



**ALASKA RESPONSIBLE FISHERY MANAGEMENT (RFM)
CERTIFICATION PROGRAM**

1st Surveillance Report

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

Facilitated by
Alaska Seafood Marketing Institute (ASMI)

And
Bering Sea Crab Client Group LLC

Assessors: Dr. Ivan Mateo, Lead Assessor
Dr. Wes G. Toller, Assessor
Dr. Gerald P. Ennis, Assessor

Report Code: AK/CRA/002.1/2018
Published Date: 19th June 2018

SAI Global
3rd Floor, Block 3,
Quayside Business Park,
Mill Street, Dundalk,
Co. Louth, Ireland.
T: + 353 42 932 0912
www.saiglobal.com



Foreword

The Alaska Responsible Fisheries Management (RFM) Standard Version 1.3 is composed of Conformance Criteria and is based on the 1995 FAO Code of Conduct for Responsible Fisheries and the FAO Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Capture Fisheries adopted in 2005 and amended/extended in 2009. The Standard also includes full reference to the 2011 FAO Guidelines for the Eco-labelling of Fish and Fishery Products from Inland Fisheries which in turn are now supported by a suite of guidelines and support documents published by the UN FAO.

Further information on the Alaska RFM program may be found here:

<http://www.alaskaseafood.org/rfm-certification/certified-fisheries>

Table of contents

Foreword	2
Table of contents	3
Glossary	4
Summary and Recommendations.....	5
Assessment Team Details	6
1. Introduction	7
1.1. Recommendation of the Assessment Team.....	8
2. Fishery Applicant Details.....	9
3. Units of Certification	10
4. Fishery Observations.....	11
4.1. Stock status, landings and TAC update	11
4.2. Enforcement update	13
4.3. Ecosystem Update.....	13
4.4. Relevant changes to Legislation and Regulations	14
4.5. Relevant changes to the Management Regime	14
5. Surveillance Meetings.....	15
6. Assessment Outcome Summary	16
6.1. Fundamental Clauses Summaries	16
7. Conformity Statement	21
8. Evaluation of Fundamental Clauses	22
8.1. Section A. The Fisheries Management System	22
8.1.1. Fundamental Clause 1	22
8.1.2. Fundamental Clause 2	24
8.1.3. Fundamental Clause 3	27
8.2. Section B. Science and Stock Assessment Activities.....	28
8.2.1. Fundamental Clause 4	28
8.2.2. Fundamental Clause 5	30
8.3. Section C. The Precautionary Approach	33
8.3.1. Fundamental Clause 6.....	33
8.3.2. Fundamental Clause 7	37
8.4. Section D. Management Measures	38
8.4.1. Fundamental Clause 8	38
8.4.2. Fundamental Clause 9	42
8.5. Section E. Implementation, Monitoring and Control	43
8.5.1. Fundamental Clause 10	43
8.5.2. Fundamental Clause 11	46
8.6. Section F. Serious Impacts of the Fishery on the Ecosystem	48
8.6.1. Fundamental Clause 12	48
8.6.2. Fundamental Clause 13	59
9. Performance specific to agreed corrective action plans.....	61
10. Unclosed, new non-conformances and new corrective action plans.....	62
11. Future Surveillance Actions	62
12. Client signed acceptance of the action plan.....	62
13. Recommendation and Determination	62
14. References	63
15. Appendices	65
15.1. Appendix 1 – Assessment Team Details.....	65

Glossary

ABC	Allowable Biological Catch
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AIGKC	Aleutian Island Golden King Crab
ASMI	Alaska Seafood Marketing Institute
BBRKC	Bristol Bay Red King Crab
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
EBSSC	Eastern Bering Sea Snow Crab
EBSTC	Eastern Bering Sea Tanner Crab
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
MSA	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
SMBKC	St. Matthew's Island Blue King Crab
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

Summary and Recommendations

This report is the 1st Surveillance Report (ref AK/CRA/002.1/2018) for the U.S. Alaska Bering Sea and Aleutian Islands King, Snow crab and Tanner 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 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 were originally certified on 16th of April 2012. More recently on December 7th 2017, the Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*) fisheries were certified.

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, Tanner, and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*), 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 (v1.3) fundamental clauses as the assessment framework.

