FMP amendment, a regulatory amendment or a combination of these actions will be implemented to end such overfishing immediately.

Determination of "Overfished" Status

A stock or stock complex is determined to be "overfished" if it falls below the MSST. According to the National Standard Guidelines definition, the MSST equals 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.

The above definition raises two questions: 1) How is the definition to be applied when "the MSY level" cannot be estimated? 2) In the context of an age-structured assessment, what is the meaning of the phrase, "the minimum stock size at which rebuilding to the MSY level would be expected to

occur within 10 years?" These questions are addressed in this FMP as follows:

1) Direct estimates of B_{MSY} (i.e., "the MSY level") are available for Tiers 1 and 2. For Tier 3, no direct estimate of B_{MSY} is available, but $B_{35\%}$ is used as a proxy for B_{MSY}. For Tiers 4-6, neither direct estimates of B_{MSY} nor reliable estimates of B_{MSY} proxies are available. Therefore, the "overfished" status of stocks and stock complexes managed under Tiers 4-6 is *undefined*.

2) For a stock assessed with an age-structured model (as is typically the case for stocks and stock complexes managed under Tiers 1-3), there is more than one stock size or numbers-at-age vector at which rebuilding to the MSY level would be expected to occur in exactly 10 years. Generally, there is no limit to the range of numbers-at-age vectors that satisfy this constraint, and each of these vectors corresponds to a stock size. Therefore, stock status in Tiers 1-3 is determined annually as follows: The determination of "overfished" status begins with an estimate of the stock's "current spawning biomass," which is defined as the estimated spawning biomass for the "current year," which in turn is defined as the most recent year from which data are used in the assessment. Given these definitions, and with the understanding that $B_{35\%}$ is used as a proxy for B_{MSY} in Tier 3, the determination proceeds as follows:

a. If current spawning biomass is estimated to be below ½ B_{MSY}, the stock is below its MSST.

b. If current spawning biomass is estimated to be above B_{MSY} the stock is above its MSST.

c. If current spawning biomass is estimated to be above ½ B_{MSY} but below B_{MSY}, then conduct a large number of stochastic simulations by projecting the numbers-at-age vector from the current year forward under the assumption that it will be fished at the MFMT in every year, and determine status as follows:

1. If the mean spawning biomass in the 10th year beyond the current year is below B_{MSY}, the stock is below its MSST.

1. Otherwise, the stock is above its MSST.

Within two years of such time as a stock or stock complex is determined to be overfished, an FMP amendment or regulations will be designed and implemented to rebuild the stock or stock complex to the MSY level within a time period specified at Section 304(e)(4) of the Magnuson-Stevens Act. If a stock is determined to be in an overfished condition, a rebuilding plan would be developed and implemented for the stock, including the determination of an F_{ofl} and F_{msy} that will rebuild the stock within an appropriate time frame.

The Magnuson-Stevens Act also requires identification of any fisheries that are "approaching a condition of being overfished," which is defined as a determination that the fishery "will become overfished within two years." The "approaching overfished" determination is made by projecting the numbers-at-age vector from the current year forward two years under the assumption that the stock will be fished at $maxF_{ABC}$ in each of those years, then determining whether the stock would be considered "overfished" at that time. In more detail, the determination proceeds as follows:

a. If the mean spawning biomass for two years beyond the current year is below ½ B_{MSY}, the stock is approaching an overfished condition.

b. If the mean spawning biomass for two years beyond the current year is above B_{MSY}, the stock is not approaching an overfished condition.

c. If the mean spawning biomass for two years beyond the current year is above ½ B_{MSY} but below B_{MSY}, then conduct a large number of stochastic simulations by projecting the numbers- at-age vector from the current year forward under the assumption that it will be fished at $maxF_{ABC}$ for two years, then at the MFMT for ten years, and determine status as follows:

1. If the mean spawning biomass in the 11th year beyond the current year is below B_{MSY}, the stock is approaching an overfished condition.

2. Otherwise, the stock is not approaching an overfished condition.

In the event that a stock or stock complex is determined to be approaching a condition of being overfished, an inseason action, an FMP amendment, a regulatory amendment or a combination of these actions will be implemented to prevent overfishing from occurring.

Application of PA to Pacific cod stocks

The assessment of the three Pacific cod stocks under federal management, and classification of overfishing and overfished status clearly follows the prescribed Precautionary Approach noted above. The biomass of each stock is compared to appropriate PA reference points, using peer reviewed scientific approaches, and then the determination of the appropriate PA zone (or tier) is determined. From Figure 16 above, it can be seen that the GOA stock has been above the reference points for biomass, and below the reference points for fishing mortality. For the EBS stock, the recent estimates of biomass and fishing mortality have also not exceeded the specified reference points. Based on 2013 and 2104 evaluations (SAFE), none of the EBS, AI, or GOA Pacific cod managment units were considered to be undergoing overfishing. None of the three stocks was considered to be overfished based on the 2013 SAFE. For the GOA and EBS stocks, this statement is also true for the 2014 SAFE. For the AI stock no statement can be made about its “overfished” status, as there are now no MSY-based reference points for this stock, given on the current assessment methodology accepted. From the 2013 and 2014 SAFE results for the 3 stocks, there is no evidence, based on the PA, that they are overfished or that overfishing is occurring, or that any of the stocks are approaching a condition of being overfished.

Fishery in the state waters of Alaska

The Pacific cod fishery occurring in the state waters of Alaska is managed by the ADFG. There are four main management areas and numerous districts and sub-districts within the state waters of Alaska, and some regulations vary by region. The three main management areas relevant to the state’s eight Pacific cod fisheries managed by ADFG are the Southeast Region (Southeast Alaska),

Central Region (Cook Inlet and Prince William Sound), and the Westward Region (Aleutian Islands, Kodiak, Chignik, Dutch Harbor, and Southern Alaska Peninsula). A fourth ADFG management region is the Arctic-Yukon-Kuskokwim (AYK) Region, but this does not contain any of the 8 state fisheries for P. cod considered here.
http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.main

Harvest Guidelines

For the eight state fisheries, individual Guideline Harvest Levels (GHL) are determined, as percentages of the ABC for the larger stock areas. For example, 75% of the ABC for the Central GOA Pacific cod is allocated to the federal + parallel fisheries, while the remaining 25% is allocated among the fisheries in Cook Inlet, Kodiak, and Chignik areas. To accommodate the State- managed fisheries, the Federal TACs are set well below ABC (typically 15-25% lower). For GOA P. cod, for example, at no time since the separate State waters fishery began in 1997 has total catch exceeded ABC, and total catch has never exceeded OFL. Based on the reported catches of P. cod in the state fisheries in 2014, the only fishery to exceed the GHL was Southeast Alaska, and that was by less than 1%. http://alaskafisheries.noaa.gov/2014/car110_goa.pdf

U.S. fisheries in federal waters

In the BSAI, Pacific cod is managed by the NPFMC under the Fishery Management Plan for the Bering Sea/Aleutian Islands Groundfish (these two subareas are identified in the FMP). The BSAI Groundfish Plan Team recommends the acceptable biological catch (ABC) and overfishing level (OFL) levels, which the Science and Statistical Committee may agree with, or make its own recommendations. The Science and Statistical Committee is part of the NPFMC. The NPFMC then determines the TAC based on these recommendations (NPFMC 2004). In the BSAI, overall catch of all species cannot exceed 2 million mt. The BSAI TAC is allocated by gear type, with the fixed gear fishery (longlines and pots), trawl fishery, and jig fishery receiving 61%, 38%, and 1% of the TAC, respectively. http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAI_FMP_APR_2015.pdf.
The TAC may be reallocated at the end of the year if a particular gear type is unlikely to catch their specified share (Thompson and Dorn 2004).

Pacific cod in the GOA is managed by the NPFMC under the Fishery Management Plan for Groundfish of the Gulf of Alaska http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOA_FMP_APR_2015.pdf. The GOA TAC is allocated by area, processor component (90% to the inshore component and 10% to the offshore component), and season (Thompson et al. 2004). State management of the Pacific cod fishery also affects the TAC, as some of these overages in the past have been due to take in the state fishery, with the quota being adjusted accordingly.

