



ALASKA RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The
**U.S. Alaska Bering Sea and Aleutian Islands King and Snow Crab Commercial
Fisheries**

Certificate Holder
Alaska Seafood Marketing Institute (ASMI)

Client
Bering Sea Crab Client Group LLC

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Glossary

ABC	Allowable Biological Catch
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
ASMI	Alaska Seafood Marketing Institute
BOF	Board of Fisheries
BSAI	Bering Sea and Aleutian Islands
CCRF	Code of Conduct for Responsible Fisheries
CDQ	Community Development Quota
CFEC	Commercial Fisheries Entry Commission
CPUE	Catch per Unit Effort
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
IRFA	Initial Regulatory Flexibility Analysis
IRIU	Improved Retention/Improved Utilization
LLP	License Limitation Program
MSFCMA	Magnuson-Stevens Fisheries Management and Conservation Act
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
OY	Optimum Yield
PSC	Prohibited Species Catch
RACE	Resource Assessment and Conservation Engineering
REFM	Resource Ecology and Fisheries Management
RFM	Responsible Fisheries Management
SAFE	Stock Assessment and Fishery Evaluation (Report)
SSC	Scientific and Statistical Committee
SSL	Steller Sea Lion
TAC	Total Allowable Catch
USCG	U.S. Coast Guard

I. Summary and Recommendations

This report is the 4th **Surveillance Report (ref: AK/CRA/001.4/2016)** for the Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*) and Eastern Bering Sea Snow crab (*Chionoecetes opilio*) commercial fisheries produced on behalf of the Bering Sea Crab Client Group LLC according to the Alaska Based Responsible Fisheries Management (RFM) Certification Program. The fisheries were originally certified on 16th April 2012.

The objective of this Surveillance Report is to monitor for, and evaluate the impacts of, any changes to the management regime, regulations and their implementation since the previous assessment. Having assessed these changes to the fishery (if any) the Assessment Team determines if these changes materially affect the fisheries' conformance to the AKRFM Standard and whether current practices remain consistent with the overall confidence ratings assigned during either initial certification or subsequent surveillance audits where the original confidence rating(s) have been changed.

In addition to this, any areas reported as "items for surveillance" or corrective action plans in the previous assessment are reassessed and a new conclusion on consistency of these items with the Conformance Criteria is given accordingly. No non-conformances were identified since certification was granted.

The certification covers the U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*) and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a 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)] joint management regime.

The surveillance assessment was conducted according to the Global Trust Certification procedures for Alaska 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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1. Introduction

This Surveillance Report documents the 4th Surveillance Assessment of the BSAI King and Snow crab commercial federal and state fisheries originally certified on April 12th 2012, and presents the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

Unit of Certification

The U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*) and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a 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)] joint management regime.

This 4th Surveillance Report documents the assessment results for the continued certification of commercially exploited BSAI King and Snow crab fisheries to the Alaska RFM Certification Program. This is a voluntary program that has been supported by ASMI who wish to provide an independent, third-party certification that can be used to verify that these fisheries are responsibly managed.

The assessment was conducted according to the Global Trust procedures for Alaska RFM Certification using the fundamental clauses of the Alaska RFM Conformance Criteria Version 1.2 (Sept 2011) in accordance with ISO 17065 accredited certification procedures.

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 5. Assessors included both externally contracted fishery experts and Global Trust internal staff (Appendix 1).

1.1. Recommendation of the Assessment Team

Following this 4th Surveillance Assessment, the assessment team recommends that continued Certification under the Alaska Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fisheries, U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*) and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a 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)] joint management regime.

2. Fishery Applicant Details

Applicant Contact Information			
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3. Unit of Certification

U.S. ALASKA KING AND SNOW CRAB BERING SEA COMMERCIAL FISHERIES			
Species	Geographic Region(s)	Gear Types	Management Authority
Red King crab (<i>Paralithodes camtschaticus</i>)	Bristol Bay	Trap gear	National Marine Fisheries Service (NMFS); North Pacific Fishery Management Council (NPFMC); Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF).
Snow crab (<i>Chionoecetes opilio</i>)	Eastern Bering Sea		
Blue King crab (<i>Paralithodes platypus</i>)	St. Matthew Island		

4. Surveillance Meetings

Date	Organization and Location	Representative	Main Topics of Discussion
May 20 th 2016	Alaska Dept. of Fish and Game (ADF&G), Juneau, Alaska	Jie Zheng, (BBRKC stock assessment scientist) Forrest Bowers, (Deputy Director) Doug Pengilly, (ADFG Kodiak Crab Researcher) Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Changes or significant updates in law, regulations or commercial fisheries operations affecting these species • Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods. • Gear loss and ghost fishing, extent, issues. • Measures to spatially and temporally protect breeding populations. • Deadloss • ADFG crab observer coverage and data collection; observer coverage rate in 2014/2015 • Observed/potential significant detrimental impacts on species used as bait in BSAI crab fisheries • Issues with gear conflict between BSAI fishery and other fisheries • Assessment of climatic or oceanic effects that may be influencing the status/trend • Endangered species interactions • Changes in the footprint of the fishery • Enhancement opportunities
May 23 rd 2016	Bering Sea Crab Client Group LLC, Seattle, Washington Alaska Bering Sea Crabbers, Seattle Washington	Scott Goodman Ruth Christiansen (ABSCA) Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Changes or significant updates in law, regulations or commercial fisheries operations affecting the BSAI crab fisheries in 2015/16. • 2015/16 catches for the 3 fisheries. • issues with illegal catches in the BSAI or on the Russian side • changes to bycatch avoidance mechanisms, technical (e.g. escape rings, large mesh size, cod fingers) and operational methods • Ongoing projects of the Alaska Bering Sea Crabbers association. • Changes to management measures relative to legal size, minimum mesh size, protection of juveniles and females • General trends in stock status for these stocks. • Handling of sublegal and female crabs. Return at sea of females and juvenile crab, handling and methods. • Gear loss and ghost fishing,

Date	Organization and Location	Representative	Main Topics of Discussion
			<ul style="list-style-type: none"> • Gear conflicts with other users, overlapping fishing areas with other crab or groundfish fisheries • Area closures • Fishing threats to Essential Fish Habitats from other fleets. • Provenience of bait for these fisheries • Crab economic data collection and use. 2015 updates
May 23 rd 2016	NOAA Alaska Fisheries Science Center, Seattle, Washington	Benjamin J. Turnock, (EBS snow crab stock assessment scientist), William Stockhausen, (Fisheries Research Biologist), Brian Garber-Yonts, (Research Economist) Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Changes or significant updates in law, regulations or commercial fisheries operations • Changes to the IFQ system for crab • Changes to the FMP for BSAI crab • Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods. • Levels of transfers of licences/turnover • CDQ in 2015/2016 within limits • Fishing Capacity Reduction Programs • Dealoss within the IFQ system • Assessment of climatic or oceanic effects that may be influencing the status/trend • Endangered species interactions • Rationalization of quota by non-fishers
May 24 th 2016	Alaska Wildlife Troopers, Kodiak, Alaska	Lt. Streifel (Southeast Region) Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Enforcement legislation, rules or proposals. Changes and updates over 2015. • Enforcement of management measures that support selectivity, reduction of discards, reduction of bycatch, 2015 updates • Number of boardings, number of violations detected, types of violation. Updates for 2015. • Gear marking regulations, checking and concern relating the loss of gear. • General level of compliance overall. Updates for 2015 • Foreign activities
May 24 th 2016	Alaska Dept. of Fish and Game (ADF&G), Kodiak, Alaska	Douglas Pengilly, (Fisheries Scientist I, Principal Investigator SMBKC), Mark Stichert, (Kodiak)	<ul style="list-style-type: none"> • Changes or significant updates in law, regulations or commercial fisheries operations affecting these species • Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods. • Gear loss and ghost fishing, extent, issues.

Date	Organization and Location	Representative	Main Topics of Discussion
		Fish and Game Coordinator), Miranda Westphal, (Fisheries Biologist III), David Barnard,(Biometrician III), Andrew Nault, (Fisheries Biologist I) Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Measures to spatially and temporally protect breeding populations. • Deadloss • ADFG crab observer coverage and data collection; observer coverage rate in 2014/2015 • Observed/potential significant detrimental impacts on species used as bait in BSAI crab fisheries • Issues with gear conflict between BSAI fishery and other fisheries • Assessment of climatic or oceanic effects that may be influencing the status/trend • Endangered species interactions • Changes in the footprint of the fishery • Enhancement opportunities
May 25 th 2016	NOAA Alaska Fisheries Science Center, Kodiak, Alaska	Bob Foy, Fisheries Biologist Ivan Mateo (GTC) Sam Dignan (GTC)	<ul style="list-style-type: none"> • Assessment of climatic or oceanic effects that may be influencing the status/trend • New research programs to elucidate biology or ecology of crabs under assessment • Research on shell aging for crab species. Updates • Studies focused on research gaps identified in the 2013 Crab SAFE (e.g. natural mortality estimation, ontogenetic migration, males and females mating efficiency and dynamics, female biennial spawning) • Research on contribution of female crabs of differing life histories to reproductive output. Updates • Fishing threats to EBS habitats from other fleets • Ecological importance of stock in relation to food web dynamics (e.g. key prey or predator species). • Ecosystem changes attributed to the commercial fishery • Significant changes in levels of crab prey or predators species/abundance • Identification of ecosystem indicators used in relation to the dynamics of these fisheries
June 24 th 2016	NOAA Alaska Office of Law Enforcement	Lt. Will Ellis, Assistant Director, Ron Antaya , Assistant Special Agent-in-Charge,	<ul style="list-style-type: none"> • Enforcement legislation, rules or proposals. Changes and updates over 2015. • Enforcement of management measures that support selectivity, reduction of discards, reduction of bycatch, 2015 updates • Number of boardings, number of violations detected, types of violation. Updates for 2015.

Date	Organization and Location	Representative	Main Topics of Discussion
		Ivan Mateo (GTC)	<ul style="list-style-type: none">• Gear marking regulations, checking and concern relating the loss of gear.• General level of compliance overall. Updates for 2015• Foreign activities

5. Assessment Outcome Summary

Fundamental Clauses Summaries

Fundamental Clause 1: Structured and legally mandated management system

Evidence adequacy rating: High

Alaska's BSAI crab stocks are managed under the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (FMP). The crab FMP was developed under a negotiated agreement between the State of Alaska and the federal government. The result was a state/federal fishery management plan (FMP) which incorporated concerns of the NPFMC, NMFS and MSA requirements on the federal side and ADFG, the BOF and Alaska statutes on the state side. This balance resulted in true Joint Management where the needs of both Alaska residents and those from other states were met. The crab FMP has three categories of regulations which reflect the state and federal emphasis. Once the state and federal agencies and the BOF and NPFMC arrived at consensus and put the Joint management document to public review, it was submitted to the Secretary of Commerce who accepted joint management for the BSAI crab fisheries.

Fundamental Clause 2: Coastal area management frameworks

Evidence adequacy rating: High

The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. This occurs whenever resources under their management may be affected by other developments and each time they create, renew or amend regulations. The fishery management agencies have processes, committees and groups that allow potential coastal zone developments and issues to be brought to formal review and engagement such as the NPFMC meetings or the BOF meetings. From witnessing the processes, interviews with representatives of these organizations, The Council and the BOF actively encourage stakeholder participation, and all their deliberations are conducted in open, public sessions. Decisions are transparently documented on the various websites of these organizations in a timely manner. With a Congressionally approved approach creating Processor Quota Shares and Individual Fishing Quotas for rationalized crab fisheries in the BSAI in 2005, the numbers of buyers and sellers were capped, seasons were protracted and vessels were able to join cooperatives that resulted in fewer vessels deploying less gear on the grounds. The economic conditions under which fishing industries operate promote responsible fisheries, and these circumstances are actively reviewed and demonstrated in various analysis by NMFS. ADFG also track ex-vessel value of the fisheries they manage, and produce Annual Management Reports that support the analysis. Decisions are based on both biological and socio-economic information collected and analyzed by NPFMC, NMFS and ADFG staff economists that participate in the economic, social and cultural evaluation and review process of fishery management proposals. Allocation also considers subsistence and community development initiatives.

Fundamental Clause 3: Management objectives and plan

Evidence adequacy rating: High

Long-term fisheries management objectives are outlined in the BSAI Crab FMP. State regulations for the king and snow (& Tanner crab) fisheries are listed under the Alaska Administrative Code, Title 5, Chapter 34 and 35. The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851) to which all fishery management plans must be consistent. Conservation of aquatic habitats and biodiversity are integral parts of the NPFMC's management process. These concerns and decisions are summarized annually in the AFSC Ecosystems Considerations report and the

ecosystem sections of each annual Stock Assessment and Fishery Evaluation (SAFE) report. Furthermore, Essential Fish Habitat (EFH) identification and protection constitute a key objective for the management system as outlined in the BSAI crab FMP.

Fundamental Clause 4: Fishery data

Evidence adequacy rating: High

The collection, aggregation and use of data in stock assessments for the BSAI crab fisheries are undertaken through collaboration between the NPFMC, the NMFS and ADFG. Data collection, analysis and stock assessment of the BSAI crab fisheries respect the NPFMC's BSAI crab FMP requirements. NMFS and ADFG collect fishery dependent data and undertake fishery-independent surveys for all BSAI crab fisheries providing the basis for the assessment of the crab stocks and their impact on the ecosystem. The NMFS annual trawl surveys of the eastern Bering Sea provide indices of relative abundance and biomass for all three fisheries. Full details of the datasets for the three fisheries and their time series can be found in the annual Stock Assessment and Fishery Evaluation (SAFE) reports

Fundamental Clause 5: Stock assessment

Evidence adequacy rating: High

The NMFS undertakes shellfish stock assessments through the annual Eastern Bering Sea trawl survey which provides the primary input to the shellfish assessments. Information derived from both regular surveys and associated research are analyzed by AFSC stock assessment scientists and supplied to fishery management agencies and to the commercial fishing industry. In addition, economic and ecosystem assessments are provided to the Council on an annual basis. For the BBRKC fishery, a length-based analysis (LBA) model combines multiple sources of survey, catch and bycatch data using a maximum likelihood approach to estimate abundance, recruitment and catchabilities, catches and bycatch of the commercial pot fisheries and groundfish trawl fisheries. For the SMBKC fishery a three-stage catch-survey analysis (CSA) assesses the male component of the stock incorporating data from commercial catches from the directed fishery and its observer program, the annual EBS trawl survey, triennial pot surveys and bycatch data from the groundfish trawl fishery. For the EBSSC fishery the stock assessment uses a size and sex-structured model which is fitted to time series of total catch data from the directed fishery and bycatch data from the trawl fishery, size frequency data from the catch in the pot fishery and the bycatch in both the pot and trawl fisheries, and abundance data from the NMFS trawl survey and two recent BSFRF surveys. An ongoing goal is to produce an ecosystem assessment utilizing a blend of data analysis and modelling to clearly communicate the current status and possible future directions of ecosystems.