The assessment was conducted by an Assessment Team comprised of two externally contracted fishery experts and SAI Global 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](#).

Assessment Team Details

Assessment Team:

Dr. Ivan Mateo, Lead Assessor

SAI Global/Global Trust Certification Ltd.

Providence, Rhode Island, U.S.A.

T: +1 401 486 8592

E: ivan.mateo@saiglobal.com

Dr. Gerald (Jerry) P. Ennis, Assessor

Independent fishery expert

Newfoundland, Canada.

Dr. Wes Toller, Assessor

Independent fishery expert

Seattle, U.S.A.

Administration Support

Niamh Connor, Client Services Administrator

SAI Global/Global Trust Certification Ltd.

Quayside Business Park, Mill Street,

Dundalk, Co. Louth, Ireland.

T: +353 (0) 42 9320912

E: niamh.connor@saiglobal.com

1. Introduction

This Surveillance Report documents the 1st Surveillance Assessment of the U.S. Alaska Bering Sea and Aleutian Islands King, Snow crab commercial fisheries originally certified on April 16 2012 and the Eastern Bering Sea Tanner Crab, Aleutian Islands Golden King Crab fisheries that were recently certified on December 7th 2017, and presents the recommendation of the Assessment Team that the fisheries be awarded continuing Certification.

Units of Certification

The U.S. Alaska Bering Sea and Aleutian Islands King, Tanner, and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*), 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 UoCs are as described in Table 2.

This Surveillance Report documents the assessment results for the continued certification of the above fisheries to the Alaska RFM Certification Program which 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 SAI Global procedures for Alaska RFM Certification using the fundamental clauses of the Alaska RFM Conformance Criteria Version (v1.3) 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 12 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 1st 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, the U.S. Alaska Bering Sea and Aleutian Islands King, Tanner, and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*), and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within the U.S. EEZ off Alaska.

2. Fishery Applicant Details

The Fishery Applicant Details are as described in Table 1 below.

Table 1. Fishery Applicant Details.

Organization/Company Name:	Bering Sea Crab Client Group LLC
Name:	Scott Goodman
Position:	Fisheries Biologist
Contact Details:	
Street :	23929 22ND Drive, SE, Bothell
City :	Seattle
Country:	United States of America
State:	Washington
ZIP Code:	98199
Phone:	(425) 486 8173
E-mail Address:	sgoodman@nrccorp.com

3. Units of Certification

The UoCs are as described in Table 2 below.

Table 2. Units of Certification (UoCs).

Common across all UoCs			Unique to each UoC	
Fishing gear	Location of Fishery	Principal Management Authorities	UoC	Species and stock
Pot gear (Baited)	U.S. 200nm EEZ off Alaska within FAO Major Fishing Area 67	Federal <ul style="list-style-type: none"> ▪ National Marine Fisheries Service (NMFS) ▪ North Pacific Fishery Management Council (NPFMC) State <ul style="list-style-type: none"> ▪ Alaska Department of Fish and Game (ADFG) ▪ Board of Fisheries (BOF) 	1	<ul style="list-style-type: none"> ▪ Common name ▪ (<i>Latin name</i>) ▪ Stock ▪ Red King crab ▪ (<i>Paralithodes camtschaticus</i>) ▪ Bristol Bay stock
			2	<ul style="list-style-type: none"> ▪ Blue King crab ▪ (<i>Paralithodes platypus</i>) ▪ St. Matthew Island stock
			3	<ul style="list-style-type: none"> ▪ Golden King Crab ▪ (<i>Lithodes aequispinus</i>) ▪ Aleutian Islands stock
			4	<ul style="list-style-type: none"> ▪ Sea Tanner Crab ▪ (<i>Chionoecetes bairdi</i>) ▪ Eastern Bering stock
			5	<ul style="list-style-type: none"> ▪ Sea Snow crab ▪ (<i>Chionoecetes opilio</i>) ▪ Eastern Bering stock

4. Fishery Observations

4.1. Stock status, landings and TAC update

Details of the foregoing and the most recent stock assessment for BSAI crab stocks can be found in the 2017 SAFE report.¹ Summaries for the five stocks under consideration in this surveillance audit follow.