Both the BSAI and GOA FMPs have detailed area and time restrictions on fishing, including crab protection and seamount protection areas, and restrictions around certain habitats for marine mammals. The BSAI and GOA longline fleets have been required to use some form of bird deterrent device since 1997 (62 FR 23176, April 29, 1997). Recently, management has implemented additional mandatory bycatch reduction measures, such as towing a buoy, and use of single or paired

streamers depending on the size of the longline fishing vessel (69 FR 1930, January 13, 2004). Paired streamers have been shown to be the most effective seabird bycatch reduction device for the Alaskan longline fleet, while single streamers do not eliminate the risk of hooking albatrosses (Melvin et al. 2001). Since 1997, the observed takes of all seabird species has declined, suggesting that management's bycatch reduction measures are effective.

The NPFMC has implemented numerous closed areas to protect both EFH and HAPCs; a total area of 310,500 km^2 has been closed to bottom trawls in the federal waters off Alaska (NRC 2002). These closures have been implemented to protect diverse habitat and species from trawling (DiCosimo 1999).

In addition, there are five haulouts in the Bering Sea for which no fishing is permitted within the 0 – 20 nm zone (NMFS 2003). In the Bering Sea, there is also no trawling permitted within 0 –10 nm of all rookeries and haulouts, and no fishing with any gear type permitted within 0 – 3 nm of all rookeries and haulouts (with the exception of jig gear, which is permitted in the 0 – 3 nm closures around haulouts) (NMFS 2003).

The Pacific cod fishery in the BSAI and GOA is regulated by a permitting system, limited entry, quotas, mandatory observer coverage (100% on large vessels), and reporting requirements. The Magnuson-Stevens Act requires that 10.7 percent of the Pacific cod TAC in the BSAI management area shall be allocated to the CDQ Program.

Most of the Pacific Cod catch is taken with bottom and pelagic trawls and longline gear (NMFS, 2004), but pot and jig gear are also used. In the Bering Sea/Aleutian Islands regions, TAC (Total Allowable Catch) is allocated by gear type. Thirty-eight percent is allocated to trawl fisheries, 61% is allocated to fixed gear fisheries (i.e., longline and pots), and 1% to jig fisheries. http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAI_FMP_APR_2015.pdf In the Gulf of Alaska region, there are no specific allocations by gear type (NMFS, 2004).

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

Alaska Pacific cod 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.
http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAI_FMP_APR_2015.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOA_FMP_APR_2015.pdf

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.nmfs.noaa.gov/sfa/laws_policies/economic_social/index.html
http://www.nmfs.noaa.gov/sfa/New%20RFA%20Guidelines%20Final%20%20Version%2010-03-00.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 Pacific cod fisheries in Alaska is the restructuring and implementation (Jan 2013) of the groundfish observer program.

http://www.fakr.noaa.gov/sustainablefisheries/amds/default.htm

In addition to the federal FMPs, regulations for 7 of the 8 state-managed fisheries are set out in annual region-specific FMPs (regulations for parallel fisheries in state waters are generally identical to federal regulations). The board uses the biological and socio-economic information provided by ADFG, public comment received from inside and outside the state, as well as guidance from the Alaska Department of Public Safety and the Alaska Department of Law when creating regulations that are sound and enforceable. The state fisheries are managed by allocation of a portion of the federal TAC to the state fishery (depending on biomass abundance in the various areas). Overall, state managed fisheries removals are accounted for by ACL.

Management

Pacific cod fisheries in Alaska are managed by both the federal and state governments (Woodby et al 2004). The federally-managed fisheries for Pacific cod occur in both the Gulf of Alaska and Bering Sea/Aleutian Islands, with the bulk of the Gulf catch coming from the Central regulatory area (Thompson et al. 2003), and most of the BSAI catch coming from the eastern Bering Sea (EBS; Thompson and Dorn 2003). Parallel fisheries for Pacific cod occur in state waters at the same time as the federal fisheries in Prince William Sound, Cook Inlet, and in the vicinities of Kodiak Island, Chignik and the South Alaska Peninsula (Ruccio et al. 2004), as well as in the Aleutian Islands (Failor-Rounds 2004). For these parallel fisheries, NMFS management, allowable gear, bycatch levels, and fishing season actions are also “paralleled” for Pacific cod in state waters (Ruccio et al. 2004). The total allowable catch (TAC) set by the NPFMC applies to both the federal and parallel fisheries.

In the GOA, the annual federal TAC for Pacific cod is apportioned among seasons and regulatory areas, and on the basis of processor type, either inshore or offshore. Some apportionments were designed to try to limit possible negative impacts of the fishery on the endangered western population of Steller sea lion, *Eumetopias jubatus* (Thompson et al. 2003). The BSAI TAC is apportioned among the same gear types used in the GOA, but also among vessel size-classes (Thompson and Dorn 2003). The Pacific halibut mortality limit sometimes constrains the harvest of Pacific cod by longline and trawl fisheries (Thompson et al. 2003).

http://www.adfg.alaska.gov/FedAidPDFs/sp05-09.pdf
http://www.npfmc.org/wp-content/PDFdocuments/bycatch/Bycatchflyer913.pdf

Relationship of State to Federal Management

In general, once the federal and parallel fisheries close, the state water fisheries are opened (except that there is no state-waters, cod fishery in the Bering Sea/Aleutian Islands area) and these are not currently subject to limits on the number of licensed fisherman who can participate. To accommodate the catch in the state-waters fisheries since 1997, TACs in the federally-managed fisheries have been set well below the ABC (Thompson et al. 2003).

New developments in management of Pacific cod

Gear modifications

- In 2011, new regulations required all BS flatfish fisheries to elevate their trawl sweeps off the seafloor to reduce habitat damage and crab mortality. In 2013, this requirement was extended to all central GOA flatfish fisheries (Note that the flatfish fisheries catch the majority of Pacific cod).
- Pot fishing gear is required to have biodegradable panels to prevent lost pots from 'ghost fishing' and tunnel openings or escape panels to reduce crab bycatch.
- Longline gear is required to be fitted with tori lines to avoid seabird interactions. This applies to longline gear catching Pacific cod.

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

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.

ALTERNATIVE 3. Gulf of Alaska Trawl Bycatch Management Program (Alternative 2) with a Community Fisheries Association allocation or Adaptive Management Program.

Full details can be found at the Council website http://www.npfmc.org/goa-trawl-bycatch-management/ under MOTION from October 2014 Council meeting: GOA Trawl Bycatch Management Motion.

New 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 places 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. As of 2015, the program is still ongoing and experiencing yearly fine tuning changes to optimize its operations and data collection activities.
http://www.npfmc.org/observer-program/

Allocation of Harvest Rules for Aleutian Islands
Starting for year 2014. The SAFE EBS/AI report was split in two. Therefore, biological reference points and harvest allocations are calculated specifically for the Aleutian Islands.
http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf

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
Specific management measures are designed and implemented to maintain stocks at levels capable of producing maximum sustainable levels. 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.

Neither of the EBS or GOA Pacific cod management units are undergoing overfishing or are overfished. The AI stock is not undergoing overfishing, but estimates are not available to evaluate whether the stock is overfished or not.

GOA Pacific cod stock
The 2015 GOA Pacific cod female spawning biomass was projected by the 2014 SAFE to be 155,400, which is above $B_{40\%}$ of 126,600t. This places the stock into Tier 3a. Figure 16 above shows the position of the 2014 and 2015 biomass levels relative to several reference points, including $B_{35\%}$.. http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

EBS Pacific cod
The 2015 EBS Pacific cod female spawning biomass was projected by the 2014 SAFE to be 409,000 t which is above the $B_{40\%}$ (the B_{MSY} proxy in tier 3 stocks) of 330,000 t. This places the stock into Tier 3a. http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf

AI Pacific cod
The 2015 AI Pacific cod biomass was projected by the 2014 SAFE to be 68,900 tonnes which is above the OFL of 23,400. There is no proxy for $B_{40\%}$ (the B_{MSY} proxy in the tier 3 stocks). This places the stock into Tier 5. http://www.afsc.noaa.gov/REFM/Docs/2014/AIpcod.pdf

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 last 5-year review found that fishing effects on the habitat of Pacific cod in the BSAI and GOA does not appear to have impaired either the stocks 'ability to sustain itself at or near the MSY level. When weighted by the proportions of habitat types used by Pacific cod, the long-term effect indices are low, particularly those of the habitat features most likely to be important to Pacific cod (infaunal

and epifaunal prey). The fishery appears to have had minimal effects on the distribution of adult Pacific cod. Effects of fishing on weight at length, while statistically significant in some cases, are uniformly small and sometimes positive. While the fishery may impose some habitat-mediated effects on recruitment, these fall below the standard necessary to justify a rating of anything other than minimal or temporary.

http://www.fakr.noaa.gov/habitat/efh/review.htm
http://alaskafisheries.noaa.gov/habitat/efh/review/appx1.pdf
http://alaskafisheries.noaa.gov/habitat/efh/review/appx2.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.npfmc.org/committees/enforcement-committee/ (see USCG 2014 year in review).