Fundamental Clause 6: Biological reference points and harvest control rule

Evidence adequacy rating: High

The status determination criteria for crab stocks are calculated on an annual basis using a five-tier system that accommodates varying levels of uncertainty of information, and incorporates new scientific information providing a mechanism for continually improving the status determination criteria as more information becomes available. For tier 3 stocks, the target reference point is B35% (when spawning biomass is reduced to 35% of the unfished condition), a proxy for BMSY, or biomass at Maximum Sustainable Yield (MSY). Stock status of BSAI crabs are determined by two metrics. Firstly, the stock is considered to be overfished if the stock size is estimated to be below the minimum stock size threshold (MSST) or limit reference point ($1/2$ MSY). Secondly, overfishing is considered to have occurred if the exploitation level, or fishing mortality, exceeds the fishing mortality at the overfishing level (F_{OFL}), or more intuitively if the total catch exceeds the OFL level (equivalent to MSY).

Fundamental Clause 7: Precautionary approach**Evidence adequacy rating: High**

The overall management for the BBRKC, EBSSC and SMBKC comprises all the elements as specified in the FAO guidelines for the precautionary approach. FAO Guidelines for the Precautionary Approach (PA) (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review. Absence of adequate scientific information is not used as a reason for postponing or failing to take conservation and management measures. The three crab stocks part of this assessment are managed under a tier system rule based on stock knowledge. Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. The five-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. The lower the tier, the less conservative the determination of OFL/ABC and ACL are, due to a greater level of information being known about the stock. Higher tier stocks are managed more conservatively due to gaps in the information about the stock. This system is intrinsically precautionary in nature and the results involve catches always lower than the overfishing level. The annual assessments and subsequent SAFE reports for the BSAI crab fisheries allow for the identification of areas where there are gaps in the knowledge of the stock which require further research and/or improvements.

Fundamental Clause 8: Management measures**Evidence adequacy rating: High**

The NPFMC's FMP for BSAI crab stocks outlines the harvest strategy and harvest control rule, the stock status definitions, the criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The BSAI Crab FMP Plan authorizes only the use of pot gear to harvest the crab resources. The Crab Rationalization program allocates BSAI crab resources among harvesters, processors, and coastal communities who have been involved with and/or were dependent upon these fisheries. Share allocations to harvesters and processors, together with incentives to participate in fishery cooperatives, increases efficiencies, provides economic stability, and facilitates compensated reduction of excess capacities in the harvesting and processing sectors. Community interests are protected by CDQ allocations and regional landing and processing requirements, as well as by several community protection measures. The BSAI crab FMP defers design specifications required for commercial crab pots and ring nets to the State. Escape mechanisms are incorporated and mesh size adjusted to allow female and sublegal male crab to escape. Crabbers are constructing pots with larger web on the panels to allow for female and juvenile crab to exit the pot before the gear is hauled back. The yearly marine habitat footprint has been assessed and its impact considered very small for the entire BSAI directed crab fisheries. Regulation imposes that undersized males and females must be promptly discarded from crab vessels to decrease handling mortality rates. Discarded crabs are returned to the sea in a variety of methods including direct release and/or with the use of chutes and ramps. The Federal BSAI Crab FMB describes fishing season requirements, those are aimed to protect king and snow/Tanner crabs during the molting and mating portions of their life cycle. Also, groundfish closure areas, or trawl protection areas, are in place to minimize the impact of groundfish harvests on crab resource.

Fundamental Clause 9: Management measures to produce maximum sustainable levels**Evidence adequacy rating: High**

There is clearly defined harvest strategy that consists of a set of defined management measures designed to maintain the crab stocks at levels capable of producing maximum sustainable levels. These include harvest control rule, stock status definitions, criteria used to determine stock status using a five-

tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). Using this strategy and clearly laid out rebuilding plans, two of these stocks were rebuilt from being declared overfished. The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH are necessary to maintain stocks capable of producing maximum sustainable yields. At present, there is an area of overlap between current female red king crab distribution and areas where trawling occurs in the southern Bristol Bay. The NPFMC is currently researching this issue and discussing the best way to proceed with the management of this area.

Fundamental Clause 10: Appropriate standards of fisher’s competence**Evidence adequacy rating: High**

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

Fundamental Clause 11: Effective legal and administrative framework**Evidence adequacy rating: High**

There is a division of effort and emphasis in the at-sea enforcement between the USCG and the AWT. Under joint management there are both state and federal laws to enforce, and both state and federal agents actively conduct at-sea enforcement. The USCG is responsible for enforcing the main federal vessel regulations: this includes safety at sea, drug enforcement, vessel compliance with ESA and EFH requirements and assuring compliance of federal permits, observer coverage, licenses and VMS in the crab fisheries. AWT have vessels that conduct at-sea compliance with gear regulations, capable of hauling and confiscating crab pots, sample crab harvests at sea, assure sex and size requirements are met and assure that the vessels have all required state and federal licenses. Additionally AWT, along with ADFG area biologists and technicians, conduct vessel inspections dockside, conducting hold inspections and observing offloads of harvested crab for compliance. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska’s EEZ. Because the fishery was rationalized in 2005, most enforcement of IFQ/IPQ violations, as well as size, sex and season violations occur at offloading.

Fundamental Clause 12: Framework for sanctions**Evidence adequacy rating: High**

In Alaska waters, enforcement policy section 50CFR600.740 states: (a) The MSA provides four basic enforcement remedies for violations, in ascending order of severity, as follows: (1) Issuance of a citation (a type of warning), usually at the scene of the offense (see 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. The MSA treats sanctions against the fishing vessel permit to be the carried out of a purpose separate from that accomplished by civil and criminal penalties against the vessel or its owner or operator. 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 Marine Division of AWT and the State of Alaska Department of Law pursue a very aggressive enforcement policy. They attend the BOF and are integral into the process for regulation formulation and legislation, analogous to the USCG attendance and input in the Council process. AWT has Statutory / Regulatory legislation pertaining to their Authority.

Fundamental Clause 13: Impacts of the fishery on the ecosystem**Evidence adequacy rating: High**

The purpose of the Crab Ecosystem Considerations and Indicators (CECI) report is to consolidate ecosystem information specific to the crab stocks in the BSAI FMP. The last EFH review (2010) identified impacts of groundfish trawling on EFH habitat of red king Crab in Southern Bristol Bay as a potential problem area. The NPFMC is addressing the issue. In the BSAI crab fisheries Final Environmental Impact Statement (EIS), the impact of pot gear on benthic Eastern Bering Sea species is discussed. The total portion of the EBS impacted by commercial pot fishing may be less than 1% of the shelf area and the report concludes that BSAI crab fisheries have an insignificant effect on benthic habitat. Habitat protection areas, prohibited species caps (PSC) and crab bycatch limits are in place to protect important benthic habitat for crab and other resources and to reduce crab bycatch in the trawl and fixed gear groundfish fisheries. If PSC limits are reached in bottom trawl fisheries executed in specific areas, those fisheries are closed. The EBS crab fisheries catch a small amount of other species as bycatch. A limited number of groundfish, such as Pacific cod, Pacific halibut, yellowfin sole, and sculpin are caught in the directed pot fishery. The invertebrate component of bycatch includes echinoderms, snails, non-FMP crab, and other invertebrates. As noted in the Endangered Species Act EIS report, crab fisheries do not adversely affect ESA listed species, destroy or modify their habitat, or comprise a measurable portion of their diet. Based on food habits data collected in the summer months during the annual EBS bottom trawl survey, Pacific cod, Pacific halibut and skates are the primary predators of large or legal size crab although legal-sized crab are a minimal component of these predators diets. The short and long term effects of removing large male crab from a population are not well understood and may vary by species and population as outlined in various scientific studies

6. Conformity Statement

The assessment team recommends that continued certification under the Alaska Responsible Fisheries Management Certification Program is granted to the U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries; Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), and Eastern Bering Sea Snow crab (*Chionoecetes opilio*) legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a 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)] joint management regime.

7. Evaluation of Fundamental Clauses

A. The Fisheries Management System

Fundamental Clause 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.

No. Supporting clauses	15
Supporting clauses applicable	9
Supporting clauses not applicable	6
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

1.1. There shall be an effective legal and administrative framework established at local and national level appropriate for the fishery resource and conservation and management.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA)¹, most recently reauthorized in 2006, is the primary domestic legislation governing management of marine fisheries in the United States. It established eight Regional Fisheries Management Councils to manage fisheries in the United States Exclusive Economic Zone (EEZ) (from three to 200 nautical miles offshore) including the North Pacific Fishery Management Council (NPFMC). The National Marine Fisheries Service (NMFS) works closely with the NPFMC and are responsible for developing, implementing, and enforcing regulations pertaining to management of the BSAI crab fisheries. Primary responsibility for the management of BSAI crab fisheries is assigned to the State of Alaska with Federal oversight and the primary state-level management entity is the Alaska Department of Fish and Game (ADFG). The NPFMC sets the OFL and the ABC for BSAI crab fisheries within which the State sets TACs and Guideline Harvest Levels (GHL). BSAI crab fisheries are rationalized closed access fisheries with a catch share system allocating quota amongst eligible users. Fisheries regulations are enforced by the Alaska Wildlife Troopers (AWT) in conjunction with the United States Coast Guard (USCG) and the NMFS and the status of BSAI crab stocks are summarized in annual Stock Assessment and Fishery Evaluation (SAFE) reports.

BSAI crab fisheries are wholly prosecuted within the U.S. EEZ by U.S. vessels, and are managed under the “Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs”². The FMP establishes a State/Federal cooperative management regime that assigns primary responsibility for the management of BSAI crab fisheries to the State of Alaska with Federal oversight. The FMP describes the management regimes for ten distinct BSAI crab fisheries prosecuting five different species of crab including the three fisheries covered by this certification. Alaska state regulations are aligned with the goals and objectives of the FMP, the MSA and other applicable federal laws. There are three categories of management measure in BSAI crab fisheries; 1) those that are fixed in the FMP and require a FMP amendment to change; 2)

¹ http://www.nmfs.noaa.gov/sfa/laws_policies/msa/documents/msa_amended_2007.pdf

² <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

those that are framework-type measures that the state can change following criteria set out in the FMP; and 3) those measures that are not frameworked in the FMP and are thus at the discretion of the State.

The State Organizational Act of 1959 provided for Alaska Statutes, Title 16, which deals with Alaska Fish and Game Resources. Article 1 provides for a Department of Fish and Game whose principal executive officer is the Commissioner of Fish and Game. The Commissioner is appointed by the Governor for five years. The Commercial Fisheries Division was established to manage all commercially harvested fish species in Alaska. The Division is headed by a director who supervises four regional supervisors. The regions are further separated into management areas. Area management biologists are responsible for collecting catch data and monitoring fisheries in their areas. A Subsistence Section within the Commissioner's Office was established to document subsistence needs and utilization and to make recommendations for developing regulations and management plans to ensure subsistence use preference. The enforcement of fish and game laws and regulations is provided by AWT, part of the Alaska Department of Public Safety (ADPS). AWT officers operate independently of the ADFG, although communication between the two departments is maintained routinely and activities are coordinated between the two agencies.

1.2. Management measures shall take into account the whole stock unit over its entire area of stock distribution.

BSAI crab fisheries each prosecute what are considered to be discrete stocks and are treated as such for the purposes of management. While research, including tagging and genetic studies, is continually carried out to improve stock definitions there have been no changes in the stock units since certification.

The ADFG defines specific areas for the management of BSAI crab fisheries. Bristol Bay red king crab is fished exclusively within Registration Area T as defined by 5 AAC34.800³ while St. Matthew Island blue king crab fishery within the St. Matthews Island subsection of Registration Area Q as defined by 5 AAC 34.905 (C)(2)⁴ (Figure 1). With respect to blue king crab studies have shown little to no genetic exchange between the St. Matthew Island Section population and the wider Pribilof District or Western Bering Sea populations. The fishable population of snow crab is much more broadly distributed, within boundaries defined under 5 AAC 35.505 (e)(1) and (B)(2)⁵.