Eastern Bering Sea Snow Crab

Total catch mortality in 2016/17 was 11,000 t (with discard mortality rates applied), while the retained catch in the directed fishery was 9,700 t (Table 1). This was below the 2016/17 OFL of 23,700 t. Snow crab bycatch occurs in the directed fishery and to a lesser extent in the groundfish trawl fisheries. Estimates of trawl bycatch in recent years are less than 1% of the total snow crab catch. Estimates of stock status were above the BMSY proxy for this stock (B35%) in 2010/11-2012/13, but below the BMSY proxy more recently. For 2017/18, the ratio of projected MMB (99.6 t) fishing at the FOFL to BMSY (139,400 t) remains less than 1 but above 0.5.

Table 3. Historical status and catch specifications for snow crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2013/14	71.5	126.5	24.5	24.5	28.1	78.1	70.3
2014/15	78.9	168.0	30.8	30.8	34.3	69.0	62.1
2015/16	75.8	91.6	18.4	18.4	21.4	83.1	62.3
2016/17	69.7	94.4	9.7	9.7	11.0	23.7	21.3
2017/18		99.6				28.4	22.7

Bristol Bay Red King Crab

The current SOA harvest strategy allows a maximum harvest rate of 15% of mature-sized (≥ 120 mm CL) males, but also incorporates a maximum harvest rate of 50% of legal males and a threshold of 8.4 million mature-sized (≥ 90 mm CL) females and 14.5 million lb (6.6 thousand t) of effective spawning biomass (ESB), to prosecute a fishery (Table 2). Annual non-retained catch of female and sublegal male RKC during the fishery averaged less than 3.9 million lb (8.6 thousand t) since data collection began in 1990. Total catch (retained and bycatch mortality) increased from 16.9 million lb (7.6 thousand t) in 2004/05 to 23.4 million lb (10.6 thousand t) in 2007/08, but has decreased since then; retained catch in 2016/17 was 8.64 million lb (3.92 thousand t) and total catch mortality was 9.44 million lb (4.28 thousand t).

Table 4. Historical status and catch specifications for Bristol Bay red king crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2013/14	12.85	27.12	3.90	3.99	4.56	7.07	6.36
2014/15	13.03	27.25	4.49	4.54	5.44	6.82	6.14
2015/16	12.89	27.68	4.52	4.61	5.34	6.73	6.06
2016/17	12.53	25.81	3.84	3.92	4.28	6.64	5.97
2016/17		21.31				5.60	5.04

¹ <http://www.npfmc.org/SAFE/CrabSAFE/2017CrabSAFE.pdf>

Eastern Bering Sea Tanner Crab

The mature male biomass was estimated to be below the Minimum Stock Size Threshold (0.5BMSY) in February 2010 (the assumed time of mating) based on trends in mature male biomass from the survey, and NMFS declared the stock overfished in September 2010 (Table 3). The directed fishery was closed from 2010/11 through 2012/13 crab fishery years. NMFS determined the stock was not overfished in 2012 based on a new assessment model with a revised estimate of BMSY. The directed fishery was open for the 2013/14 to 2015/16 seasons with a total allowable catch (TAC) of 1,410 t in 2013/14, 6,850 t in 2014/15, and 8,920 t in 2015/16. The total retained catch in 2015/16 (8,910 t) was the largest taken in the fishery since 1992/93. In 2016/17, ADF&G determined that mature female biomass did not meet the criteria for opening a fishery according to the regulatory harvest strategy, and the TAC was set at zero. Consequently, there was no directed harvest in 2016/17.

Table 5. Historical status and catch specifications for Eastern Bering Sea Tanner crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC (East + West)	Retained Catch	Total Catch Mortality	OFL	ABC
2013/14	16.98	72.70	1.41	1.26	2.78	25.35	17.82
2014/15	13.40	71.57	6.85	6.16	9.16	31.48	25.18
2015/16	12.82	73.93	8.92	8.91	11.38	27.19	21.75
2016/17	14.58	77.96	0.00	0.00	1.14	25.61	20.49
2017/18		43.31				25.42	20.33

St. Matthew Island Blue King Crab

Harvest increased to a mean catch of 1,496 t (3.298 million lb) during the 1991/92 to 1998/99 seasons until the fishery was declared overfished and closed in 1999 when the stock size estimate was below the MSST (Table 4). In November of 2000, Amendment 15 to the FMP was approved to implement a rebuilding plan for the St. Matthew Island blue king crab stock. The rebuilding plan included a harvest strategy identified in regulation by the Alaska Board of Fisheries, an area closure to control bycatch, and gear modifications. In 2008/09 and 2009/10, the MMB was estimated to be above BMSY for two years and the stock declared rebuilt in 2009.