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.

http://www.npfmc.org/upcoming-council-meetings/

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 Pacific cod 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 table below shows the boarding and violations in the BSAI Pacific cod fishery from 2010 to 2014.

USCG Federal Fisheries Boardings Violations
BSAI GOA (2010-2014)

	2010		2011		2012		2013		2014	
	BSAI	GOA	BSAI	GOA	BSAI	GOA	BSAI	GOA	BSAI	GOA
Halibut Boardings	19	489	36	311	16	218	33	123	29	348
Violations	3	15	3	10	0	5	3	5	1	15
Sablefish Boardings	9	30	13	44	7	7	10	2	11	12
Violations	1	0	3	1	2	1	0	0	1	0
Flatfish Boardings BSAI	24	1	25	5	17	1	11	1	19	2
Violations	2	0	2	0	2	0	0	0	1	0
Pacific Cod Boardings	34	68	50	79	28	54	27	11	55	22
Violations	2	10	13	15	6	0	1	0	5	0
Pollock Boardings	49	9	44	8	34	3	34	8	57	19
Violations	3	0	11	5	4	0	1	3	4	0

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

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.

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

Alaska's fisheries management organizations conduct assessments and research on the ecosystem effects of groundfish fisheries. Findings and conclusions are published in SAFE document, annual Ecosystem Considerations SAFE documents, and other research reports.

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 Pacific cod 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/

The Final Programmatic Supplemental Environmental Impact Statement is an extensive review of the Alaska Groundfish Fisheries (PSEIS) (NMFS 2004). It provides information about effects of the fishery on the ecosystem and effects of the ecosystem on the groundfish fishery. The Final Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement (PSEIS) serves as the primary decision document for determining the future overarching management policies and directions of the Fishery Management Plan for the Groundfish Fishery of the Gulf of Alaska and the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (FMPs). The PSEIS also serves as the current primary environmental review document supporting the FMPs. It summarizes and analyzes the best scientific information about the natural and physical environment in the Gulf of Alaska and Bering Sea and Aleutians Islands areas and the relationship of people with that environment. It assesses the environmental impacts resulting from past and present fishery management regimes and from the expected impacts of alternative future fishery management regimes. Significant environmental and fishery changes have occurred since the original Environmental Impact Statements (EISs) for the FMPs were prepared approximately 25 years ago

http://alaskafisheries.noaa.gov/sustainablefisheries/seis/final062004/Exec_sum.pdf

Ecosystem Effects on Pacific cod stock

BSAI Cod Fishery

Ecosystem Effects on the Stock (from the EBS and AI cod 2014 SAFE reports)
http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf
http://www.afsc.noaa.gov/REFM/Docs/2014/aipcod.pdf

A primary ecosystem phenomenon affecting the Pacific cod stock seems to be the occurrence of periodic "regime shifts," in which central tendencies of key variables in the physical environment change on a scale spanning several years to a few decades (Zador, 2011). One well-documented example of such a regime shift occurred in 1977, and shifts occurring in 1989 and 1999 have also been suggested (e.g., Hare and Mantua 2000). In the present assessment, an attempt was made to estimate the change in mean recruitment of EBS Pacific cod associated with the 1977 regime shift. According to the assessment model, pre-1977 mean recruitment was only about 31% of post-1976 mean recruitment. Establishing a link between environment and recruitment within a particular regime is more difficult. In the 2004 assessment (Thompson and Dorn 2004), for example, the correlations between age 1 recruits spawned since 1977 and monthly values of the Pacific Decadal Oscillation (Mantua et al. 1997) were computed and found to be very weak.
In the 2012 assessment, annual log-scale recruitment deviations estimated by the assessment model were regressed against each of several environmental indices summarized by Zador (2011). The highest univariate correlation was obtained for the spring-summer North Pacific Index (NPI), which was developed by Trenberth and Hurrell (1994). The NPI is the area-weighted sea level pressure over the region 30°N-65°N, 160°E-140°W. Further investigations were conducted with monthly NPI data from the Climate Analysis Section of the National Center for Atmospheric Research. The best univariate model obtained in the 2012 analysis was a linear regression of recruitment devs from 1977-2011 against the October-December average NPI (from the same year), giving a correlation of 0.52 (R_2=0.27). This analysis was updated and expanded for the 2013 assessment, including a cross-validation analysis indicating a very low probability that the correlation is entirely spurious. Vestfals et al. (in press) also noted a positive correlation between Pacific cod recruitment and the NPI, although not the October-December average NPI in particular. The above analysis was updated again in 2014, including the cross-validation.
The prey and predators of Pacific cod have been described or reviewed by Albers and Anderson (1985), Livingston (1989, 1991), Lang et al. (2003), Westrheim (1996), and Yang (2004). The composition of Pacific cod prey varies to some extent by time and area. In terms of percent occurrence, some of the most important items in the diet of Pacific cod in the BSAI and GOA have been polychaetes, amphipods, and crangonid shrimp. In terms of numbers of individual organisms consumed, some of the most important dietary items have been euphausids, miscellaneous fishes, and amphipods. In terms of weight of organisms consumed, some of the most important dietary items have been walleye pollock, fishery offal, yellowfin sole, and crustaceans. Small Pacific cod feed mostly on invertebrates, while large Pacific cod are mainly piscivorous. Predators of Pacific cod include Pacific cod, halibut, salmon shark, northern fur seals, Steller sea lions, harbor porpoises, various whale species, and tufted puffin. Major trends in the most important prey or predator species could be expected to affect the dynamics of Pacific cod to some extent.

Fishery Effects on the Ecosystem

Potentially, fisheries for Pacific cod can have effects on other species in the ecosystem through a variety of mechanisms, for example by relieving predation pressure on shared prey species (i.e., species which serve as prey for both Pacific cod and other species), by reducing prey availability for predators of Pacific cod, by altering habitat, by imposing bycatch mortality, or by "ghost fishing" caused by lost fishing gear.

Incidental Catch Taken in the Pacific Cod Fisheries

Table 15. Incidental catch (t) of FMP species, other than squid and members of the former "other species" complex, taken in the Bering Sea trawl fishery for Pacific cod, 2003-2014 (2014 data current through October 20).

Trawl fishery

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pollock	8744	13299	9919	12078	16922	4289	3332	2241	3481	3524	3933	5437
Pacific cod	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sablefish	56	73	28	2	1	1					0	
Yellowfin Sole	1006	1840	1266	1438	645	322	306	469	1141	767	2679	1508
Greenland Turbot	71	76	10	20	82	8	1	5	0	1	2	2
Arrowtooth Flounder	4139	7859	3785	4297	1923	584	448	417	218	216	275	216
Kamchatka Flounder									6	7	16	29
Rock Sole	5134	8647	7461	4528	3864	974	750	848	1329	1146	818	1403
Flathead Sole	1445	2817	1350	2899	3748	360	479	167	222	235	239	215
Alaska Plaice	265	372	389	342	404	53	55	73	502	144	577	625
Other Flatfish	893	2063	1331	600	382	75	28	63	73	71	29	48
Flounder												
Pacific Ocean Perch	31	64	80	50	25	2	1	0	4	2	2	
Northern Rockfish	12	51	22	48	4	1	1	3	6	5	0	1
Rougheye Rockfish		1	1									
Shortraker Rockfish												
Sharpchin/Northern Rockfish												
Shortraker/Rougheye Rockfish	3											
Shortraker/Rougheye/Sharpchin/Northern Rockfish												
Other Rockfish	33	63	18	12	5	5	2	8	2	16	2	2
Atka Mackerel	3470	4442	652	367	123	10	28	46	69	35	10	2

Table 16. Incidental catch (t) of FMP species, other than squid and members of the former "other species" complex, taken in the Bering Sea longline fishery for Pacific cod, 2003-2014 (2014 data current through October 20).