³ <http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter034/section800.htm>

⁴ <http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter034/section905.htm>

⁵ <http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter035/section505.htm>

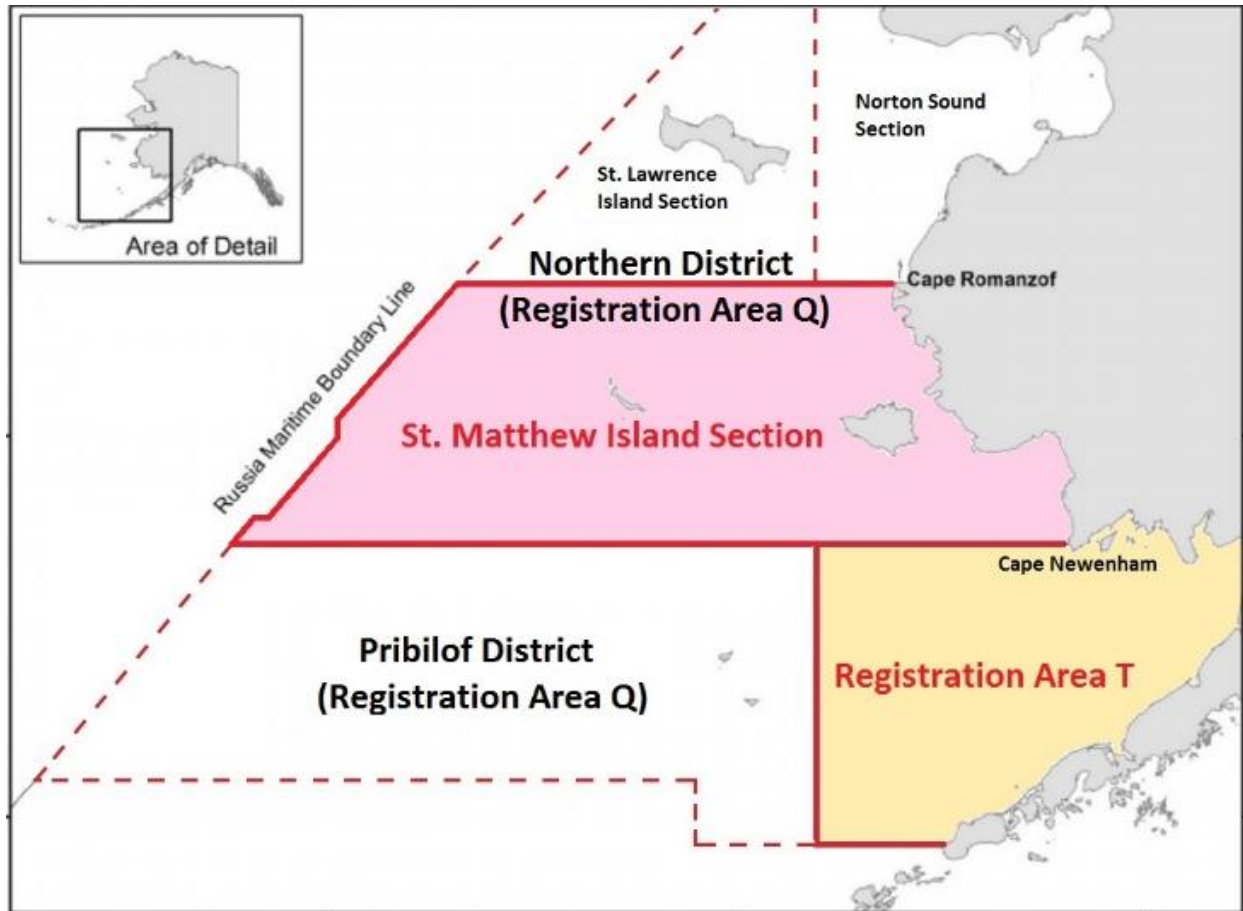


Figure 1. Fishing areas for Bristol Bay red king crab (Yellow) and St. Matthew's Island blue king crab (Pink).

ADFG asserts management authority over all migratory fish and shellfish species which enter and leave territorial waters of the State, including the migratory fish and shellfish taken from State waters which are indistinguishable, in most instances, from those taken from adjacent high seas areas. Regulations governing migratory fish and shellfish cover both areas and are enforced by the State's landing laws. These landing laws prohibit the sale or transportation within State waters of migratory fish and shellfish taken on the high seas unless they were taken in accordance with State regulations.

1.3./1.4/1.5./1.6. Transboundary stocks

The BSAI crab stocks under review do not represent transboundary stocks; these Clauses are not applicable.

1.7. Review and Revision of conservation and management measures

Procedures are in place to keep the efficacy of current conservation and management measures and their possible interactions under continuous review to revise or abolish them in the light of new information. The annual crab SAFE assessment process evaluates crab stocks and current regulations by the CPT, SSC, the public and the NPFMC. Any need for program modification recognized during this annual review process can result in a proposed amendment to the FMP been brought forward by the CPT, SSC, the public or the Council. The Crab Rationalization program, first implemented in 2005, was subject to 18-month,

two-year, and five-year program reviews and is currently undergoing its ten-year review⁶. It has been actively addressed at nearly every NPFMC meeting since its inception. Appropriate refinements to the rationalization program, stock assessments and management regimes for each species are continually discussed and adapted if deemed appropriate.

1.8. Transparent management arrangements and decision making

The BOF and the NPFMC's management arrangements and decision-making processes for the fishery are organized in a very transparent manner. The BOF and the Council provide a great deal of information on their websites, including agenda of meetings, discussion papers, and records of decisions. Both the BOF and the Council actively encourage stakeholder participation, and all BOF and Council deliberations are conducted in open, public session. Revisions to existing programs are accomplished through the process.

1.9. Compliance with international conservation and management measures

The BSAI crab stocks under review are fished exclusively by U.S. vessels in U.S. territorial waters and as such are not party to the Agreement to Promote Compliance with International Conservation and Management Measures by Vessels Fishing in the High Seas.

⁶ <http://www.npfmc.org/crabrationalization/>

Fundamental Clause 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.

No. Supporting clauses	16
Supporting clauses applicable	15
Supporting clauses not applicable	1
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

2.1./2.2./2.3./2.4. Policy, legal and institutional frameworks adopted to achieve sustainable and integrated use of marine resources along with mechanisms to avoid conflict shall be in place. Representatives of the fisheries sector and fishing communities shall be consulted in decision making processes and information related to management measures shall be disseminated.

An appropriate policy, legal and institutional framework is adopted in order to achieve sustainable and integrated use of living marine resources, taking into account the fragility of coastal ecosystems, the finite nature of their natural resources and the needs of coastal communities. State and federal entities that participate in ensuring the sustainable and integrated use of living marine resources include, but are not limited to:

NMFS in connection with the **NPFMC**⁷ manages all Category 1 measures for crab in the Bering Sea, as defined in the FMP. These federal agencies participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) process⁸. NEPA documents are required to be produced each time regulations are renewed or amended meaning all proposed regulations include NEPA considerations. The NEPA process requires information to be made publically available and provides a robust opportunity for public involvement and decisions are made in collaboration with fishery managers, fishermen, fishing organizations and fishing communities.

The **BOF**⁹, in conjunction with the **ADFG**, are responsible for all Category 2 and 3 management measures and routinely take into account the risks and uncertainties involved in the management of BSAI crab. Any proposed changes to the existing management regime go through a rigorous regulatory review process whereby ADFG prepare detailed scientific reports that are then presented to the BOF and the public for their consideration. The **NPFMC** and the **BOF** are required to manage the crab resources in a sustainable manner, as mandated by the MSA National Standards and the Alaska Constitution, respectively.

The Department of Environmental Conservation (DEC)¹⁰ implements regulations affecting air, land and water quality and is the state agency charged with implementing the federal Clean Water Act.

⁷ <http://www.npfmc.org/>

⁸ https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf

⁹ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main>

¹⁰ <http://dec.alaska.gov/>

Alaska Department of Fish and Game (**ADFG**)¹¹ 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.

The Department of Natural Resources (**DNR**)¹² manages all state-owned land, water, and natural resources except for fish and game and uses the state Endangered Species Program to preserve the habitats of species threatened with extinction. In addition the DNR Office of Project Management and Permitting (**OPMP**)¹³ coordinates the review of larger scale projects in the state such as transportation, oil and gas, mining, federal grants, ANILCA coordination, and land use planning.

The functions of the U.S. Fish and Wildlife Service (**USFWS**)¹⁴ include enforcement of federal wildlife laws, protection of endangered species, management of migratory birds, restoration of nationally significant fisheries and conservation and restoration of wildlife habitat such as wetlands. Additionally, the USFWS distributes monies collected through the Sport Fish and Restoration Program to State fish and wildlife agencies for fishery projects, boating access and aquatic education.

The Bureau of Ocean Energy Management (**BOEM**)¹⁵ 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 overlap extensively with those of ADNR, ADFG and ADEC given the potential impacts of such activities on marine resources.

While the Coastal Management Program for Alaska was not renewed in 2012 upon the expiry of the old program this would in reality only serve to formalize and better define the State's role in decision making processes. Ultimately, the assessment team considers the collectivity of the NEPA process and existing State and Federal agencies and processes, to be demonstrably capable of planning and managing coastal developments in a transparent, organized and sustainable way.

Alaska has institutional and legal frameworks that determine the possible uses of coastal resources, govern access to them and take into account the rights of coastal fishing communities and their customary practices when doing so. These processes are clearly demonstrated by the NPFMC and BOF decision-making processes, the Alaska National Interest Lands Conservation Act (ANILCA)¹⁶ and the Community Development Quota (**CDQ**) Program.

The Council system was designed so that fisheries management decisions were made at the regional level allowing input from affected stakeholders. **NPFMC** meetings are open and public testimony, both written and oral, is taken on each issue ensuring that the rights of coastal communities and their historic access to the fishery are included in the decision making process. The ANILCA conveyed large sections of federal land to settle Alaska native lands claims and directs federal agencies to consult and coordinate with the state of Alaska.

¹¹ <http://www.adfg.alaska.gov/>

¹² <http://dnr.alaska.gov/>

¹³ <http://dnr.alaska.gov/commis/opmp/>

¹⁴ http://www.fws.gov/help/about_us.html

¹⁵ http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf

¹⁶ <http://dnr.alaska.gov/commis/opmp/anilca/>

The BOF meets four to six times per year in communities around the state to consider proposed changes to fisheries regulations. Advisory committees are the local "grass roots" groups that meet to discuss fish and wildlife issues and to provide recommendations to the respective boards¹⁷. There are 84 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.

The Community Development Quota (CDQ) Program is a federal fisheries program that aims to promote fisheries related economic development in western Alaska. The program involves 65 eligible communities within a fifty-mile radius of the Bering Sea coastline eligible communities split into six regional organizations, referred to as CDQ groups. The CDQ program allocates a portion of the BSAI harvest of species including halibut, pollock, Pacific cod, flatfish, rockfish and crab to CDQ groups. The Economic status of BSAI fisheries is presented annually in Economic SAFEs¹⁸.

Risks and uncertainties related to the policies set up for the management of coastal areas are taken into account within and throughout the various NEPA processes, NPFMC and BOF proceedings as well as through ANILCA and the Department of Natural Resources (DNR) Office of Project Management and Permitting (OPMP).

Management entities and processes give due publicity to conservation and management measures and ensure that laws, regulations and other legal rules governing their implementation are effectively disseminated. The bases and purposes of such measures are explained to users of the resource in order to facilitate their application and thus gain increased support in the implementation of such measures.

2.5. The economic, social and cultural value of coastal resources shall be assessed in order to assist decision-making on their allocation and use.

The economic, social and cultural value of BSAI fisheries are continually assessed to assist decision-making on their allocation and use. The economic status of fisheries are presented in annual economic SAFE reports published yearly alongside ecosystem SAFEs and Stock Assessment SAFEs.

The Alaska Fisheries Information Network (AKFIN) was established in 1997 in response to an increased need for detailed, organized fishery information to aid decision-making by managers with the aims of consolidating, managing and dispensing information related to commercial fishing in Alaska¹⁹. The AKFIN maintains an analytic database of both state and federal historic, commercial Alaska fisheries data relevant to the needs of fisheries analysts and economists and to provide that data in a usable format.

In August of 2005, as part of the BSAI share-based management program, the Council developed an economic data collection program (referred to as "economic data reports" or EDR) to provide information for use in assessing the effects of both the program and future amendments to it²⁰.

¹⁷ <http://www.adfg.alaska.gov/index.cfm?adfg=process.main>

¹⁸ <http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/CrabEconSAFE2015.pdf>

¹⁹ <http://www.akfin.org/about-akfin>

²⁰ <http://www.afsc.noaa.gov/REFM/Socioeconomics/Default.php>

2.6./2.7/2.9/2.10/2.11 Research and monitoring of the coastal environment, mechanisms for cooperation and coordination, appropriate technical capacities and financial resources, conflict avoidance amongst user groups

Monitoring of the coastal environment in Alaska is performed by federal and state agencies. Economic and social parameters are routinely assessed by the NPFMC, NMFS and ADFG either during the NEPA review of plan amendments or during their on-going studies and evaluations. Some entities engaged in conducting research and monitoring of the marine environment in Alaska include:

The AFSC's "*Ecosystem Monitoring and Assessment Program*" (EMA) aims to improve and reduce uncertainty in stock assessment models of commercial fish and shellfish species through the collection of observations of survey catch and oceanography. Its oceanographic observations include temperature, conductivity, salinity, density, photosynthetically available radiation (PAR), oxygen, Chlorophyll a, and estimates of the composition and biomass of phytoplankton and zooplankton (includes jellyfish) species.

The University of Alaska Institute of Marine Science (IMS²¹) provides expertise in marine biology, biological oceanography, physical, chemical and geological oceanography; current IMS projects include Northeast Pacific near-surface monitoring of temperature, salinity and fluorescence, polycyclic aromatic hydrocarbon research, and Arctic ocean biodiversity.

The North Pacific Research board (NPRB²²) funds numerous oceanographic studies describing baseline parameters and support buoy arrays for the collection of environmental data.

The NMFS Pacific Marine Environmental Lab (PMEL²³) collects oceanographic and environmental data important to understanding the changing habitat of crab and other marine species.

The Alaska Department of Environmental Conservation (ADEC²⁴) Division of Water monitors and reports on water quality and responds to spills of hazardous materials such as oil.

ADFG Habitat Division²⁵ conducts research on coastal and marine environments throughout Alaska in an effort to document and mitigate human-related impacts, changes in habitat & species abundance. The agency also collects physical and chemical data, including temperature, depth, salinity and conductivity during their St. Matthew's pot survey using data loggers placed on the survey pots.