The fishery re-opened in 2009/10 with a TAC of 529 t (1.166 million lb) and 209 t (0.461 million lb) of retained catch were harvested. The 2010/11 TAC was 726 t (1.601 million lb) and the fishery reported a retained catch of 573 t (1.263 million lb). The 2011/12 harvest of 853 t (1.881 million lb) represented 80% of the 1,152 t (2.540 million lb) TAC. In 2012/13, by contrast, harvesters landed 99% (733 t, 1.616 million lb) of a reduced TAC of 740 t (1.630 million lb), though fishery efficiency, at about 10 crab per pot, was little changed from what it had been in each of the previous three years. The directed fishery was closed in 2013/14 due to declining trawl survey estimates of abundance and concerns about the health of the stock. The directed fishery resumed again in 2014/15 with a TAC of 300 t (0.655 million pounds), but the fishery performance was relatively poor with the retained catch of 140 t (0.309 million pounds). The TAC in 2015/16 was 190 t (0.410 million pounds) with a retained catch of 47 t (0.105 million pounds). The fishery was closed in 2016/17.

Table 6. Historical status and catch specifications for Saint Matthew blue king crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB _{mating})	TAC	Retained Catch	Total Male Catch	OFL	ABC
2013/14	1.50	3.01	0.00	0.00	0.0003	0.56	0.45
2014/15	1.86	2.48	0.30	0.14	0.15	0.43	0.34
2015/16	1.84	2.11	0.19	0.05	0.05	0.28	0.22
2016/17	1.97	2.23	0.00	0.00	0.05	0.14	0.11
2017/18		2.18				0.12	0.10

Aleutian Islands Golden King Crab

Average harvests dropped sharply from 1989/90 to 1990/91 to a level of 6.9 million lb for the period 1990/91 – 1995/96. Management based on a formally established GHL began with the 1996/97 season. The 5.9 million lb GHL established for the 1996/97 season, which was based on the previous five-year average catch, was subsequently reduced to 5.7 million lb beginning in 1998/99. The GHL (or TAC, since 2005/06) remained at 5.700 million lb for 2007/08, but was increased to 5.985 million lb for the 2008/09-2011/12 seasons, and to 6.290 million lb starting with the 2012/13 season (Table 5). The TAC was reduced to 5.545 million lb for the 2016/17 season.

Table 7. Status and catch specifications (1000 t) of Aleutian Islands golden king crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch ^a	Total Catch ^a	OFL	ABC
2013/14	N/A	N/A	2.853	2.894	3.192	5.69	5.12
2014/15	N/A	N/A	2.853	2.771	3.079	5.69	4.26
2015/16	N/A	N/A	2.853	2.729	3.073	5.69	4.26
2016/17	N/A	N/A	2.515	2.593	2.829	5.69	4.26
2017/18 ^b	6.044	14.205				6.048	4.838

- Total retained catch plus estimated bycatch mortality of discarded bycatch during crab fisheries and groundfish fisheries.
- Approach 2 above.

4.2. Enforcement update

There were no significant changes to enforcement impacts of the Alaska BSAI king and tanner crab fisheries in the last year. In 2017, there were a total of 858 total federal fisheries & safety boardings documented by U.S. Coast Guard. Of all those boardings there were 12 violations accounting for almost 1% of annual violation rate. There were 3 boardings for Bering Sea Snow Crab fishing vessels and 2 boardings for Bering Sea Bristol Bay Red/Golden King Crab. No violations were detected for crab fishing vessels.

4.3. Ecosystem Update

There were no significant changes to the ecosystem impacts of the Alaska BSAI king and tanner crab fisheries in the last year.

4.4. Relevant changes to Legislation and Regulations

There were no significant changes to the legislation and/or regulations that govern the Alaska BSAI king and tanner crab fisheries in the last year.