Longline Fishery

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pollock	7162	5309	4172	3040	3372	5285	4529	4168	5476	4821	5103	4260
Pacific Cod	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sablefish	66	19	21	22	14	4	2	2	16	3	3	3
Yellowfin Sole	631	616	717	485	264	507	653	198	674	1001	1422	1400
Greenland Turbot	182	218	165	65	115	72	79	106	173	121	15	14
Arrowtooth Flounder	1295	1365	1668	1322	1265	1208	1220	1100	961	961	580	370
Kamchatka Flounder									51	71	47	27
Rock Sole	45	37	48	21	14	20	25	5	20	26	33	50
Flathead Sole	372	593	618	539	352	334	248	265	334	291	372	476
Alaska Plaice	0	0	0	4	0	0	0	0	0	0	1	0
Other Flatfish	80	187	253	145	59	29	56	96	50	64	10	32
Flounder												
Pacific Ocean Perch	1	3	1	0	0	0	1	1	2	1	2	3
Northern Rockfish	6	5	6	6	5	4	4	11	13	9	18	23
Rougheye Rockfish	0	2	4	2	2	5	1	4	3	2	2	1
Shortraker Rockfish		26	19	4	22	12	21	48	20	14	8	9
Sharpchin/Northern Rockfish												
Shortraker/Rougheye Rockfish	18											
Shortraker/Rougheye/Sharpchin/Northern Rockfish												
Other Rockfish	10	28	19	10	22	18	7	47	36	23	28	35
Atka Mackerel	6	25	5	0	4	1	0	1	6	3	2	3

Table 17. Incidental catch (t) of FMP species, other than squid and members of the former "other species" complex, taken in the Bering Sea pot fishery for Pacific cod, 2003-2014 (2014 data current through October 20).

Pot fishery

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pollock	18	9	8	26	12	11	17	8	7	4	7	14
Pacific Cod	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sablefish	0	1	0	4							0	
Yellowfin Sole	82	78	76	47	206	133	35	2	29	29	298	305
Greenland Turbot	0			1					0			
Alaska Plaice										0		
Arrowtooth Flounder	4	4	5	12	3	6	0	1	1	1	2	1
Kamchatka Flounder										0	0	
Rock Sole	3	2	1	2	3	1	0	1	0	1	1	2
Flathead Sole	0	1	1	0	2	1	0	0	0	0	0	0
Other Flatfish	1	1	1	1	1	0	0	0	0	0	2	0
Flounder												
Pacific Ocean Perch	1	0	0	1		0	0		0	0	0	
Northern Rockfish	1	1	1	1	1	2	0	0	1	1	0	0
Rougheye Rockfish		0	0									
Shortraker Rockfish								0				
Sharpchin/Northern Rockfish												
Shortraker/Rougheye Rockfish	0											
Shortraker/Rougheye/Sharpchin/Northern Rockfish												
Other Rockfish	5	3	3	4	1	1	0	2	2	1	5	3
Atka Mackerel	198	141	236	342	41	61	2	27	29	9	3	4

Table 18. Incidental catch (t) of squid and members of the former "other species" complex taken in the Bering Sea fisheries for Pacific cod, 2003-2014 (2014 data are current through October 8).

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Octopus	196	264	299	268	130	177	37	114	555	119	181	177
Sculpins, Large	817	2832	2248	1920	2087	1404	1060	1059	1647	1777	1470	1763
Sculpins, Other	1857	349	339	382	337	299	210	66	147	239	33	47
Shark, Other	20	20	10	4	2	2	5	2	3	1	1	1
Shark, Pacific Sleeper	121	228	188	123	44	20	14	15	20	10	20	26
Shark, Salmon	1	0	2	1							0	
Shark, Spiny Dogfish	11	8	11	6	2	7	17	13	7	19	18	6
Skate, Alaska								1493	2156	2676	3251	2642
Skate, Aleutian									103	231	121	106
Skate, Big		158	174	243	74	49	63	117	132	287	218	198
Skate, Longnose	0	12	21	20	1	1	1	5	4	3	9	10
Skate, Other	14742	17708	18843	14432	12740	13685	11886	9007	14133	14919	16684	14101
Skate, Whiteblotched									13	24	12	11
Squid	5	4	1	0	1	0	0	0	0	0	0	1

Table 19. Catches of prohibited species by Bering Sea fisheries for Pacific cod, 1991-2014 (2014 data are current through October 13). Herring and halibut catches (and halibut mortality totals) are in t, salmon and crab are in 1000s of individuals.

Species	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Bairdi Tanner Crab	764	439	230	319	330	455	293	152	158	180	155	355
Opilio Tanner (Snow) Crab	212	308	291	440	277	377	1019	803	540	404	251	508
Red King Crab	52	13	2	2	8	79	28	12	17	44	21	40
Blue King Crab												
Golden (Brown) King Crab												
Other King Crab	1	13	1	3	2	7	3	25	12	9	18	27
Herring		8	23	2	8	18	1	1	1	1	5	3
Chinook Salmon	4	5	6	7	7	6	5	2	2	1	3	2
Non-Chinook Salmon	0	0	0	1	1	0	0	1	0	0	2	1

Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bairdi Tanner Crab	257	258	291	588	819	1265	528	390	325	120	241	
Opilio Tanner (Snow) Crab	162	222	195	342	1812	693	550	786	192	51	43	
Red King Crab	14	17	21	19	47	36	8	4	23	11	99	
Blue King Crab	3	3	1	4	173	9	15	123	1	1	0	
Golden (Brown) King Crab	0	0	0	0	0	0	1	0	0	0	0	
Other King Crab												
Herring	14	9	18	8	2	0	0	0	0	6	0	
Chinook Salmon	2	5	3	3	5	1	0	0	0	1	1	
Non-Chinook Salmon	1	7	1	7	1	0	0	0	0	0	0	

Halibut quantity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Catch	5198	7256	3463	8657	8950	9175	8640	7234	6136	7273	6729	7329
Mortality				2069	2264	2326	2060	1719	1780	1537	1278	1789

Halibut quantity	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Catch	6696	6724	7901	6344	5787	6605	6067	6099	6387	7162	6758	3044
Mortality	1870	2065	1963	1812	1418	902	782	784	779	1038	861	481

Table 20. Incidental catch (t) of non-target species groups by Bering Sea Pacific cod fisheries, 2003-2014 (2014 data are current through October 8), sorted in order of descending average.

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Ave.
Sea star	438	423	439	316	235	181	139	135	191	454	279	577	317
Giant Grenadier	2	15	143	105	95	135	201	292	1126	494	171	65	237
Scypho jellies	668	709	399	66	110	47	93	43	186	68	338	77	234
Sea anemone unidentified	92	115	113	87	37	54	115	84	144	177	233	202	121
Misc fish	223	226	205	93	86	40	51	52	111	128	61	140	118
Grenadier	238	225	190	25	84	27	11	98	13	20	103	34	89
Sea pens whips	6	12	30	16	7	10	37	25	25	35	53	54	26
Snails	25	20	12	16	15	19	25	17	23	21	29	33	21
Eelpouts	47	35	42	17	18	7	2	2	4	11	24	38	21
Invertebrate unidentified	19	5	3	17	19	2	15	37	57	35	21	8	20
Benthic urochordata	14	4	10	5	1	2	1	10	35	65	51	34	19
Sponge unidentified	6	8	6	11	2	3	11	6	12	15	19	18	10
Misc crabs	8	4	4	16	28	6	2	5	4	5	12	8	9
Bivalves	5	16	6	5	2	11	9	3	11	11	12	7	8
Urchins/dollars/cucumbers	11	11	13	4	13	3	1	1	4	3	1	5	6
Corals Bryozoans	1	1	1	1	2	2	8	2	3	24	2	1	4
Hermit crab unidentified	5	3	2	2	2	1	1	1	1	1	1	1	2
Greenlings	6	3	2	2	0	1	0	0	0	0	0	0	1
Brittle star unidentified	1	1	0	1	0	0	0	0	1	1	1	1	1
Dark Rockfish						1	0	0	0	0	0	0	0
Misc crustaceans	0	0	0	1	1	0	0	0	0	0	0	0	0
Other osmerids	0	0	0	0	0		0	0	0	0	0		0
Pandalid shrimp	0	0	0	0	0	0	0	0	0	0	0	0	0
Eulachon		0	0	0	0	0		0	0	0			0
Pacific Sand lance	0	0	0	0	0	0		0	0	0		0	0
Polychaete unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc inverts (worms etc)	0	0	0	0	0	0	0	0	0	0	0	0	0
Capelin		0			0	0		0	0	0	0	0	0
Stichaeidae	0	0	0	0	0	0	0	0					0
Lanternfishes (myctophidae)		0											0
Gunnels		0	0		0								0
Birds	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 21. Incidental catch (t) of FMP species, other than squid and members of the former "other species" complex, taken in the Aleutian Islands trawl fishery for Pacific cod, 2003-2014 (2014 data current through October 20).