The NMFS' Habitat Conservation Division (HCD) works to avoid, minimize, or offset adverse anthropogenic effects on Essential Fish Habitat (EFH) and living marine resources in Alaska. This work includes conducting and/or reviewing environmental analyses for a large variety of activities including commercial fishing. HCD focuses on activities in habitats used by federally managed fish species in marine, estuarine, and freshwater areas²⁶.

The Coast Guard enforces fisheries laws at sea including regulations to aid the recovery of marine protected species and their associated habitats²⁷.

²¹ <http://www.uaf.edu/sfos/research/institute-of-marine-scienc/>

²² <http://www.nprb.org>

²³ <http://www.pmel.noaa.gov>

²⁴ <http://dec.alaska.gov/water/>

²⁵ <http://www.adfg.alaska.gov/index.cfm?adfg=habitatresearch.main>

²⁶ <http://www.fakr.noaa.gov/habitat/default.htm>

²⁷ <http://www.uscg.mil/hq/cg5/cg531/LMR.asp>

Fundamental Clause 3

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

No. Supporting clauses	6
Supporting clauses applicable	6
Supporting clauses not applicable	0
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

3.1. Long-term management objectives shall be translated into a plan or other management document and be subscribed to by all interested parties.

Long-term fisheries management objectives are outlined in the BSAI Crab FMP²⁸. State regulations for the king and snow (& Tanner crab) fisheries are listed under the Alaska Administrative Code, Title 5, Chapter 34 and 35²⁹. The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851) to which all fishery management plans must be consistent. Conservation of aquatic habitats and biodiversity are integral parts of the NPFMC's management process. These concerns and decisions are summarized annually in the AFSC Ecosystems Considerations report and the ecosystem sections of each annual Stock Assessment and Fishery Evaluation (SAFE) report. Furthermore, Essential Fish Habitat (EFH) identification and protection constitute a key objective for the management system as outlined in the BSAI crab FMP.

3.2. Management measures should limit excess fishing capacity, promote responsible fisheries, take into account artisanal fisheries, protect biodiversity and allow depleted stocks to recover.

In 2005, the NPFMC instituted a catch sharing mechanism that created quota shares for BSAI crab fisheries. The quota share system resulted in the removal of excess fishing capacity, fewer active vessels deploying less gear, greatly extended fishing seasons and increased economic viability within the fishing industry. Fishing gear used in BSAI crab fisheries is selective, with compulsory escape rings and biodegradable twine to reduce ghost fishing from lost pots. The rationalization program has incentivized responsible fishing practices with pot losses, damage as a result of on-deck sorting and deadloss of crab all having reduced.

Prior to rationalization, all vessels participated in a "race to fish" scenario. When the fisheries were rationalized, the number of qualifying vessels was reduced. A shareholder may hold quota in several fisheries concurrently, as allocation was determined based on historical track record of landings. Today fewer vessels are needed to take the TAC and because vessel owners fish within cooperatives, they can fish their pooled quota using fewer vessels thereby reducing operational costs and increasing overall efficiency.

²⁸ <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

²⁹ <http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://www.jnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac>

B. Science and Stock Assessment Activities

Fundamental Clause 4

There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.

No. Supporting clauses	14
Supporting clauses applicable	9
Supporting clauses not applicable	5
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

4.1. (Incl. 4.1.1., 4.1.2.) Reliable and accurate data required for assessing the status of fisheries and ecosystems - including data on retained catch of fish, bycatch, discards and waste shall be collected.

The collection, aggregation and use of data in stock assessments for the BSAI crab fisheries are undertaken through collaboration between primarily the NPFMC, the NMFS and ADFG. The fisheries are managed by NPFMC and NMFS Alaska Region with day-to-day management devolved to ADFG. Data collection, analysis and stock assessment of the BSAI crab fisheries respect the NPFMC's BSAI crab FMP requirements.

ADFG and NMFS collect fishery dependent data and undertake fishery-independent surveys for all Bering Sea and Aleutian Islands (BSAI) crab fisheries providing the basis for the assessment of the crab stocks and their impact on the ecosystem. The NMFS annual trawl surveys of the eastern Bering Sea provide indices of relative abundance and biomass for all three fisheries. Full details of the datasets for the three fisheries and their time series can be found in the annual Stock Assessment and Fishery Evaluation (SAFE) reports.

Bristol Bay red king crab

Fisheries data were collected originally by the International North Pacific Fisheries Commission and since 1974 by ADFG. Bycatch data are collected by ADFG and NMFS, and fisheries-independent data from the NMFS annual trawl surveys of the eastern Bering Sea and two recent Bering Sea Fisheries Research Foundation (BSFRF) surveys are used to assess Bristol Bay red king crab. The data are described in the annual SAFE report include total catch, catch per unit effort (CPUE), pot bycatch, trawl bycatch, catch size composition (dependent data); and biomass, size composition and shell condition (independent data).

St Matthew Island blue king crab

Fisheries data are collected by ADFG, bycatch data by ADFG and NMFS, and fisheries-independent data from the NMFS annual trawl surveys of the eastern Bering Sea and the triennial ADFG pot survey are available for use in assessment of St. Matthew Island blue king crab, although not all datasets are used in all years. The data are described in the annual SAFE report and include total catch, CPUE, pot bycatch, trawl and fixed gear bycatch, catch size composition (dependent data); and biomass, size composition, shell condition, total catch and CPUE (independent data).

Eastern Bering Sea snow crab

Fisheries data are collected by ADFG, bycatch data by ADFG and NMFS, and fisheries-independent data from the NMFS annual trawl surveys of the eastern Bering Sea and two recent BSFRF surveys. The data

are described in the annual SAFE report and include total catch, CPUE, pot bycatch, trawl bycatch, catch size composition (Commercial Fishery dependent data); and biomass, size composition and shell condition (independent data).

For all the three units of assessment there are effective fishery data collection systems in place and surveys providing fishery-independent estimates of stock biomass and there are sufficiently long time series of both fishery-dependent and fishery-independent data. In addition to fishery data, annual SAFE reports provide information on ecosystem indicators which may have an impact on BSAI crab stocks. The report considers the physical environment of the BSAI ecosystem including climatic factors, sea ice trends, habitat and ocean acidification, the biological environment of the ecosystem including crab prey and predators of crab, and the physical and biological environmental impacts on crab biology including recruitment, growth and mortality, and provides trends in ecosystem-based management indicators. The report also updates current research and identifies future research priorities for BSAI crab stocks with respect to ecosystem interactions³⁰.

4.2. An observer scheme designed to collect accurate data for research and support compliance with applicable fishery management measures shall be established.

ADFG runs and deploys ADFG observers on vessel participating in the BSAI crab fisheries as an important component of data collection and fishery management. Observers are deployed on all catcher-processor vessels in the crab fisheries, on randomly selected catcher vessels in the Bristol Bay red king crab (BBRKC) and Eastern Bering Sea snow crab (EBSSC) fisheries, but following the closure of the St Matthew blue king crab (SMBKC) fishery in 1999 and the subsequent re-building plan, all vessels in the fishery must carry an observer now that the fishery has re-opened. The on-board observers monitor the fishing position, depth, soak time etc. of the fishing gear, pot contents including samples of the size and shell condition frequency distributions for both total catch and retained crabs, and other biological information. The observers also document total catch, bycatch, effort (and hence catch per unit effort, CPUE), and so the data collected from this observer program can be used in both stock assessment of the fishery and in-season projections of fishery performance. Full observer sampling methods are provided in the 2014 ADFG Crab Observer Training and Deployment Manual.

4.3. (Incl. 4.3.1.) Sufficient knowledge of social, economic and institutional factors relevant to the fishery in question shall be developed through data gathering, analysis and research.

4.4. States shall stimulate the research required to support national policies related to fish as food.

4.5. States shall ensure that the economic, social, marketing and institutional aspects of fisheries are adequately researched and that comparable data are generated for ongoing monitoring, analysis and Policy Formulation.

The BSAI crab FMP also has an economic and social objective which is defined as maximizing economic and social benefits to the nation over time. Economic benefits are broadly defined to include, but are not limited to: profits, income, employment, benefits to consumers, and less tangible or less quantifiable social benefits such as the economic stability of coastal communities. The socio-economic data as set in the BSAI crab FMP include: 1) the value of crab harvested (adjusted for the amount of crab dying prior to processing and discarded, known as deadloss) during the season for which management measures are

³⁰ http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/C1_CRAB_SAFE_0915.pdf

considered, 2) the future value of crab, based on the value of a crab as a member of both the parent and harvestable stock, 3) subsistence harvests within the registration area, and 4) economic impacts on coastal communities. This examination is accomplished by considering, to the extent that data allow, the impact of management alternatives on the size of the catch during the current and future seasons and their associated prices, harvesting costs, processing costs, employment, the distribution of benefits among members of the harvesting, processing and consumer communities, management costs, and other factors affecting the ability to maximize the economic and social benefits as defined in this section.

NOAA administrative order 216-100 prescribes policies and procedures for protecting the confidentiality of data submitted to and collected by NMFS. Under agreements with the State, each State data collector collecting confidential data will sign a statement at least as protective as the one signed by Federal employees, which affirms that the signer understands the applicable procedures and regulations and the penalties for unauthorized disclosure.

The Economic and Social Sciences Research Program within NMFS's REFM provides economic and socio-cultural information that assists NMFS in meeting its stewardship programs. Much of the existing economic data about Alaskan fisheries is collected and organized around different units of analysis, such as counties (boroughs), fishing firms, vessels, sectors, and gear groups. These data are reported annually in the Economic SAFE documents.

4.6. States shall investigate and document traditional fisheries knowledge and technologies, in particular those applied to small scale fisheries, in order to assess their application to sustainable fisheries conservation, management and development.

The fisheries for Bristol Bay red king crab, St. Matthew blue king crab and Eastern Bering Sea snow crab are fully developed industrialized fisheries which use modern technology in the capture process. The Bristol Bay red king crab fishery was started in the early 1930s by the Japanese fleet, followed by United States trawlers and Russian tangle net vessels, but from 1974 onwards the fishery was prosecuted solely by the US pot fleet (with a small bycatch from trawlers). The St. Matthew blue king crab fishery developed in the late 1970s and is prosecuted solely by the domestic US fleet. The fishery for Eastern Bering Sea snow crab was undertaken by the Japanese fleet from the 1960s until it was prohibited under the Magnuson Act in 1980 and was then developed by the domestic US fleet. Traditional fisheries knowledge relating to the three crab fisheries has been collected and incorporated where appropriate into current fishery management regimes³¹.

³¹ <http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

Fundamental Clause 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.

No. Supporting clauses	11
Supporting clauses applicable	10
Supporting clauses not applicable	1
Overall level of conformity	HIGH
Non Conformances	0

Summarized Evidence:

5.1. (Incl. 5.1.1.) States shall ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science. The research shall be disseminated accordingly. States shall also ensure the availability of research facilities and provide appropriate training, staffing and institution building to conduct the research, taking into account the special needs of developing countries.

The NMFS undertakes shellfish stock assessments through its Eastern Bering Sea trawl survey which provides the primary input to the shellfish assessments. NMFS shellfish assessment programs are coordinated between the ASFC's Kodiak Laboratory and the NOAA/NMFS AFSC in Seattle, Washington. The AFSC is split into a number of Divisions which contribute to research and stock assessment of shellfish. The Resource Assessment and Conservation Engineering (RACE) Division³² comprises scientists from a wide range of disciplines whose function is to conduct quantitative fishery surveys and related ecological and oceanographic research to describe the distribution and abundance of commercially important fish and crab stocks in the region, and to investigate ways to reduce bycatch, bycatch mortality and the effects of fishing on habitat. Information derived from both regular surveys and associated research are analyzed by AFSC stock assessment scientists and supplied to fishery management agencies and to the commercial fishing industry.

Resource Ecology and Fisheries Management (REFM) Division³³ conducts research and data collection to support an ecosystem approach to management of fish and crab resources. More than twenty-five groundfish and crab stock assessments are developed annually and used to set catch quotas. In addition, economic and ecosystem assessments are provided to the Council on an annual basis. The Division also has a socio-economic program whose work includes evaluating economic impacts of fisheries rationalization programs, and compiling and evaluating socio-cultural information on Alaskan communities and traditional ecological knowledge. The Fisheries Monitoring and Analysis (FMA) Division³⁴ monitors groundfish fishing activities and conducts research associated with sampling commercial fishery catches and estimation of catch and bycatch mortality, and analysis of fishery- dependent data. In relation to the crab assessments, the key role is the oversight of observers who collect groundfish catch and crab bycatch data on board groundfish fishing vessels and quality assurance of the data provided by these

³² <http://www.afsc.noaa.gov/race/default.php>

³³ <http://www.afsc.noaa.gov/refm/default.php>

³⁴ <http://www.afsc.noaa.gov/fma/default.htm>

observers. In addition an interdisciplinary program, the Habitat and Ecological Processes Research (HEPR) Program³⁵ develops scientific research that supports implementation of an ecosystem approach to fishery management. Key projects which could be important for understanding crab population dynamics are focused on loss of sea ice, essential fish habitat and ocean acidification.

The BSAI crab fisheries are jointly managed by the NPFMC and the BOF under the Fishery Management Plan (FMP). A requirement of this FMP is the production of an annual stock assessment and fishery evaluation (SAFE) report¹. For the Bristol Bay red king crab, St Matthew blue king crab and Eastern Bering Sea snow crab fisheries, the BSAI SAFE report provides a detailed description of the data used in the stock assessments, the stock assessment methodology used and any changes in approaches that may have been taken during the year, the estimated status of the stocks in relation to pre-determined fisheries management reference points, advice on appropriate harvest levels, and an assessment of the relative success of existing state and federal fishery management programs.

In addition to the stock assessment of the BSAI crab fisheries, the SAFE report contains a chapter which assesses the BSAI ecosystem trends, identifies and provides annual updates of ecosystem status indicators and research priorities for BSAI crab stocks, and updates management status indicators. A separate SAFE report describes the economic aspects of the BSAI crab fisheries³⁶.

5.2. (Incl. 5.2.1.) The state of the stocks under management jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration shall be monitored.