4.5. Relevant changes to the Management Regime

There were no significant changes to the management regime that governs the Alaska BSAI king and tanner crab fishery in the last year.

5. Surveillance Meetings

The fishery was re-certified on December 7th 2017. Since the period between re-certification and this 1st surveillance was less than 12 months, site visit meetings were deemed unnecessary, as most of the data and information relevant for this assessment and fishery remain the most current. However, accredited procedures require that 4 surveillance audits are conducted within the total 5 year re-certification period, and since the original certificate was extended by one of these years, the four surveillances are required within a 4 year period. Therefore, this 1st surveillance audit was conducted 6 months post re-certification. The assessment team conducted a desktop review of the fishery for the purpose of identifying if there has been any significant update since the date of recertification.

6. Assessment Outcome Summary

6.1. Fundamental Clauses Summaries

Fundamental Clause 1: Structured and legally mandated management system

Evidence adequacy rating: High

There is a structured and legally mandated management system in place for the BSAI king and tanner crab fisheries. 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.

Fundamental Clause 3: Management objectives and plan

Evidence adequacy rating: High

Long-term objectives for the fishery are outlined in the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (NPFMC 2011). FMP objectives are dictated by, and consistent with, the Magnuson-Stevens Act (MSA). The decision-making processes of responsible agencies are extremely transparent and inclusive of all stakeholders, thereby ensuring that the plan is subscribed to by all interested parties. Conservation and management measures ensure that excess fishing capacity is avoided and exploitation of the stocks remains economically viable.

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 four of the five fisheries under consideration. Full details of the datasets for the five 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. For the AIGKC fishery, the stock assessment uses a length-based model that combines a variety of catch, catch composition and catch discard data from commercial crab and groundfish (trawl and pot) fisheries and standardized observer legal size catch-per-unit-effort (CPUE) as indices of abundance. For the EBSTC fishery, the stock assessment model is a stage/size-based population dynamics model that incorporates sex (male, female), shell condition (new shell, old shell), and maturity (immature, mature) as different categories into which the overall stock is divided on a size-specific basis.

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 example, 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 (FOFL), 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, SMBKC, AIGKC and EBSTC 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 five crab stocks under consideration 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

Conservation and management measures are in place to ensure the long-term sustainability of BSAI crab resources at levels which promote optimum utilization that are based on verifiable and objective scientific and traditional, fisher and community sources. 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 9: Appropriate standards of fisher's competence

Evidence adequacy rating: High

Advanced education and training programs are readily available and required by fishers to enhance their skills and professional qualifications. All those engaged in BSAI crab fishing operations are provided information on the most important provisions of the FAO CCRF (1995), as well as provisions of relevant international conventions and applicable environmental and other standards that are essential to ensure responsible fishing operations, as part of required education and training. Records of all BSAI crab fishers are maintained as part of licence and permit programs which contain information on their service and qualifications, including certificates of competency.

Fundamental Clause 10: 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 11: 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 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 12: Impacts of the fishery on the ecosystem**Evidence adequacy rating: Medium**

There is in place a robust fisheries management system that appropriately and adequately considers fishery interactions and effects on the ecosystem. The BSAI crab fishery management system is based on the best available science while allowing for inputs from fishery participants and other stakeholders. The management system also incorporates risk-based approaches for determining most probable adverse impacts of the fishery so that potentially adverse impacts of the fishery on the ecosystem are appropriately assessed and effectively addressed. 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 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.

The Aleutian Islands golden king crab fishery takes place in deep water areas where coral and sponge habitats may be adversely impacted by bottom contact gear such as pots. For the AI GKC unit of certification, it was not shown that outcome indicators are in place that are consistent with avoiding, minimizing, or mitigating the impact on habitats that are highly vulnerable to damage by the fishing gear of the unit of certification (i.e. pots). For example, there are no spatial analyses available which would allow an estimation of current and historic overlap of AIGKC pot fishing effort with the distribution of vulnerable coral and sponge habitats in the Aleutian Islands. The AIGKC unit of certification was therefore assigned a medium confidence rating for clause 12.13 and, consequently, a minor non-conformity was raised at re-assessment (SAI Global 2017). The minor non-conformance is now being addressed through a Corrective Action Plan that was developed by the Bering Sea Crab Client Group and which was accepted by the assessment team and incorporated into the re-assessment report.