Trawl fishery

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pollock	785	537	669	314	395	54	51	18	57	78	23	11
Pacific Cod	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sablefish	1	1	0	1	1							
Yellowfin Sole	0	9		3	0	0						
Greenland Turbot	8	6	5		7	1	1					
Arrowtooth Flounder	230	199	244	206	134	24	35	35	16	19	17	5
Kamchatka Flounder									3	2	2	
Rock Sole	802	699	437	449	585	258	432	427	196	217	146	101
Flathead Sole	39	34	24	33	22	10	14	17	3	9	5	2
Alaska Plaice					0	0						
Other Flatfish	8	10	6	11	9	13	3	2	0	7	3	8
Flounder												
Pacific Ocean Perch	185	160	180	134	96	105	32	5	2	43	33	1
Northern Rockfish	215	129	210	185	89	51	59	29	21	9	11	14
Rougheye Rockfish		1	3	1	0	0		0	1			
Shortraker Rockfish		3		2	0						0	
Sharpchin/Northern Rockfish												
Shortraker/Rougheye Rockfish	7											
Shortraker/Rougheye/Sharpchin/Northern Rockfish												
Other Rockfish	13	12	8	7	9	9	7	4	4	9	3	1
Atka Mackerel	1075	549	482	447	361	456	359	124	101	384		
Squid	3	2	1	1	0	0	0	0		0	0	

Table 22. Incidental catch (t) of FMP species, other than squid and members of the former "other species" complex, taken in the Aleutian Islands longline fishery for Pacific cod, 2003-2014 (2014 data current through October 20).

Longline fishery

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pollock	9	15	3	8	6	9	29	47	6	8	0	
Pacific Cod	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sablefish	14	2		37	22	23	3	30	6	15	1	
Yellowfin Sole												
Greenland Turbot	12	3		11	15	4	5	5	1	2		
Arrowtooth Flounder	14	18	34	36	66	42	45	65	8	10	2	
Kamchatka Flounder										4	3	
Rock Sole	1	2	4	3	3	2	2	3		2	0	
Flathead Sole	0	0	0	1	2	2	3	3		1		
Alaska Plaice												
Other Flatfish		10		0		0	16	2				
Flounder												
Pacific Ocean Perch	1	0	2	1	4	3	1	1		1		
Northern Rockfish	18	27	19	8	33	54	56	119		12	34	
Rougheye Rockfish		26	1	3	28	46	23	30		27	11	
Shortraker Rockfish		3	5	8	12	6	6	28	2	6	4	
Sharpchin/Northern Rockfish												
Shortraker/Rougheye Rockfish	12											
Shortraker/Rougheye/Sharpchin/Northern Rockfish												
Other Rockfish	12	55	12	20	50	45	77	81	14	20	15	
Atka Mackerel	14	12	19	9	25	47	89	93		19	23	
Squid												

Table 23. Incidental catch (t) of squid and members of the former "other species" complex taken in the Aleutian Islands fisheries for Pacific cod, 2003-2014 (2014 data are current through October 8).

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Octopus	14	14	12	64	26	19	20	48	10	8	38	8
Sculpins, Large	107	294	207	307	378	375	402	523	99	366	298	88
Sculpins, Other	153	64	7	69	29	26	91	201	6	13	9	4
Shark, Other		0										
Shark, Pacific Sleeper	0	2	2	0	0	0	0	0				
Shark, Salmon							0		0			
Shark, Spiny Dogfish	0	0	0	1	0	3	1	1	0	0	0	0
Skate, Alaska								207	39	64	38	9
Skate, Aleutian									6	25	6	3
Skate, Big		0	0	5	0	0	0	0		2	0	0
Skate, Longnose		0	0	0		0	0	0		0	0	0
Skate, Other	200	486	405	411	647	576	748	602	116	251	148	22
Skate, Whiteblotched									2	4	8	3
Squid	3	2	1	1	0	0	0	0	0	0	0	0

Table 24. Catches of prohibited species by Aleutian Islands fisheries for Pacific cod, 1991-2014 (2014 data are current through October 13). Herring and halibut catches (and halibut mortality totals) are in t, salmon and crab are in 1000s of individuals.

Species	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Bairdi Tanner Crab	2	2	1	1	1	7	3	1	6	48	5	14
Opilio Tanner (Snow) Crab	2	1	1	0	0	0	0	0	0	0	0	1
Red King Crab	0	0	0	0	0	0	0	1	0	1	1	8
Blue King Crab												
Golden (Brown) King Crab												
Other King Crab	2	5	1	2	0	1	0	1	7	1	1	1
Herring												
Chinook Salmon	0	0	0	0	1	0	1	1	0	1	0	2
Non-Chinook Salmon		0			0		0	0		0	0	0

Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bairdi Tanner Crab	11	8	3	7	28	199	41	11	1	11	16	
Opilio Tanner (Snow) Crab	0	0	0	12	73	108	126	34	1	2	1	
Red King Crab	7	1	3	0	3	6	1	1	1	1	8	
Blue King Crab	0	0	0	0	9	0	0	18	0	0	0	
Golden (Brown) King Crab	0	0	0	0	1	2	1	0	1	0	0	
Other King Crab												
Herring	0	0	0	0	0	0	0	0	0	0	0	
Chinook Salmon	2	1	1	1	1	1	1	1	0	0	0	
Non-Chinook Salmon	0	0	0	0	1	0	0	0	0	0	0	

Halibut quantity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Catch	313	1626	531	423	386	546	438	1023	457	643	1486	261
Mortality				62	48	122	75	190	86	111	172	50

Halibut quantity	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Catch	175	328	306	331	936	698	718	711	211	245	81	51
Mortality	58	60	79	82	148	89	102	74	35	56	24	19

Table 25. Incidental catch (t) of non-target species groups by Aleutian Islands Pacific cod fisheries, 2003-2014 (2014 data are current through October 8), sorted in order of descending average.

Species/group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Ave.
Giant Grenadier	0	0	1	95	31	26	10	189	18	51	1	23	37
Misc fish	29	18	20	17	26	17	18	17	9	9	7	5	16
Grenadier	46	13	1	26	10	0	2	70	0	4	1		16
Sponge unidentified	25	23	26	28	19	4	15	9	3	7	2	1	13
Corals Bryozoans	25	13	12	12	16	11	11	10	6	4	4	1	10
Sea star	6	9	6	7	9	11	21	18	2	8	5	3	9
Invertebrate unidentified	0	1	0	14	2	4	0	10	0	0	0	0	3
Bivalves	15	1	1	3	2	1	0	0	0	0	0	0	2
Dark Rockfish						2	4	4	0	0	0	0	1
Scypho jellies	0	0	1	2	0	0	0	0	0	3	6	2	1
Snails	1	1	0	1	1	2	3	1	0	1	1	0	1
Greenlings	1	0	0	4	1	1	0	1	0	0	0	0	1
Urchins dollars cucumbers	1	1	0	1	1	0	1	0	0	0	0	0	1
Sea anemone unidentified	0	0	1	1	1	0	1	1	0	1	0	0	1
Sea pens whips	0	0	0	0	0	0	1	1	0	0	0		0
Eelpouts	0	1	0	0	0	0	0	0	0	0	0	0	0
Benthic urochordata	0	0	0	0	1	0	0	0	0	0	0	0	0
Misc crustaceans	0	0	0	0	0	0	0	0	0	0	0	0	0
Hermit crab unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0
Brittle star unidentified	0	0	0	0	1	0	0	0	0	0	0	0	0
Pandalid shrimp	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaete unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Sand lance	0		0	0	0	0		0					0
Eulachon			0	0	0	0				0			0
Misc inverts (worms etc)		0	0	0	0	0	0	0	0	0	0	0	0
Capelin					0	0				0	0	0	0
Stichaeidae	0		0	0	0		0						0
Other osmerids			0	0	0					0	0		0
Gunnels		0	0		0								0
Birds	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc crabs	1	1	0	1	2	1	1	1	0	0	2	1	1

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

Steller Sea Lions

Sinclair and Zeppelin (2002) showed that Pacific cod was one of the four most important prey items of Steller sea lions in terms of frequency of occurrence averaged over years, seasons, and sites, and was especially important in winter. Pitcher (1981) and Calkins (1998) also showed Pacific cod to be an important winter prey item in the GOA and BSAI, respectively. Furthermore, the size ranges of Pacific cod harvested by the fisheries and consumed by Steller sea lions overlap, and the fishery operates to some extent in the same geographic areas used by Steller sea lion as foraging grounds

(Livingston (ed.), 2002).The Fisheries Interaction Team of the Alaska Fisheries Science Center has been engaged in research to determine the effectiveness of recent management measures designed to mitigate the impacts of the Pacific cod fisheries (among others) on Steller sea lions. Results from studies conducted in 2002-2003 were summarized by Conners et al. (2004). These studies included a tagging feasibility study, which may evolve into an ongoing research effort capable of providing information on the extent and rate to which Pacific cod move in and out of various portions of Steller sea lion critical habitat. Nearly 6,000 cod with spaghetti tags were released, of which approximately 1,000 had been returned as of September, 2003.