Stock assessments are carried out annually for all BSAI crab species in Alaskan waters. These assessments involve the collection and analysis of data on catch and effort from the directed fisheries, catch size composition, and fishery independent indices of abundance and population size composition from surveys. Outputs of the assessments include estimates of population abundance, stock biomass, population size composition and recruitment, which are used to evaluate the performance of the management regime in relation to agreed harvest rules and management objectives.

Extensive peer review is an integral part of the BSAI crab stock assessment process. Individual stock assessments compiled by various ADFG and NMFS scientists are peer reviewed by the full Crab Plan Team (CPT) whose members are employed by a range of agencies and institutes and have expertise in stock assessment and crab fisheries biology. The CPT makes recommendations on overfishing level (OFL) determinations, acceptable biological catch (ABC), stock status specifications and any other issues related to crab stocks to the Scientific and Statistics Committee (SSC) of the NPFMC. The SSC makes the final recommendation on OFL and ABC to the NPFMC. ADFG then set total allowable catch (TAC) levels in line with the Council's ABC recommendations of the SSC. Additionally, BSAI crab stock assessments are reviewed periodically by external groups. Firstly, workshops are convened by NPFMC as necessary to address particular issues, and, secondly, the Center for Independent Experts (CIE) periodically conducts a comprehensive review by a panel of national and international experts in stock assessment methodology.

For the **Eastern Bering Sea snow** crab fishery, the stock assessment is based on a size- and sex-structured model in which crabs are categorized into immature or mature and new- or old shell. The model is fitted to abundance and size frequency data from the NMFS trawl survey, total catch data from the directed fishery, bycatch data from the trawl fishery, size frequency data for male retained catch in the directed fishery, and male and female bycatch in the directed and trawl fisheries. Updated data in the model

³⁵ <http://www.afsc.noaa.gov/HEPR/default.php>

³⁶ http://www.afsc.noaa.gov/REFM/Socioeconomics/SAFE/crab_safe/Crab_Economic_SAFE_2014.pdf

include biomass and length frequency data from the 2015 NMFS Eastern Bering Sea trawl survey, retained and discard catch and length frequencies from the 2014/15 directed fishery, and discard catch and length frequencies from the 2014/15 groundfish fisheries. The 2015 assessment indicates recent catches below OFL and projects the 2015/16 MMB at 93.3% of B_{msy} ³⁷.

For the **Bristol Bay red king crab** fishery, the stock assessment model is a sex- and size-structured population dynamics model incorporating data from the NMFS eastern Bering Sea trawl survey, the Bering Sea Fisheries Research Foundation (BSFRF) trawl survey, landings of commercial catch, at-sea observers, and dockside samplers. Annual stock abundance was estimated for male and female crabs ≥ 65 -mm carapace length from 1975 to the time of the 2015 survey and mature male (males ≥ 120 mm CL) biomass was projected to 15 February 2016. Catch data from the directed fishery, which targets males ≥ 135 mm (6.5 in carapace length), were obtained from ADF&G fish tickets and reports, red king crab and Tanner crab fisheries bycatch data from the ADF&G observer database, and groundfish trawl bycatch data from the NMFS trawl observer database. NMFS trawl survey data were updated with the newly re-estimated time series provided by NMFS in 2015; catch and bycatch data were updated with data from the 2014/15 crab fishery year. The 2015 assessment indicates recent catches below OFL and projects the 2015/16 MMB at 95% of B_{msy} .

For the **St Matthew blue king crab** fishery a three-stage catch-survey analysis (CSA) is used to assess the male component of the stock incorporating data from commercial catches from the directed fishery and its observer program, the annual EBS trawl survey, triennial pot surveys and bycatch data from the groundfish trawl fishery. The three size categories are: 90–104 mm CL; 105–119 mm CL; and ≥ 120 mm CL. Males ≥ 105 are used as a proxy to identify mature males, and males ≥ 120 mm CL are used as a proxy to identify legal males. The 2015 assessment indicates recent catches below OFL. The CPT-recommended model defines the proxy for B_{MSY} in terms of average estimated MMB_{mating} . The MMB estimated for 2015/16 is 2,450 t and the F_{MSY} proxy is the natural mortality rate (0.18^{-1} year), resulting in a MMB OFL of 280 t. A 20% buffer on the OFL yielded an ABC of 220 t, below the 2014/15 ABC of 340 t.

Resource Ecology and Fisheries Management (REFM) Division at the NMFS AFSC conducts a program of research and data collection to support an ecosystem approach to management of BSAI crab stocks, examining climate and/or environmental changes. Crab stock assessments are developed annually and used by the NPFMC to set catch quotas. In addition, annual economic and ecosystem assessments are provided to NPFMC. Scientists evaluate how fish stocks, ecosystem relationships and user groups might be affected by fishery management actions and climate. The Division also has a socio-economic program whose work includes evaluating economic impacts of fisheries rationalization programs, and compiling and evaluating socio-cultural information on Alaskan communities and traditional ecological knowledge⁴. Within the AFSC there is also an interdisciplinary program, The Habitat and Ecological Processes Research (HEPR) Program which develops scientific research that supports implementation of an ecosystem approach to fishery management³⁸.

Ecosystem SAFE documents are provided yearly to the NPFMC. These reports provide a concise summary of the status of marine ecosystems in Alaska for stock assessment scientists, fishery managers, and the public. One section of the report covers Ecosystem Status and Management Indicators, and provides detailed information and updates on the status and trends of ecosystem components as well as either early signals of direct human effects on ecosystem components that might warrant management

³⁷ <http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

³⁸ <http://www.afsc.noaa.gov/refm/default.php>

intervention or to provide evidence of the efficacy of previous management actions. A major component of the report is an ecosystem assessment that synthesizes historical climate and fishing effects on the eastern Bering Sea/Aleutian Islands and Gulf of Alaska ecosystems using information from the Ecosystem Status and Management Indicators section and stock assessment reports. Notable trends that capture unique occurrences, changes in trend direction, or patterns across indicators are highlighted. An ongoing goal is to produce an ecosystem assessment utilizing a blend of data analysis and modelling to clearly communicate the current status and possible future directions of ecosystems.

5.3. Management organizations shall cooperate with relevant international organizations to encourage research in order to ensure optimum utilization of fishery resources.

Research output on the three crab fisheries is exchanged and discussed at meetings of the North Pacific Marine Science Organization (PICES), which has members from the US, Russia, Japan and Canada who have an interest in crab assessment and management³⁹.

5.4. The fishery management organizations shall directly, or in conjunction with other States, develop collaborative technical and research programmes to improve understanding of the biology, environment and status of trans-boundary aquatic stocks.

Although the three crab stocks under assessment are not shared or straddling stocks, there is a collaborative technical and research program to improve understanding of the biology, environment and status of trans-boundary aquatic stocks in the area. The United States and Russian Federation maintain the bilateral Intergovernmental Consultative Committee (ICC)⁴⁰ fisheries forum pursuant to the U.S.-Soviet Comprehensive Fisheries Agreement, signed on May 31, 1988. The ICC is responsible for furthering the objectives of the Comprehensive Fisheries Agreement. The objectives include maintaining a mutually beneficial and equitable fisheries relationship through (1) cooperative scientific research and exchanges; (2) reciprocal allocation of surplus fish resources in the respective national 200-mile zones, consistent with each nation's laws and regulations; (3) cooperation in the establishment of fishery joint ventures; (4) general consultations on fisheries matters of mutual concern; and, (5) cooperation to address illegal or unregulated fishing activities on the high seas of the North Pacific Ocean and Bering Sea.

5.5. (Incl. 5.5.1. and 5.5.2.) Data generated by research shall be analysed and the results of such analyses published in a way that ensures confidentiality is respected, where appropriate.

Data from the BSAI crab fisheries that are generated both through the data collection programs for commercial fisheries and through research surveys and other research programs form an integral part of the annual assessment process that determines the status of the stocks. The analysis of these data is published in reports of specific programs and the annual SAFE report describes how the various datasets have contributed to the assessment of the status of stocks. NOAA administrative order 216-100 prescribes policies and procedures for protecting the confidentiality of data submitted to and collected by the National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS).

The annual SAFE report which provides both stock summaries and full details of the stock assessments for the Bristol Bay red king crab, St Matthew blue king crab and Eastern Bering Sea snow crab fisheries are accessible to the public on the NPFMC and NMFS websites. The economic and ecosystem SAFE reports are also available providing a wider perspective on the status of the crab fisheries in the BSAI region. In addition, the NPFMC, NMFS and ADFG websites make available a wide range of documents that contribute towards the annual assessment of the status of the stocks. These documents include, for example, summaries of the sampling levels and population metrics derived from both the ADFG observer program

³⁹ <http://www.pmel.noaa.gov/foci/publications/2010/paraR709.pdf> <http://www.pices.int/>

⁴⁰ http://www.nmfs.noaa.gov/ia/bilateral/docs/US-Russia_ICC_IA_Book.pdf

on the directed crab fisheries and from the NMFS groundfish observer program, reports of the annual EBS trawl survey, and original research papers that have influenced development of the assessment methodology. In addition to the various scientific reports which provide the technical details of the assessment, the websites provide helpful summaries of the assessment process that are accessible to non-scientists.

A key component of the annual assessments and subsequent SAFE reports for the BSAI crab fisheries is the identification of components of the assessment where there are gaps in evidence and which require research to fill those gaps. The NPFMC and the NPRB both compile an annual list of needed research from their Board/Council members and their scientific advisors. Assessments of each of the three crab fisheries highlight priorities for future research and the assessment authors will respond to requests from a hierarchy of peer-reviewers through the CPT, SSC and external reviews (e.g. CIE) to conduct either re-analysis of data currently available or new research to generate additional data and/or information.

5.6. Studies shall be promoted which provide an understanding of the costs, benefits and effects of alternative management options designed to rationalize fishing, in particular, options relating to excess fishing capacity and excessive levels of fishing effort.

5.7. In the evaluation of alternative conservation and management measures, their cost-effectiveness and social impact shall be considered.

The National Environmental Policy Act (NEPA) requires preparation of EISs for major Federal actions significantly affecting the quality of the human environment. NEPA is a comprehensive process to provide checks and balances against changes to the environment that may impact ecosystems and the natural processes, as well as the socio-economic sphere of fisheries. An EIS for the BSAI crab fisheries was prepared in 2004 to provide decision-makers and the public with an evaluation of the environmental, social, and economic effects of alternative management/rationalization programs, including the rationalization selected by the Council. The EIS considered impacts on safety, harvester efficiency, processing efficiency, and the distribution of benefits between the harvesting and processing sectors, consumers, captains and crew, and affected coastal communities^{41,42}.

⁴¹ <http://www.epa.gov/compliance/basics/nepa.html>

⁴² <http://alaskafisheries.noaa.gov/sustainablefisheries/crab/eis/default.htm>

C. The Precautionary Approach

Fundamental Clause 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.

No. Supporting clauses	6
Supporting clauses applicable	6
Supporting clauses not applicable	0
Overall level of conformity	HIGH
Non Conformances	0

Summarized Evidence:

6.1. (Incl. 6.1.1., 6.1.2., 6.1.3., 6.1.4., 6.1.5.) States shall determine for the stock both safe targets for management (Target Reference Points) and limits for exploitation (Limit Reference Points), and, at the same time, the action to be taken if they are exceeded.

The biomass that is associated with MSY, B_{msy}, is effectively treated as the target reference point since it is the desired stock condition (but effective harvest is always lower). Furthermore, MSY itself is treated as an upper limit rather than a target reference point because the overfishing limit (OFL) is based upon MSY. The (lower) limit reference point corresponds to ½ MSY. The harvest rate is decreased when stock biomass is moving from upper to the limit reference point and is reduced to zero when the stock reaches the limit reference point. At that point, a rebuilding plan is implemented.

For Tier 3 stocks, the target reference point is B_{35%} (when spawning biomass is reduced to 35% of the unfished condition), a proxy for B_{msy}. The terms “overfishing” and “overfished” are defined as a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce maximum sustainable yield (MSY) on a continuing basis, and thus NPFMC prescribe that the overfishing level (OFL – the catch limit that should never be exceeded) should never exceed the amount that would be taken if the stock were fished at F_{msy} or a proxy for F_{msy}. Stock status of BSAI crabs are therefore determined by two metrics. Firstly, the stock is considered to be overfished if the stock size is estimated to be below the minimum stock size threshold (MSST). Secondly, overfishing is considered to have occurred if the exploitation level, or fishing mortality, exceeds the fishing mortality at the overfishing level (F_{OFL}), or more intuitively if the total catch exceeds the OFL value.

The NPFMC’s fishery management plan (FMP)⁴³ for BSAI crab stocks outlines the stock status definitions, the criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The OFL is the catch level above which overfishing is occurring, and the harvest control rules aim to prevent overfishing by establishing a maximum fishing mortality threshold and using this threshold value to determine annual catch limits. The ABC is the level of annual catch that accounts for scientific uncertainty in the estimate of OFL and other uncertainties. The ABC is set below the OFL. The Annual Catch Limits

⁴³ <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

(ACL) is the level of catch that serves as the basis for invoking accountability measures, and for crab stocks the ACL is set at the ABC. Accountability measures could include seasonal, area and gear allocations, closed areas, bycatch limits, in-season fishery closures, gear restrictions, limited entry, catch shares and observer and vessel monitoring requirements. The TAC is the annual catch target for the fishery which is set at or below the ACL and may take into account uncertainty in the management process and socio-economic factors, or other biological concerns that may affect the reproductive potential of the stock but that are not reflected in the OFL itself.

The status determination criteria for crab stocks are calculated on an annual basis using a five-tier system that accommodates varying levels of uncertainty of information, and incorporates new scientific information providing a mechanism for continually improving the status determination criteria as more information becomes available.