Seabirds

The following is a summary of information provided by Livingston (ed., 2002): In both the BSAI and GOA, the northern fulmar (*Fulmarus glacialis*) comprises the majority of seabird bycatch, which occurs primarily in the longline fisheries, including the hook and line fishery for Pacific cod. Shearwater (*Puffinus* spp.) distribution overlaps with the Pacific cod longline fishery in the Bering Sea, and with trawl fisheries in general in both the Bering Sea and GOA. Black-footed albatross (*Phoebastria nigripes*) is taken in much greater numbers in the GOA longline fisheries than the Bering Sea longline fisheries, but is not taken in the trawl fisheries. The distribution of Laysan albatross (*Phoebastria immutabilis*) appears to overlap with the longline fisheries in the central and western Aleutians. The distribution of short-tailed albatross (*Phoebastria albatrus*) also overlaps with the Pacific cod longline fishery along the Aleutian chain, although the majority of the bycatch has taken place along the northern portion of the Bering Sea shelf edge (in contrast, only two takes have been recorded in the GOA). Some success has been obtained in devising measures to mitigate fishery-seabird interactions. For example, on vessels larger than 60 ft. LOA, paired streamer lines of specified performance and material standards have been found to reduce seabird incidental take significantly.

Fishery Usage of Habitat

The following is a summary of information provided by Livingston (ed., 2002): The longline and trawl fisheries for Pacific cod each comprise an important component of the combined fisheries associated with the respective gear type in each of the three major management regions (BS, AI, and GOA). Looking at each gear type in each region as a whole (i.e., aggregating across all target species) during the period 1998-2001, the total number of observed hauls/sets was as follows:

Gear	BS	AI	GOA
Trawl	240,347	43,585	68,436
Longline	65,286	13,462	7,139

In the BS, both longline and trawl effort was concentrated north of False Pass (Unimak Island) and along the shelf edge represented by the boundary of areas 513, 517 (in addition, longline effort was concentrated along the shelf edge represented by the boundary of areas 521-533). In the AI, both longline and trawl effort were dispersed over a wide area along the shelf edge. The catcher vessel longline fishery in the AI occurred primarily over mud bottoms. Longline catcher-processors in the AI tended to fish more over rocky bottoms. In the GOA, fishing effort was also dispersed over a wide area along the shelf, though pockets of trawl effort were located near Chirikof, Cape Barnabus, Cape

Chiniak and Marmot Flats. The GOA longline fishery for Pacific cod generally took place over gravel, cobble, mud, sand, and rocky bottoms, in depths of 25 fathoms to 140 fathoms. Impacts of the Pacific cod fisheries on essential fish habitat were further analyzed in an environmental impact statement by NMFS (2005), followed by a 5-year review in 2010 (NMFS 2010). A second 5-year review is currently in progress, and should be available for the 3rd surveillance assessment.
http://www.afsc.noaa.gov/REFM/Docs/2014/EBSpcod.pdf
http://www.afsc.noaa.gov/REFM/Docs/2014/aipcod.pdf

GOA Fishery

Ecosystem Effects on the Stock (from GOA SAFE Dec 2014) http://www.afsc.noaa.gov/REFM/Docs/2014/GOApcod.pdf

A primary ecosystem phenomenon affecting the Pacific cod stock seems to be the occurrence of periodic "regime shifts," in which central tendencies of key variables in the physical environment change on a scale spanning several years to a few decades (Boldt (ed.), 2005). One well-documented example of such a regime shift occurred in 1977, and shifts occurring in 1989 and 1999 have also been suggested (e.g., Hare and Mantua 2000). In the present assessment, an attempt was made to estimate the change in median recruitment of GOA Pacific cod associated with the 1977 regime shift. According to this year's model, pre-1977 median recruitment was only about 32% of post-1976 median recruitment. Establishing a link between environment and recruitment within a particular regime is more difficult. In the 2004 assessment (Thompson et al. 2004), for example, the correlations between age 1 recruits spawned since 1977 and monthly values of the Pacific Decadal Oscillation (Mantua et al. 1997) were computed and found to be very weak.

The prey and predators of Pacific cod have been described or reviewed by Albers and Anderson (1985), Livingston (1989, 1991), Lang et al. (2003), Westrheim (1996), and Yang (2004). The composition of Pacific cod prey varies to some extent by time and area. In terms of percent occurrence, some of the most important items in the diet of Pacific cod in the BSAI and GOA have been polychaetes, amphipods, and crangonid shrimp. In terms of numbers of individual organisms consumed, some of the most important dietary items have been euphausids, miscellaneous fishes, and amphipods. In terms of weight of organisms consumed, some of the most important dietary items have been walleye pollock, fishery offal, yellowfin sole, and crustaceans. Small Pacific cod feed mostly on invertebrates, while large Pacific cod are mainly piscivorous. Predators of Pacific cod include Pacific cod, halibut, salmon shark, northern fur seals, Steller sea lions, harbor porpoises, various whale species, and tufted puffin. Major trends in the most important prey or predator species could be expected to affect the dynamics of Pacific cod to some extent.

Fishery Effects on the Ecosystem

Potentially, fisheries for Pacific cod can have effects on other species in the ecosystem through a variety of mechanisms, for example by relieving predation pressure on shared prey species (i.e.,

species which serve as prey for both Pacific cod and other species), by reducing prey availability for predators of Pacific cod, by altering habitat, by imposing bycatch mortality, or by "ghost fishing" caused by lost fishing gear.

Incidental Catch of Non target Species

Table 26. Groundfish bycatch, discarded and retained, for GOA Pacific cod as target species (AKFIN; as of 2014-10-09).

	2009		2010		2011		2012		2013		2014	
	D	R	D	R	D	R	D	R	D	R	D	R
Arrowtooth Flounder	644.9	109.0	322.0	66.6	310.4	268.8	332.7	498.9	885.3	575.9	816.7	476.4
Atka Mackerel	46.5	0.9	57.1	0.1	16.6	0.2	12.4	1.9	21.4	0.1	1.4	0.0
Flathead Sole	25.3	95.0	41.1	33.2	19.2	149.7	52.3	157.5	249.4	178.5	116.4	175.9
GOA Deep Water Flatfish	1.5	0.4	12.6	1.3	8.5	3.8	0.2	3.1	18.3	5.6	0.8	8.7
GOA Demersal Shelf Rockfish		2.0		1.8		3.0		0.5		1.7		1.4
GOA Dusky Rockfish							23.1	9.4	17.4	6.5	2.8	39.1
GOA Pelagic Shelf Rockfish	32.7	11.2	12.8	14.8	10.0	7.5						
GOA Rex Sole	0.0	66.3	8.9	6.8	8.6	31.6	27.8	109.9	17.5	95.1	11.9	72.5
GOA Rougheye Rockfish	4.0	3.3	4.9	2.6	0.9	5.1	0.4	4.3	0.4	5.0	0.4	4.2
GOA Shallow Water Flatfish	43.5	204.9	161.5	517.3	127.7	816.3	125.1	686.3	173.7	792.0	292.6	511.8
GOA Shortraker Rockfish	3.5	4.0	4.7	3.7	3.8	4.1	2.0	4.0	1.3	4.7	0.4	4.5
GOA Skate, Big	211.0	339.2	333.9	613.6	299.0	662.5	83.3	671.6	227.1	422.7	463.8	179.0
GOA Skate, Longnose	115.9	208.8	175.4	255.0	144.4	230.1	9.3	317.3	114.8	320.4	68.2	223.7
GOA Skate, Other	623.6	65.8	919.1	158.1	605.2	195.0	584.6	119.3	899.1	11.0	669.5	58.7
GOA Thornyhead Rockfish	0.4	7.4	0.6	5.4	0.7	7.0	0.3	2.7	5.0	4.1	0.2	10.5
Halibut									182.5	36.6	136.4	23.7
Northern Rockfish	10.8	13.9	13.9	4.7	8.2	8.2	26.8	24.0	48.1	61.9	2.0	58.7
Octopus					482.1	379.4	135.0	273.1	108.8	211.7	258.0	313.3
Other Rockfish	23.7	11.8	19.8	10.1	20.1	33.5	6.9	38.6	28.7	38.6	9.2	25.2
Other Species	498.1	264.1	596.9	233.4								
Pacific Ocean Perch	4.4	38.2	0.2	8.5	1.3	18.5	7.5	45.8	7.0	5.3	0.3	14.2
Pollock	123.2	353.2	205.5	423.7	47.5	503.7	710.4	970.5	109.6	750.4	82.4	1186.9
Sablefish	25.5	19.1	46.9	72.8	49.4	60.3	0.4	23.1	73.7	16.4	6.4	33.7
Sculpin					332.9	10.3	414.4	42.2	481.1	4.7	368.7	6.1
Shark					90.7	0.7	18.8	0.6	66.1	0.1	66.7	0.2
Squid									0.2			
Total	2,937.8	2,433.4	2,587.1	3,399.3	2,573.7	4,004.8	3,736.5	3,549.7	3,375.1	3,428.4	2,937.8	2,433.4

Table 27. Incidental catch (t) of non-target species groups by GOA Pacific cod fisheries, 2005-2014 (as of 2014-10-09)

Species/group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Benthic urochordata	0.0	0.0	0.0	0.6	3.0	0.0	0.2	0.0	0.0	0.1
Birds	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1
Bivalves	1.3	2.1	1.2	1.7	4.2	2.7	6.2	1.7	2.0	1.4
Brittle star unidentified	0.2	0.1	0.3	0.1	0.0	0.1	2.1	0.0	0.1	0.0
Capelin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corals Bryozoans	0.0	0.1	0.2	0.0	1.7	0.0	0.7	4.0	0.1	0.9
Dark Rockfish	0.0	0.0	0.0	0.3	2.7	12.4	2.5	1.5	1.1	1.8
Eelpouts	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.3	0.2	0.1
Eulachon	0.0	2.4	0.0	0.1	0.0	0.6	0.0	0.0	0.0	0.3
Giant Grenadier	0.0	21.9	81.5	31.0	51.3	142.7	60.4	175.8	144.5	142.4
Greenlings	1.5	3.7	0.8	7.1	1.3	0.8	0.8	1.9	1.2	0.4
Grenadier	0.0	0.6	0.0	66.0	6.6	11.3	8.2	0.0	24.1	22.6
Gunnels	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hermit crab unidentified	0.4	0.5	1.7	2.9	3.9	2.1	0.8	0.8	1.8	0.4
Invertebrate unidentified	0.0	12.6	1.6	1.3	0.1	1.6	9.1	4.5	0.4	0.5
Misc crabs	1.7	0.7	6.6	2.4	1.5	3.4	2.5	2.2	2.9	2.9
Misc crustaceans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
Misc fish	152.5	176.0	539.4	210.5	99.0	89.0	134.2	224.3	91.9	132.6
Misc inverts (worms etc)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other osmerids	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Pacific Sand lance	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Polychaete unidentified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scypho jellies	1.1	4.6	0.1	0.4	0.2	11.1	0.8	0.6	1.8	0.9
Sea anemone unidentified	0.7	0.3	5.1	6.0	6.6	7.2	8.8	6.0	7.7	4.0
Sea pens whips	0.0	3.2	1.0	0.0	3.3	3.9	1.4	0.8	2.5	1.7
Sea star	937.7	703.5	299.0	316.5	471.9	871.0	718.0	462.5	553.2	545.9
Snails	4.8	2.9	0.8	0.9	2.5	0.7	1.3	3.7	2.6	25.0
Sponge unidentified	1.0	1.2	0.0	1.1	1.6	0.7	0.5	0.4	0.5	0.4
Stichaeidae	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.1	0.0
Surf smelt	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
urchins dollars cucumbers	1.1	1.0	3.2	0.5	1.3	0.5	2.2	3.6	1.3	1.1

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

Essential Fish Habitat Pacific Cod

EFH is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH for groundfish species is determined to be the general distribution of a species described by life stage. EFH is described for FMP-managed species by life stage as general distribution using guidance from the EFH Final Rule (50 CFR 600.815), including the EFH Level of Information definitions.

Effects of Pacific cod fisheries on Habitat

Fishing operations change the abundance or availability of certain habitat features (e.g., prey availability or the presence of living or non-living habitat structure) used by managed fish species to

accomplish spawning, breeding, feeding, and growth to maturity. These changes can reduce or alter the abundance, distribution, or productivity of that species, which in turn can affect the species' ability to "support a sustainable fishery and the managed species' contribution to a healthy ecosystem" (50 CFR 600.10). The outcome of this chain of effects depends on characteristics of the fishing activities, the habitat, fish use of the habitat, and fish population dynamics. The duration and degree of fishing's effects on habitat features depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of habitat features. A mathematical model was developed as a tool to structure the relationships among available sources of information that may influence the effects of fishing on habitat. The model was designed to estimate proportional effects on habitat features that would persist if current fishing levels were continued until affected habitat features reached an equilibrium with the fishing effects. Details on the limitations and uncertainties of the model and the process used by the analyst are in Section B.1 of Appendix B of the EFH EIS (NMFS 2005).

Summary of Effects—Fishing's effects on the habitat of Pacific cod in the BSAI and GOA do not appear to have impaired either stocks' ability to sustain itself at or near the MSY level. When weighted by the proportions of habitat types used by Pacific cod, the long-term effect indices are low, particularly those of the habitat features most likely to be important to Pacific cod (infaunal and epifaunal prey). The fishery appears to have had minimal effects on the distribution of adult Pacific cod. Effects of fishing on weight at length, while statistically significant in some cases, are uniformly small and sometimes positive. While the fishery may impose some habitat-mediated effects on recruitment, these fall below the standard necessary to justify a rating of anything other than minimal or temporary.

http://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmpAppendix.pdf
http://www.npfmc.org/wp-content/PDFdocuments/fmp/GOA/GOAfmpAppendix.pdf

Ecosystem impacts and gear modifications

Gear modifications have been implemented in the BSAI and in the Central GOA trawl fisheries to lift the sweep off the seafloor and hence limit detrimental effects of fishing gear interacting with seafloor, habitat and related biota. Research has demonstrated that elevated sweeps also reduces unobserved mortality of crab from interacting with the trawl sweeps. There are also several regulations in place dealing with seabird avoidance, including circle hooks, scarelines (tori lines), line settings, weighted longlines for vessels fishing with hook-and-line gear. Further gear-related measures include (i) biodegradable panels required for pot gear, to minimize bycatch associated with ghost fishing of lost gear (5 AAC 39.145 *Escape Mechanism for Shellfish and Bottomfish Pots*) and (ii) tunnel openings for pot gear (tunnel eye openings must be 36 inches in perimeter or less) to reduce incidental catch of halibut and crabs. Gillnets for groundfish have been prohibited to prevent ghost fishing and bycatch of non-target species.

Seabirds

The incidental mortality of seabirds, mostly albatrosses and petrels, in longline fisheries continues to be a serious global concern and was major reason for the establishment of the Agreement on the Conservation of Albatrosses and Petrels (ACAP). In longline fisheries seabirds are killed when they become hooked and drowned while foraging for baits on longline hooks as the gear is deployed. They also can become hooked as the gear is hauled; however, many of these seabirds can be released alive with careful handling. Although most mitigation measures are broadly applicable, the application and specifications of some will vary with local longlining methods and gear configurations. This section provides estimates of the numbers of seabirds caught as bycatch in commercial groundfish fisheries in Alaska operating in federal waters of the U.S. Exclusive Economic Zone for the years 2007 through 2013. Fishing gear types represented are demersal longline, pot, pelagic trawl, and non-pelagic trawl. These numbers do not apply to gillnet, seine, or troll fisheries. Data collection on the Pacific halibut longline fishery began in 2013 with the restructured observer program, although some small amounts of halibut fishery information were collected in years previous when an operator had both halibut and sablefish individual fishing quota. The 2013 estimated numbers for the combined groundfish fisheries are the lowest since the AFSC began estimating bycatch in 1993. Since they implemented the Catch Accounting System (CAS) the 2013 estimates are 62% of the running 5-year average for 2008-2012 of 7,558 birds and are the lowest total since using the CAS originally in 2007. While the fisheries achieved the lowest overall seabird bycatch since 1993, albatross bycatch increased in 2013 to 438 birds (249 black-foots and 189 Laysan), an increase of 25% compared to the previous 5 year average of 350. The 2013 numbers included the halibut fishery where previous years did not. However, the increase in albatross bycatch in the sablefish fisheries (>100) surpassed the new contribution from the halibut fishery (53 birds) while other fisheries (cod freezer longline) experienced reduced albatross bycatch numbers. Northern fulmar (*Fulmaris glacialis*) bycatch remained the highest proportion in the catch at 69%. Fulmar bycatch increased by 8% from the year before but remained 30% below the 5-year average. Fulmar bycatch has ranged between 45 to 76% of the total seabird bycatch since 2007. Average annual mortality for fulmars since 2007 has been 4,472. When compared to estimates of the total population size in Alaska of 1.4 million (Denlinger, 2006), this represents an annual 0.33% mortality due to fisheries. However, there is some concern that the mortality could be colony-specific possibly leading to local depletions (Hatch et al., 2010). Laysan albatross (*Phoebastria immutabilis*) bycatch increase by 40% and black-footed albatross (*P. nigripes*) increased by 70%. Although the black-footed albatross is not endangered (unlike its relative, the short-tailed albatross), it is considered a Bird of Conservation Concern by the U.S. Fish and Wildlife Service. This designation means that without additional conservation actions, these birds of concern are likely to become candidates for listing under the Endangered Species Act. Of special interest is the endangered short-tailed albatross (*Phoebastria albatrus*). Since 2003, bycatch estimates were above zero only in 2010 and 2011, when 2 birds and 1 bird were incidentally hooked respectively, resulting in estimated takes of 15 and 5 birds. This incidental take occurred in the Bering Sea area. No observed takes occurred in 2012 or 2013.