For 2015/16, the Crab Plan Team (CPT) recommended that Bristol Bay red king crab and Eastern Bering Sea snow crab should be allocated to Tier 3 and so the OFL should be determined by the $F_{35\%}$ control rule, and that St. Matthew blue king crab should be allocated to Tier 4. Tier 3 is for stocks where reliable estimates of the spawner-recruit relationship are not available, but proxies for F_{msy} and B_{msy} are estimated. Tier 4 is for stocks where there is insufficient population data to estimate the spawner-recruit relationship, but simulation modelling is used to derive OFLs which capture the historical performance of the fisheries and borrow information from other stocks. Estimation of F_{OFL} requires estimates of current survey biomass, natural mortality rate (M) or proxy, and a scalar, γ , which allows adjustments in the overfishing definitions to account for differences in biomass measures.

Eastern Bering Sea snow crab

Total catch in 2014/15 was 34,300 t, below the OFL of 69,000 t. Estimates of stock status for 2015/16 project MMB (147,200 t) to be 93.3% of the $B_{35\%}$ value (B_{msy} proxy).

Bristol Bay red king crab

Total catch in 2014/15 was 5,440 t, below the OFL of 6,820 t. Estimates of stock status for 2015/16 project MMB (24,700 t) to be 95% of the $B_{35\%}$ value (B_{msy} proxy).

St Matthew blue king crab

Total catch in 2014/15 was 150 t, below the OFL of 430 t. The CPT-recommended model defines the proxy for B_{MSY} in terms of average estimated MMB_{mating} . The MMB estimated for 2015/16 is 2,450 t and the F_{MSY} proxy is the natural mortality rate (0.18^{-1} year), resulting in a MMB OFL of 280 t. A 20% buffer on the OFL yielded an ABC of 220 t⁴⁴.

⁴⁴ <http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

Fundamental Clause 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.

No. Supporting clauses	6
Supporting clauses applicable	3
Supporting clauses not applicable	3
Overall level of conformity	HIGH
Non Conformances	0

Summarized Evidence:

7.1. (Incl. 7.1.1.) The precautionary approach shall be applied widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment.

7.2. (Incl. 7.2.3.) For new and exploratory fisheries, procedures shall be in place for promptly applying precautionary management measures, including catch or effort limits.

The precautionary approach is applied widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851), with which all fishery management plans must be consistent. The BSAI Crab FMP is consistent with MSA requirements, and the TAC for the three crab stock under assessment is always well below the OFL, corresponding to MSY levels. The FAO Guidelines for the Precautionary Approach (PA) (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review, prior identification of desirable (target) and undesirable (limit) outcomes, and measures in place to avoid and correct undesirable outcomes, the action to be taken when specified deviations from operational targets are observed (i.e. harvest control rules) and an effective management plan. Lastly, the absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species as well as non-target species and their environment. The overall management for the Bristol Bay red king crab, Eastern Bearing Sea snow crab and St. Matthews blue king crab comprises all the elements specified in the FAO guidelines for the PA.

Furthermore, Article VIII, Section 4 of the State of Alaska's Constitution, drafted in 1959, is titled Sustained Yield and dictates that: *"Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial users."* The principle of sustained yield management is a basic tenet of conservation: the annual harvest of a biological resource should not exceed the annual regeneration of that resource. Maximum sustained yield is the largest harvest that can be maintained year after year. State law defines maximum sustained yield as "the achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the state land consistent with multiple use" (Alaska Statute 38.04.910). The qualifying phrase "subject to preferences among beneficial uses" signals recognition by the delegates that not all the demands made upon resources can be satisfied, and that prudent resource management based on modern conservation principles necessarily involves prioritizing competing uses.

Absence of adequate scientific information and therefore uncertainties is not used as a reason for postponing or failing to take conservation and management measures. The three crab stocks under assessment are managed under a tier system rule based on stock knowledge. Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. The five-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. The lower the tier, the less conservative the determination of OFL/ABC and ACL are. This is because more conservative determinations are at the higher tier levels. The NPFMC treats OFL (MSY) as an upper limit rather than a target. This system is intrinsically precautionary in nature resulting in catches always lower than the overfishing level.

Assessments of each of the three crab fisheries highlight priorities for future research and the assessment authors will respond to requests from a hierarchy of peer-reviewers through the CPT, SSC and external reviews (e.g. CIE) to conduct either re-analysis of data currently available or new research to generate additional data and/or information.

D. Management Measures

Fundamental Clause 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.

No. Supporting clauses	10
Supporting clauses applicable	10
Supporting clauses not applicable	0
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

8.1. (Incl. 8.1.1.) Conservation and management measures shall be designed to ensure the long-term sustainability of fishery resources at levels which promote the objective of optimum utilization, and be based on verifiable and objective scientific and/or traditional sources. In the evaluation of alternative conservation and management measures, their cost-effectiveness and social impact shall be considered. The NPFMC's FMP⁴⁵ for BSAI crab stocks outlines the harvest strategy and harvest control rule, the stock status definitions, the criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The BSAI Crab FMP Plan authorizes only the use of pot gear to harvest the crab resources. The Crab Rationalization Program allocates BSAI crab resources among harvesters, processors, and coastal communities who have been involved with and/or were dependent upon these fisheries. Share allocations to harvesters and processors, together with incentives to participate in fishery cooperatives, increases efficiencies, provides economic stability, and facilitates compensated reduction of excess capacities in the harvesting and processing sectors.

Community interests are protected by CDQ allocations and regional landing and processing requirements, as well as by several community protection measures. The BSAI crab FMP defers design specifications required for commercial crab pots and ring nets to the State. Escape mechanisms are incorporated and mesh size adjusted to allow female and sublegal male crab to escape. Crabbers are constructing pots with larger web on the panels to allow for female and juvenile crab to exit the pot before the gear is hauled back. The yearly marine habitat footprint has been assessed and its impact considered very small for the entire BSAI directed crab fisheries. Regulation⁴⁶ imposes that undersized males and females must be promptly discarded from crab vessels to decrease handling mortality rates. Discarded crabs are returned to the sea in a variety of methods including direct release and/or with the use of chutes and ramps. The Federal BSAI Crab FMP describes fishing season requirements that are aimed to protect king, snow and Tanner crabs during the molting and mating portions of their life cycle. Also, groundfish closure areas, or trawl protection areas, are in place to minimize the impact of groundfish harvests on crab resource.

⁴⁵ <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

⁴⁶ <http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/KingTannerCrab-2012-2014.pdf>

The FMP authorizes the use of pot gear (and ring nets, although not used) to harvest the crab resources. Trawls and tangle nets are specifically prohibited because of the high mortality rates which they inflict on non-legal crab. Title 5 of Fish and Game, Chapter 34 and 35 of the Alaska Administrative Code (5 AAC 34 and 35) specify “lawful gear” (i.e. size, dimension, internal structure etc...) for king and tanner crab respectively⁴⁷.

8.2. (Incl. 8.2.1.) States shall seek to identify domestic parties having a legitimate interest in the use and management of the fishery.

The Crab Rationalization Program allocates BSAI crab resources among harvesters, processors, and coastal communities who have been involved with and/or were dependent upon these fisheries. The North Pacific Fishery Management Council developed the Program over a 6-year period to accommodate the specific dynamics and needs of the BSAI crab fisheries. The Program is a limited access system that balances the interests of several groups who depend on these fisheries. The Program addresses conservation and management issues associated with the previous derby fishery, reduces bycatch and associated discard mortality, and increases the safety of crab fishermen by ending the race for fish.

Share allocations to harvesters and processors, together with incentives to participate in fishery cooperatives, increases efficiencies, provides economic stability, and facilitates compensated reduction of excess capacities in the harvesting and processing sectors. Community interests are protected by Community Development Quota (CDQ) allocations and regional landing and processing requirements, as well as by several community protection measures.

Crab Rationalization Program components include quota share allocation, processor quota share allocation, IFQ and individual processing quota (IPQ) issuance, quota transfers, use caps, crab harvesting cooperatives, protections for Gulf of Alaska groundfish fisheries, arbitration system, monitoring, economic data collection, and cost recovery fee collection⁴⁸.

The Crab Rationalization Program has experienced extensive public review. The BOF and the NPFMC are openly public processes. Any individual or group can submit proposals for discussion of management and research for crab fisheries in Alaska. The BOF meets in communities throughout coastal Alaska, while the NPFMC meets in communities in Alaska as well as in Washington and Oregon to provide public opportunities. Written comments are accepted when it is not possible to attend in person¹⁶.

8.3. (Incl. 8.3.1.) Fleet capacity operating in the fishery shall be measured. States shall maintain, in accordance with recognized international standards and practices, statistical data, updated at regular intervals, on all fishing operations and a record of all authorizations to fish allowed by them.

The crab fisheries in the Bering Sea are limited entry rationalized fisheries. Capacity of these fisheries has been reduced since 2002. Fleet consolidation accompanying rationalization was substantial. In both the Bristol Bay red king crab and Bering Sea snow crab fisheries, the annual average post-rationalization fleet was roughly one-third of the size of the pre-rationalization fleet. While virtually all participating Alaska communities lost vessels, the remaining vessel ownership has tended to aggregate in fewer and larger communities⁴⁹.

⁴⁷ <http://www.touchngo.com/lglcntr/akstats/aac/title05.htm>

⁴⁸ <http://www.fakr.noaa.gov/npfmc/> <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main>

⁴⁹ http://www.fakr.noaa.gov/npfmc/PDFdocuments/catch_shares/Crab/SlAexS_911.pdf

The NMFS's Restricted Access Management Program (RAM)⁵⁰ is responsible for managing Alaska Region permit programs, including those that limit access to the Federally-managed fisheries of the North Pacific. RAM responsibilities include: providing program information to the public, determining eligibility and issuing permits, processing transfers, collecting landing fees and related activities.

The Alaska Commercial Fisheries Entry Commission (CFEC)⁵¹ helps to conserve and maintain the economic health of Alaska's commercial fisheries by limiting the number of participating fishers. CFEC issues permits and vessel licenses to qualified individuals in both limited and unlimited fisheries, and provides due process hearings and appeals as and when needed.

8.4. (Incl. 8.4.1., 8.4.2., 8.4.3) States and relevant groups from the fishing industry shall encourage the development and implementation of technologies and operational methods that reduce waste and discards of the target species. These measures shall be applied appropriately.

The promotion, development and use of selective, environmentally safe and cost-effective gear, methods and techniques are one of the key requirements for the BSAI crab fisheries. The gear utilized and the effects on target and non-target catch as well as issues relating to decreasing handling mortality have been researched and conservation sensitive modifications to gear have evolved since the 1990s.

Pots and ring nets are the specified legal commercial gear for capturing crab in the BSAI area. Although specific details vary with target species and particular fisheries, all require gear modifications to prevent capture of other species and to allow escapement of female and sublegal male crabs. Incorporation of biodegradable twine in escape mechanisms is a requirement on all pots to prevent ghost fishing.

Upon retrieval of crab pots, a wide range of sorting and discard techniques are used by the crab fleets but the basic elements of the process are essentially the same on all vessels. After the pot has been retrieved and secured in the launcher, crab are dumped into totes (plastic boxes) or onto a sorting table. As the male crab of marketable size are separated from the rest of the catch, the crab to be discarded are returned to the sea in a variety of methods, ranging from being tossed overboard, dragged in totes and dumped into an outflow shoot, or placed directly into an outflow ramp of various designs. Longer seasons resulting from rationalization of the crab fisheries have led to improved handling methods and reduced mortality of crabs brought on deck.

Only male crab that meet a specified size limit can be harvested. Undersized males and females must be promptly discarded to decrease handling mortality. Also, seasons restrictions are in place for all crab species. Closed seasons have been set to maximize the reproductive potential of crab populations based on protection of dense breeding aggregations, avoidance of molting periods, protection of soft-shell animals, increasing product quality and minimizing bycatch. There also are groundfish closure areas, or trawl protection areas, to minimize the impact of groundfish harvests on the crab resource⁵².

⁵⁰ <http://www.fakr.noaa.gov/ram/>

⁵¹ <http://www.cfec.state.ak.us/>

⁵² <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

Fundamental Clause 9

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

No. Supporting clauses	11
Supporting clauses applicable	8
Supporting clauses not applicable	3
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

9.1. Measures shall be introduced to identify and protect depleted resources and those resources threatened with depletion, and to facilitate the sustained recovery of such stocks. Also, efforts shall be made to ensure that resources and habitats critical to the well-being of such resources which have been adversely affected by fishing or other human activities are restored.

As specified in the BSAI crab FMP, there are clearly defined management measures designed to maintain the crab stocks at levels capable of producing maximum sustainable levels. These include harvest strategy and harvest control rule, stock status definitions, criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The state of the three crab resources under assessment in this report is monitored through the use of a complex system that yearly determines overfishing levels, allowable biological catches and annual catch limits. A stock reaching overfished conditions is placed under a rebuilding plan. Using this strategy and clearly laid out rebuilding plans, two of these stocks were rebuilt from being declared overfished.

The MSA includes provisions concerning the identification and conservation of Essential Fish Habitat (EFH). The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The NMFS and the NPFMC (as well as all the other regional Fishery Management Councils) must describe and identify EFH in FMPs, minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with NMFS, and NMFS must provide conservation recommendations to federal and state agencies regarding actions that would adversely affect EFH.

There are groundfish closure areas in Bristol Bay to protect red king crab EFH. However, there is an area of overlap between current female red king crab distribution and areas where trawling occurs in the southern Bristol Bay. Southern Bristol Bay is an important spawning ground for red king crab and heavy trawling there could greatly impact the crab spawning success. This issue is a focus of the 2015 EFH 5-year Review⁵³.

⁵³ http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf

9.2. When deciding on use, conservation and management of the resource, due recognition shall be given, where relevant, in accordance with national laws and regulations, to the traditional practices, needs and interests of indigenous people and local fishing communities which are highly dependent on these resources for their livelihood.