The National Marine Fisheries Service (NMFS) confirmed the take of a second endangered short-tailed albatross (STAL) in the hook-and-line groundfish fishery of the BSAI 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

Table 28. Total estimated seabird bycatch in Alaskan groundfish fisheries, all gear types and Fishery Management Plan areas combined, 2007 through 2013. Note that these numbers represent extrapolations from observed bycatch, not direct observations. See text for estimation methods.

Species/Species Group	2007	2008	2009	2010	2011	2012	2013
Unidentified Albatross	17	0	0	0	0	0	0
Short-tailed Albatross	0	0	0	15	5	0	0
Black-footed Albatross	200	314	56	48	221	141	249
Laysan Albatross	17	226	148	233	206	135	189
Northern Fulmar	4700	3334	8199	2452	6214	3022	3268
Shearwaters	3586	1224	620	653	194	514	191
Storm Petrels	1	44	0	0	0	0	0
Gull	1345	1551	1335	1145	2158	890	556
Kittiwake	10	0	16	0	6	5	3
Murre	6	6	13	102	14	6	3
Puffin	0	0	0	5	0	0	0
Auklets	0	3	0	0	0	7	4
Other Alcid	0	0	105	0	0	0	0
Other	0	0	136	0	0	0	0
Unidentified	514	541	696	240	306	285	267
Grand Total	10397	7243	11323	4894	9324	5005	4731

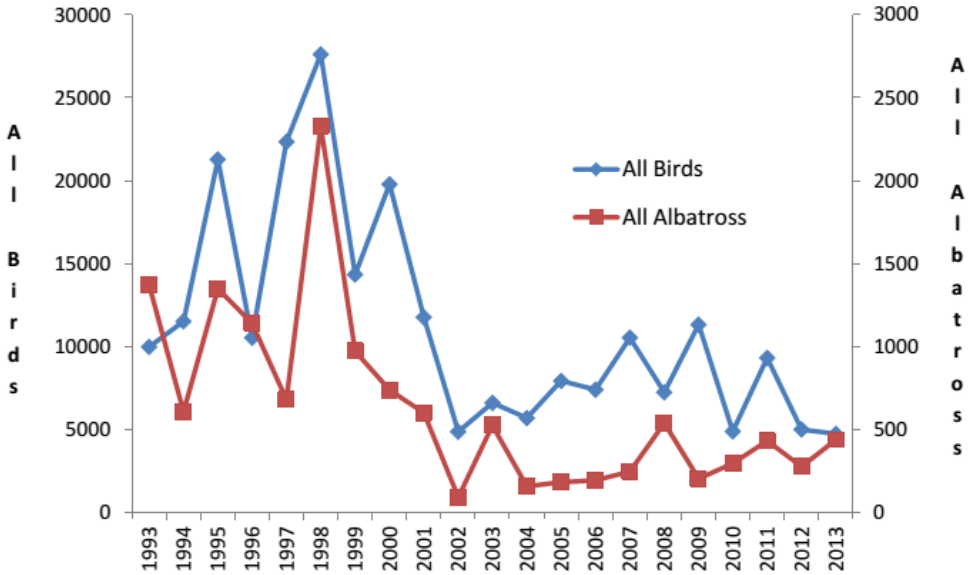


Figure 17. Seabird bycatch in Alaskan groundfish fisheries, all gear types combined, 1993 to 2013. Total estimated bird numbers are shown in the left-hand axis while estimated albatross numbers are shown in the right-hand axis (http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf)

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 Pacific cod commercial fishery as it is not an enhanced fishery.**

8. Performance specific to agreed corrective action plans

Not Applicable. This is the 2nd FAO RFM Alaska Pacific cod surveillance assessment report. Non-conformances were issued neither during the full assessment nor the surveillance assessments. However, splitting of the Aleutian Islands and Eastern Bering Sea TAC was identified during full assessment as an item of importance during the first surveillance. BS/AI TAC split took place originally in December 2013.

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

Not applicable as no unclosed are present. Furthermore, new non-conformances have not been issued.

10. Future Surveillance Actions

The assessment team will review the following during the 3rd surveillance assessment:

- Coverage rates of the restructured groundfish observer program in the GOA fisheries.

11. Client signed acceptance of the action plan

Not applicable.

12. Recommendation and Determination

Following this 2nd surveillance assessment, finalized in mid 2015, the assessment team recommended that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fishery, the Pacific cod commercial fishery employing bottom trawl gear, longline gear, pot gear and jig gear within Alaska jurisdiction (200 nautical miles EEZ), and subjected to federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] management.

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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 2nd Surveillance assessment team members for the fishery as follows:

Bill Broodie (Assessor)

William (Bill) Brodie graduated from Memorial University of Newfoundland with a BSc. in biology in 1978, and then worked as a fisheries biologist. After a 36-year career with Fisheries and Oceans Canada (DFO), he retired from there in 2014, and has since been doing some fisheries consulting. His main areas of work have included flatfish biology, trawl surveys, and stock assessment, involving various species and several international fisheries in the Newfoundland and Grand Banks regions. Mainly through his extensive involvement with the Scientific Council of the Northwest Atlantic Fisheries Organization (NAFO), Bill participated in and chaired many scientific committees dealing with fishery advice, as well as ecosystem and precautionary approaches for numerous fish and shellfish stocks.

Dr. Ivan Mateo (Assessor)

Dr. Ivan Mateo has over 15 years' experience working with natural resources population dynamic modeling. His specialization is in fish and crustacean population dynamics, stock assessment, evaluation of management strategies for exploited populations, bioenergetics, ecosystem-based assessment, and ecological statistical analysis. Dr. Mateo received a Ph.D. in Environmental Sciences with Fisheries specialization from the University of Rhode Island. He has studied population dynamics of economically important species as well as candidate species for endangered species listing from many different regions of the world such as the Caribbean, the Northeast US Coast, Gulf of California and Alaska. He has done research with NMFS Northeast Fisheries Science Center Ecosystem Based Fishery Management on bioenergetic modeling for Atlantic cod. He also has been working as environmental consultant in the Caribbean doing field work and looking at the effects of industrialization on essential fish habitats and for the Environmental Defense Fund developing population dynamics models for data poor stocks in the Gulf of California. Recently Dr. Mateo worked as National Research Council postdoc research associate at the NOAA National Marine Fisheries Services Ted Stevens Marine Research Institute on population dynamic modeling of Alaska sablefish.

Dr. Géraldine Criquet (Assessor)

Géraldine 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-Based RFM and MSC fisheries assessments.

Vito Ciccia Romito (Lead Assessor)

Vito Ciccia Romito is Italian and holds a BSc in Ecology and a MSc in Tropical Coastal Management from Newcastle University in the U.K. After his BSc, he worked in Tanzania as a Marine Research officer at the 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, Pacific cod and flatfish fisheries as well as the Icelandic cod, saithe, haddock and redfish fisheries. Vito has also participated in IFFO fisheries assessments for anchovy and sardine stocks in both Chile and Peru, and other assessment work in Canada and the Gulf of Mexico. Vito is also lead, third party IRCA approved auditor.