The three BSAI crab fisheries under assessment are well developed commercial fisheries. The needs of rural coastal communities have been taken into account through the Community Development Quota (CDQ). The Western Alaska CDQ Program allocates a percentage of all Bering Sea and Aleutian Islands quotas for groundfish, prohibited species, halibut, and crab to eligible communities. The purpose of the CDQ Program is to (i) to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the Bering Sea and Aleutian Islands Management Area; (ii) to support economic development in western Alaska; (iii) to alleviate poverty and provide economic and social benefits for residents of western Alaska; and (iv) to achieve sustainable and diversified local economies in western Alaska. Those communities receive 10% of the total TAC for each of the crab species⁵⁴.

Provisions are made in Title 5 of the Alaska Administrative Code for subsistence fisheries on red king crab in four general areas: Yakutat, Kodiak, Alaska Peninsula-Aleutian Islands, and the Bering Sea. The subsistence fishery catch may be shared with all members of the community. There are also red king crab personal use fisheries around the state of Alaska designed to provide harvest opportunities for Alaska residents and their immediate family members⁵⁵.

9.3. States and relevant groups from the fishing industry shall encourage the development and implementation of technologies and operational methods that reduce discards of the target and non-target species catch. The use of fishing gear and practices that lead to the discarding of catch shall be discouraged and the use of fishing gear and practices that increase survival rates of escaping fish shall be promoted. The promotion, development and use of selective, environmentally safe and cost-effective gear, methods and techniques is one of the key requirements for the BSAI crab fisheries. The gear utilized and the effects on target and non-target catch as well as issues relating to decreasing handling mortality have been researched and conservation sensitive modifications to gear have evolved since the 1990s.

Pots and ring nets are the specified legal commercial gear for capturing crab in the BSAI area. Although specific details vary with target species and particular fisheries, all require gear modifications to prevent capture of other species and to allow escapement of female and sublegal male crabs. Incorporation of biodegradable twine in escape mechanisms is a requirement on all pots to prevent ghost fishing.

Only male crab that meet a specified size limit can be harvested. Undersized males and females must be promptly discarded to decrease handling mortality. Also, seasons restrictions are in place for all crab species. Closed seasons have been set to maximize the reproductive potential of crab populations based on protection of dense breeding aggregations, avoidance of molting periods, protection of soft-shell animals, increasing product quality and minimizing bycatch. There also are groundfish closure areas, or trawl protection areas, to minimize the impact of groundfish harvests on the crab resource⁵⁶.

⁵⁴ <http://www.fakr.noaa.gov/cdq/default.htm>

⁵⁵ <http://www.adfg.alaska.gov/index.cfm?adfg=redkingcrab.main>

⁵⁶ <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

9.4. Technologies, materials and operational methods shall be applied to minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear.

After rationalization of the Crab fisheries in the BSAI, vessel numbers have decreased and there has been a slower paced fishery, with decreased rates of lost fishing gear and allowing for longer soak times and more time for the gear to work sorting undersized and females crab from the harvest. Crabbers are constructing pots with larger web on the panels to allow for female and juvenile crab to exit the pot before the gear is hauled back by the vessel. Also, fewer pots being used in the crab fisheries results in less impact on the marine habitat.

All snow and king crab pots must include an escape mechanism. The pot sidewall, which may include the tunnel, must contain an opening equal to or exceeding 18 inches and the opening must be laced, sewn or secured together by a single length of untreated, 100 percent cotton twine, no larger than 30 thread. The cotton twine may be knotted at each end only. The opening must be within six inches of the bottom of the pot and must be parallel with it. The cotton twine may not be tied or looped around the web bars. 36 thread may be used along with a galvanic time release device⁵⁷.

9.5. There shall be a requirement that fishing gear, methods and practices where practicable, are sufficiently selective as to minimize waste, discards, and catch of non-target species - both fish and non-fish species and impacts on associated or dependent species.

The selectivity of pot gear in regards to bycatch of juvenile and female crab is regulated by requirement of escape rings, specific mesh panel webbings, sorting tables and chutes on board of vessels (to decrease handling mortality) as discussed in the immediate clauses above. Pot gear used to fish for crab in the BSAI appears to be relatively selective. The majority of bycatch species in crab fisheries are mostly crab⁵⁸.

9.6. The intent of fishing selectivity and fishing impacts related regulations shall not be circumvented by technical devices and information on new developments and requirements shall be made available to all fishers.

No evidence is available to indicate that technical devices are negatively affecting or circumventing regulations aimed at defining requirements for fishing selectivity or to reduce fishing impacts.

Because the fishery was rationalized in 2005, most enforcement of IFQ/IPQ violations, as well as size, sex and season violations occur at offloading. While this is true, there is still significant at-sea enforcement by the State Fish & Wildlife Troopers where they pull pots and check gear on the grounds. ADFG perform pot and vessel holding tank inspections prior to each fishing season. Generally speaking, AWT personnel ensure state regulations, permits, gear and catch are in line with regulations. Also, the on-board crab observer program collects information which is presented to the AWT who can use it in the enforcement process. Information on new requirements is available at the ADFG, NPFMC and NMFS websites.

9.7. International cooperation shall be encouraged with respect to research programs for fishing gear selectivity and fishing methods and strategies, dissemination of the results of such research programs and the transfer of technology.

The Alaska Sea Grant College Program has been sponsoring and coordinating the Lowell Wakefield Fisheries Symposium series since 1982, in partnership with the Alaska Department of Fish and Game, NOAA National Marine Fisheries Service, and the North Pacific Fishery Management Council. These

⁵⁷ <http://www.touchngo.com/iglcnr/akstats/aac/title05/chapter039/section145.htm>

⁵⁸ <http://www.adfg.alaska.gov/FedAidPDFs/FDS14-49.pdf>

meetings are a forum for information exchange in biology, management, economics, and processing of various fish species and complexes, as well as an opportunity for scientists from high-latitude countries to meet informally and discuss their work. The series is internationally recognized for excellence and scope, and more than 1,000 scientists from 30 nations have come to Alaska to focus their expertise on key resource management problems. Symposia relative to crab have been sponsored several times and most recently in 2009.

9.8. States and relevant institutions involved in the fishery shall collaborate in developing standard methodologies for research into fishing gear selectivity, fishing methods and strategies, and on the behavior of target and non-target species in relation to such fishing gear as an aid for management decisions and with a view to minimizing non-utilized catches.

Considerable research has been carried out that provides comprehensive information on fishing gear selectivity, fishing methods and strategies as well as the behavior of target and non-target species to the gear.

Fundamental Clause 10

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

No. Supporting clauses	3
Supporting clauses applicable	3
Supporting clauses not applicable	0
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

10.1./10.2./10.3. Education and training programs.

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. Entities involved in education and training programs include but are not limited to:

The North Pacific Fishing Vessel Owners association (**NPFVO**⁵⁹) provides a training program that many professional fishermen crew members must pass including elements related to firefighting, damage control, man-overboard and MARPOL.

The Alaska Marine Safety Education Association's (**AMSEA**⁶⁰) mission is to reduce, through education and training, injury and death in the marine and freshwater environment. AMSEA offers training courses which meet USCG requirements for commercial fishermen and cover topics including, Fire Fighting, Life rafts, MAYDAYS, Immersion Suits & PFDs, Flares, Emergency Drills, Cold Water Survival Skills and EPIRBs. Thanks to funding from various entities full or partial course fee waivers are often available to commercial fishermen. AMSEA additionally offers courses covering Mariner's First Aid & CPR, Vessel Stability and Ergonomics for Commercial Fishermen and Industry Workers.

The goal of the Alaska Vocational Technical Center's (**AVTEC**⁶¹) 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 Training Center is a USCG approved training facility offering USCG/STCW compliant maritime training (STCW is the international Standards of Training, Certification, & Watch keeping).

The Alaska Ocean Observing System (**AOOS**⁶²) and the University of Alaska's Sea Grant (**ASG**⁶³) Marine Advisory Program (MAP) host bi-monthly conference calls with participants across the state interested in marine policy with topics including marine funding, legislation, and state and federal policy issues. In addition the MAP provides education and training in the form of seminars and workshops in several

⁵⁹ <http://www.npfvoa.org/>

⁶⁰ <http://www.amsea.org/>

⁶¹ <https://avtec.edu/department/alaska-maritime-training-center>

⁶² <http://www.aos.org/ak-marine-policy-forum/>

⁶³ <https://seagrants.uaf.edu/>

sectors including fisheries management, seafood safety, quality control and product development. MAP also conducts sessions of their Alaska Young Fishermen's Summit. Each Summit is an intense course in all aspects of Alaska fisheries, from fisheries management & regulation (e.g. MSA), to seafood marketing. The 2016 summit was hosted in Juneau, Alaska, from January 27-29th 2016. The conference aimed at providing crucial training and networking opportunities for fishermen entering the business or wishing to take a leadership role in their industry⁶⁴.

⁶⁴ <https://seagrants.uaf.edu/map/workshops/2016/ayfs/>

E. Implementation, Monitoring and Control

Fundamental Clause 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.

No. Supporting clauses	6
Supporting clauses applicable	3
Supporting clauses not applicable	3
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

11.1. Enforcement agencies and framework:

There is a collaborative effort emphasizing the at-sea enforcement between the USCG and the AWT. Under joint management there are both state and federal laws to enforce, and both state and federal agents actively conduct at-sea enforcement. The USCG is responsible for enforcing the main federal vessel regulations: this includes safety at sea, drug enforcement, vessel compliance with ESA and EFH requirements and assuring compliance of federal permits, observer coverage, licenses and VMS in the crab fisheries. AWT have vessels that conduct at-sea compliance with gear regulations, capable of hauling and confiscating crab pots, sample crab harvests at sea, assure sex and size requirements are met and assure that the vessels have all required state and federal licenses. Additionally AWT, along with ADFG area biologists and technicians, conduct vessel inspections dockside, conducting hold inspections and observing offloads of harvested crab for compliance. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska's EEZ. Because the fishery was rationalized in 2005, most enforcement of IFQ/IPQ violations, as well as size, sex and season violations occur at offloading.

The NMFS Office of Law Enforcement with use of the United States Coast Guard's at-sea platforms is primarily responsible for enforcing crab regulations at sea, while the NMFS Office of Law Enforcement and the State of Alaska's Division of Wildlife Troopers (AWT) have that responsibility ashore. AWT spends about 90% of their effort doing dockside enforcement of offloaded crab (although The AWT vessel E/V Stinson also does at-sea enforcement, checking gear and catch for legal specification). The U.S. Coast Guard (USCG) and NMFS Office of Law Enforcement (OLE) enforce Alaska fisheries laws and regulations, especially 50CFR679.

USCG

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 inland 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. Between January and December 2015, the Coast Guard focused commercial vessel safety enforcement activities on the start of the Bering Sea crab fisheries, with CGC MUNRO conducting 9 boardings on vessels targeting Bristol Bay Red King Crab

and 9 boardings on vessels targeting Eastern Bering Sea Snow Crab. There were no violations found during these boardings ⁶⁵

NMFS OLE

NOAA Office of Law Enforcement Special Agents and Enforcement Officers perform a variety of tasks associated with the protection and conservation of the nation's living marine resources. In order to enforce these laws, OLE special agents and enforcement officers 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 agencies. OLE has responsibility for enforcement of the crab rationalization program. In addition, OLE's officers inspect and cross check at landings and processors records for reconciliation, and closely monitor Prohibited Species Catch in non-crab fisheries.

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).

For crab in 2015 there were 90 incidents, 73 boardings and 3 violations with one violation discovered during boarding. The most common violations were crab overages and IFQs (Pers. Comm. Lt William Ellis, NOAA OLE AK Chief Officer June 23 2016).

AWT

The C Detachment of the Alaska Wildlife Troopers covers the Island of Kodiak, King Salmon, Dillingham, and the Aleutian Islands. Detachment headquarters is located in Kodiak and under the command by a Lieutenant, Sergeants in Dutch Harbor, King Salmon, and Kodiak assist with the overall supervision of this region. Posts within the region include: Dutch Harbor, Kodiak, Dillingham, King Salmon, Iliamna, and Cold Bay (Seasonal Posting)⁶⁶.

This detachment has enforcement responsibility for Commercial Fisheries in Salmon, Herring, Crab, and Ground fish. Overall, the AWT stated that the level of compliance is very high, and increasing, especially so after fishery rationalization (pers. comm., 24 May 2016, Lieutenant Jon Streifel, Deputy Commander, Alaska Wildlife Troopers, Southeast Alaska).fish in areas that contain some of the nation's richest fisheries, such as the Bering Sea.

Crab Observer Program

Since 1988 ADFG has required varying levels of observer coverage aboard vessels participating in the BAI crab fisheries. The ADFG Observer report for 2013/2014⁶⁷ summarizes commercial crab fisheries by crab observers deployed on floating-processor vessels, catcher-processor vessels, and catcher vessels and provides historical data for comparison. Primary data summaries include estimates of CPUE and information about size and shell condition of both captured and retained crabs. Further information include catch rates by soak time & depth, female reproductive condition, sampled pot lift locations, species composition of sampled pot lifts, total legal tally results.

⁶⁵ <http://www.npfmc.org/committees/enforcement-committee/>

⁶⁶ <http://dps.alaska.gov/AWT/detachments.aspx>

⁶⁷ <http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS14-49.pdf>

Dockside inspections

Crab information is mainly collected through a dockside sampling program. Dockside samplers (port samplers), ADFG staff, provide an independent data source for assessing the accuracy of the CPUE estimates for retained legal crab. They will also call AWT if an inspection has spotted a violation. ADFG technicians and Wildlife Troopers also perform pot and vessel holding tank inspections prior to each fishing season.

Vessel Monitoring System

Any vessel used to harvest crab in the rationalized crab fisheries must have a functioning VMS transmitter on board. The VMS must be transmitting when the following two conditions are met:

- the vessel is operating in any reporting area off Alaska; and,
- the vessel has crab pots or crab pots hauling equipment, or a crab pot launcher onboard; and

11.2./11.4. Fishing permit requirements:

No foreign fleet is allowed to fish in the Alaska's EEZ. Every fishing vessel targeting crab in Alaska is required to have a federal permit. The permit programs are managed by the Restricted Access Management (RAM) federal division.

The BSAI crab fisheries of Alaska under assessment here are harvested exclusively within the Alaska EEZ only. Those fisheries are not part of any international agreement or part of a framework of sub-regional or regional fisheries management organizations or arrangements

Fundamental Clause 12

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

No. Supporting clauses	4
Supporting clauses applicable	2
Supporting clauses not applicable	2
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

12.1/12.2 Enforcement policies and regulations, state and federal:

The Magnuson-Stevens Act (MSA) provides four basic enforcement remedies for violations (50CFR600.740 Enforcement policy)⁶⁸:

1. Issuance of a citation (a type of warning), usually at the scene of the offense (see 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 MSA requires permit sanctions following the assessment of a civil penalty or the imposition of a criminal fine. In sum, the MSA 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. 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.⁶⁹

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.

⁶⁸ <https://www.law.cornell.edu/cfr/text/50/600.740>

⁶⁹ http://www.gc.noaa.gov/documents/Penalty%20Policy_FINAL_07012014_combo.pdf

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.

F. Serious Impacts of the Fishery on the Ecosystem

Fundamental Clause 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 on the fishery on the ecosystem shall be appropriately assessed and effectively addressed.

No. Supporting clauses	13
Supporting clauses applicable	13
Supporting clauses not applicable	0
Overall level of conformity	HIGH
Non Conformances	0

Summarized evidence:

13.1. Research and Institutional capacity for environmental impact assessment

The North Pacific Research Board (NPRB) supports peer-reviewed scientific research in the Gulf of Alaska, Bering Sea/Aleutian Islands, and Chukchi/Beaufort Seas that informs effective management and sustainable use of marine resources. NPRB also develops and implements multi-institution, interdisciplinary science projects under the integrated ecosystem research program to create a more integrated understanding of Alaska's ocean ecosystems. Current regional projects include the **Gulf of Alaska Project** and the **Bering Sea Project**.

The **Bering Sea Project**⁷⁰, a partnership between the North Pacific Research Board and the National Science Foundation, was a \$52 million study of the eastern Bering Sea ecosystem that took place from 2007 to 2012. The study sought to understand the impacts of climate change and dynamic sea ice cover on the eastern Bering Sea ecosystem and involved more than one hundred scientists engaged in field research and ecosystem modeling to link climate, physical oceanography, plankton, fishes, seabirds, marine mammals, humans, traditional knowledge and economic outcomes to better understand the mechanisms that sustain this highly productive region. The **Bering Sea Project** consisted of 44 unique studies which are linked together by five principal hypotheses:

1. **Physical forcing affects food availability.**

Climate-induced changes in physical forcing will modify the availability and partitioning of food for all trophic levels through bottom-up processes.

2. **Ocean conditions structure trophic relationships.**

Climate and ocean conditions influencing water temperature, circulation patterns, and domain boundaries impact fish reproduction, survival and distribution, the intensity of predator-prey relationships, and the location of zoogeographic provinces through bottom-up processes.

⁷⁰ <http://www.nprb.org/bering-sea-project/about-the-project/what-we-studied/hypotheses/>

3. Ecosystem controls are dynamic.

Later spring phytoplankton blooms resulting from early ice retreat will increase zooplankton production, thereby leading to increased abundances of piscivorous fish (walleye pollock, Pacific cod, and arrowtooth flounder) and a community controlled by top-down processes with several trophic consequences.

4. Location matters.

Climate and ocean conditions influencing circulation patterns and domain boundaries will affect the distribution, frequency, and persistence of fronts and other prey-concentrating features and, thus, the foraging success of marine birds and mammals largely through bottom-up processes.

5. Commercial and subsistence fisheries reflect climate.

Climate-ocean conditions will change and, thus, affect the abundance and distribution of commercial and subsistence fisheries

The Gulf of Alaska Project⁷¹ began with a pilot season in 2010 and was scheduled to run through January 2015. The Project tests three main hypotheses about the survival and recruitment of the five focal groundfish species, (walleye pollock, Pacific cod, Pacific ocean perch, sablefish and arrowtooth flounder), and the gauntlet they face as they move from offshore spawning areas to nearshore nursery areas during their first year of life. The three hypotheses include:

1. The Gauntlet

The primary determinant of year-class strength for marine groundfishes in the Gulf of Alaska is early life survival. This is regulated in space and time by climate-driven variability in a biophysical gauntlet comprising offshore and nearshore habitat quality, larval and juvenile transport, and settlement into suitable demersal habitat.

2. Regional Comparisons

The physical and biological mechanisms that determine annual survival of juvenile groundfishes and forage fishes differ in the eastern and western GOA regions.

3. Interactions

Interactions among species (including predation and competition) are influenced by the abundance and distribution of individual species and by their habitat requirements, which vary with life stage and season.

The publication of peer-reviewed literature resulting from this project will likely continue throughout 2015 and beyond. Findings and conclusions are published in SAFE document, annual Ecosystem SAFE documents and other reports. SAFE documents for BSAI Crab summarize ecosystem considerations for the stocks.

The FMP for the Commercial King and Tanner Crab Fisheries in the Bering Sea/Aleutian Islands (BSAI) includes as one of its major objectives; To protect, conserve, and enhance adequate quantities of essential fish habitat (EFH) to support king and Tanner crab populations and maintain a healthy ecosystem. The FMP describes and identifies EFH for BSAI crab and identifies fishing and non-fishing threats to BSAI crab EFH, research needs, and EFH conservation and enhancement recommendations.

⁷¹ <http://www.nprb.org/gulf-of-alaska-project/about-the-project/>

13.2./13.3. Fishery Interaction with the ecosystem

Impacts of fishing gear on the habitat

Pot gear is considered a passive gear (not towed). There are no serious, irreversible concerns of crab pot gear interaction on the habitat that are presented in the recent (2010) NPFMC Essential Fish Habitat review. Furthermore there was a less than 1% impact on the seafloor. However, there is potential for other gear types to impact crab habitat, such as bottom trawls and dredges in disrupting nursery and adult feeding areas^{72, 73}.

13.4. Pollution – MARPOL

MARPOL 73/78 (the "International Convention for the Prevention of Pollution from Ships") is one of the most important treaties regulating pollution from ships. Six Annexes of the Convention cover the various sources of pollution from ships and provide an overarching framework for international objectives. In the U.S., the Convention is implemented through the Act to Prevent Pollution from Ships (APPS). Under the provisions of the Convention, the United States can take direct enforcement action under U.S. laws against foreign-flagged ships when pollution discharge incidents occur within U.S. jurisdiction. When incidents occur outside U.S. jurisdiction or jurisdiction cannot be determined, the United States refers cases to flag states, in accordance with MARPOL. These procedures require substantial coordination between the Coast Guard, the State Department, and other flag states, and the response rate from flag states has been poor. Different regulations apply to vessels, depending on the individual state.

13.5. Management responses to likely serious impacts on ecosystem Regulations/measures to minimize impacts.

Regulations

Regulations are in place to address waste, discard, bycatch, and endangered species interactions in the crab fisheries. The NMFS and ADFG promulgate these regulations through the NPFMC, and the Alaska Board of Fisheries. Gear requirements and restrictions set limits for the size of pots, presence of escape rings and bio-degradable mesh and mesh sizes. General spawning areas have been mapped in Alaska. Crab fisheries are closed during peak spawning times, by regulation. The NPFMC has established Marine Protected Areas that benefit juvenile fish and adult spawners. Additional trawl closures for areas in the Bering Sea, AI and GOA provide a significant degree of refuge for crab species.

Essential Fish Habitat

There is a 2015 EFH 5-year Review that will evaluate EFH components in the six Council FMPs, with respect to new information including Bering Sea/Aleutian Islands King and Tanner Crab (BSAI Crab)⁷⁴. EFH descriptions for all managed species within the Council's six FMPs will be re-evaluated as part of the 5-year review. Since the 2010 EFH review, new habitat information is available that may allow EFH descriptions to be refined for some stocks. The EFH final rule identified four types of information on which to base EFH descriptions, categorized into levels:

- Level 1 – distribution data are available for some or all portions of the geographic range of the species
- Level 2 – Habitat-related densities of the species are available
- Level 3 – Growth, reproduction, or survival rates within habitats are available
- Level 4 – Production rates by habitat are available

⁷² https://alaskafisheries.noaa.gov/sites/default/files/efh_5yr_review_sumrpt.pdf

⁷³ <http://alaskafisheries.noaa.gov/habitat/efh/review>

⁷⁴ <http://www.npfmc.org/habitat-protections/essential-fish-habitat-efh/>

Currently, stocks managed in the Council FMPs are all described either using Level 1 distribution data, or are stocks for which no EFH information is available at all. The technical subgroup for EFH description methodology is tasked with developing a methodology to apply level 2 and/or level 3 data to stocks that have additional information is available. The subgroup will determine whether a different methodology is warranted for different FMPs, for example, groundfish, salmon, crab, or scallop species.

13.6. Research on environment and social impacts of fishing gear.

The 2015 EFH review will also re-examine the Long-term Evaluation of Fishing Effects Index (LEI) model, which was used in the 2005 EFH EIS to determine whether fishing has adverse effects on EFH. The Fishing Effects model technical subgroup is tasked with reviewing the 2005 fishing effects model, and updating it to make it easier to use. The subgroup will then compile updated information on significant input parameters, and re-run the model using the updated information.

The output of the revised model will be written up in the EFH summary report. It will also be provided to stock assessment authors to consider whether any substantial new information is available to augment the 2005 EFH EIS analysis of whether fish stocks show any evidence of adverse effects caused by fishing. The EFH review will also reassess non-fishing activities that have an adverse effect on EFH. The technical subgroup on non-fishing effects will review activities affecting EFH, and will update existing literature, the EFH Conservation Recommendations for non-fishing activities, and potentially develop a geospatial mapping tool.

In December 2015, the North Pacific Council initiated the development of a Bering Sea Fishery Ecosystem Plan (BS FEP). An FEP for the Bering Sea could be used to guide policy options and associated opportunities, risks, and tradeoffs affecting FMP species and the broader Bering Sea ecosystem in a systematic manner. The Bering Sea FEP could document current procedures and best practices for ecosystem-based fishery management (EBFM), provide brief, targeted, and evolving descriptions of the interconnected physical, biological, and human/institutional Bering Sea ecosystem and through ecosystem thresholds and targets, and direct how that information can be used to guide fishery management options.

The Council underscored its commitment to EBFM with the adoption of an ecosystem approach policy statement in 2014. With the development of a Bering Sea FEP, the Council has another opportunity to progress on the continuum of EBFM, allowing Alaska to lead internationally in fishery management, and provide a clear record of the Council's ecosystem-based policy decision making, while still applying policies that are suited to Alaskan circumstances. In 2007, the Council developed an FEP for the Aleutian Islands, which describes ecosystem processes, and physical, biological, socioeconomic, and management interactions in the area, and includes a qualitative ecosystem risk assessment and description of how risk associated with these interactions is currently being addressed by managers.

8. Performance specific to agreed corrective action plans

Not Applicable. No non-conformances are active for this fishery.

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

Not applicable, no new non-conformances have been issued.

10. Future Surveillance Actions

Not applicable, next assessment will be a full re-assessment.

11. Client signed acceptance of the action plan

Not applicable, no non-conformances have been issued

12. Recommendation and Determination

Following this 4th Surveillance Assessment, the assessment team recommends that continued Certification under the Alaska Responsible Fisheries Management Certification Program is granted for the management system of the applicant fisheries, U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*) and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a 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)] joint management regime.

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Reference	Hyperlink
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NOAA Fisheries Alaska Regional Crab Shares Program	http://www.fakr.noaa.gov/npfmc/PDFdocuments/catshares/Crab/SIAexS_911.pdf
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University of Alaska Fairbanks (UAF) Institute of Marine Science	http://www.uaf.edu/sfos/research/institute-of-marine-scienc/
US Coastguard Living Marine Resources	http://www.uscg.mil/hq/cg5/cg531/LMR.asp

14. Appendix 1 – Assessment Team Details

Dr. Ivan Mateo, Lead 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. Gerald P. Ennis (Assessor)

Following undergraduate and graduate degrees at Memorial University of Newfoundland in the 1960s, Dr. Ennis completed a Ph.D. in marine biology at University of Liverpool in the early 1970s. He retired in 2005 following a 37-year research career with the Science Branch of the Department of Fisheries and Oceans. His extensively published work has focused primarily on lobster fishery and population biology and on various aspects of larval, juvenile and adult lobster behavior and ecology in Newfoundland waters. Throughout his career, Dr. Ennis was heavily involved in the review and formulation of scientific advice for management of shellfish in Atlantic Canada as well as the advisory/consultative part of managing the Newfoundland lobster fishery.

Sam Dignan (Assessor)

Sam Dignan is a fisheries scientist who has previously worked with the Department of Environment, Food and Agriculture (DEFA), Isle of Man and Bangor University Fisheries and Conservation Science Group (Wales). He has a BSc in Biological and Chemical Sciences with Zoology from University College Cork, Ireland and an MSc in Marine Environmental Protection from Bangor University. He has experience conducting stock assessments including from survey design, implementation, data collection, stock assessment modelling and through to final analysis and report presentation. From 2013 to 2015 he was a member of the ICES working group on scallop stock assessment and has an understanding of a range of shellfish and finfish fishery stock assessment applications. He has worked on behalf of UK fisheries departments for the analysis of fishing activity, using Vessel Monitoring System (VMS) and logbook data, to spatially quantify fishing activity and fisheries-ecosystem interactions. Sam has also been involved in providing scientific data for client fisheries to the Marine Stewardship Council's (MSC) certification scheme and has been a central part in participating on behalf of the client fishery management responses to MSC audits. A native and active member of a small fishing community in the Southwest of Ireland, Sam has extensive experience of interacting directly with fishers and their representative organizations as well as members of scientific and government institutions.