Fundamental Clause 13: Fisheries enhancement activities (where applicable)

Evidence adequacy rating: NA

Not applicable.

7. Conformity Statement

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, the U.S. Alaska Bering Sea and Aleutian Islands King, Tanner, and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*), and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within the U.S. EEZ off Alaska.

8. Evaluation of Fundamental Clauses

8.1. Section A. The Fisheries Management System

8.1.1. 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.

Number of Supporting clauses	13
Supporting clauses applicable	6
Supporting clauses not applicable	7
Overall level of conformity	Full Conformity
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.

There is a structured and legally mandated management system in place for the BSAI king and tanner crab fisheries. 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. The management system and the fishery operate in compliance with applicable law including the MSA.

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

As detailed previously in the BSAI Crab RFM Re-assessment Report², management measures consider the whole stock biological unit over its entire area of distribution, the area through which the species migrates during its life cycle, and other biological characteristics of the stock. The Council and NMFS produce annually a Stock Assessment & Fishery Evaluation (SAFE) report³ covering all crab stocks within the BSAI King and Tanner Crab Fishery Management Plan (FMP), including each of the five stocks under consideration here. Both state and federal assessment biologists meet at the NPFMC Plan Team meetings and share assessment information and harvest strategies to assure conservation management over the entire stock distribution.

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

The five stocks under assessment are not considered shared, straddling, high seas or highly migratory stocks, nor are they considered common shared resources exploited by two or more States. As such, the following six supporting clauses are not applicable: 1.3, 1.3.1, 1.4, 1.4.1, 1.5 and 1.6.1. With respect to supporting clause 1.6, an updated rationale is provided below.

² <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

³ <https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

With respect to continuing conformity with supporting clause 1.6, there is evidence for well-established means by which fisheries management activities, organisations and arrangements are financed, including arrangements aiming to recover the costs of fisheries conservation, management and research. Specific costs incurred during management, research and enforcement of BSAI crab fisheries are largely funded through Congressional appropriations for federal programs. The State of Alaska also receives some funding from NMFS, in addition to funding from the Alaska Legislature. The Crab Observer Program is funded through industry funds as well as Test Fish funding sources. ADF&G provides the Crab Observer Oversight Task Force (COOTF) with an annual financial report summarizing test fish expenditures on BSAI crab fishery observer program.

1.7. Review and Revision of conservation and management measures

The NPFMC and Alaska BOF have procedures in place to ensure continuous review of the efficacy of conservation and management measures. Mechanisms exist to revise or abolish current management measures in light of new information. For example, the Magnuson-Stevens Act (MSA) requires Regional Fishery Management Councils 1852(f)(5) to “review on a continuing basis, and revise as appropriate, the assessments and specifications made pursuant to section 1853(a)(3) and (4) of this title with respect to the optimum yield...”

1.8. Transparent management arrangements and decision making

The NPFMC and Alaska BOF processes are organized in a highly transparent manner in terms of both management arrangements and decision-making processes. The Council provides a great deal of information on their website⁴, including meeting agendas, discussion papers, and records of decisions. The Council actively encourages stakeholder participation, and all Council deliberations are conducted in open, public session. As previously discussed, the Three Meeting Outlook outlines issues likely to be of concern and therefore likely to be discussed at the following three NPFMC meetings affording stakeholders the opportunity to prepare and submit comments for discussion in advance of meetings.

Similar to NPFMC, Alaska’s Board of Fisheries (BOF) management arrangements and decision-making processes for the fishery are organized in a very transparent manner. The Board and ADFG provide a great deal of information on their websites⁵, including agenda of meetings, discussion papers, news items, and records of decisions. The BOF actively encourages stakeholder participation, and BOF deliberations are conducted in open, public session. Anyone may submit regulatory proposals, and all such proposals are given due consideration by the BOF.

1.9. Compliance with international conservation and management measures

The crab fisheries under assessment are prosecuted exclusively within waters of the U.S. EEZ and State of Alaska. These fisheries do not occur on the high seas. As such, supporting clause 1.9 is not applicable.

⁴ <https://www.npfmc.org/>

⁵ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main>

8.1.2. 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.

Number of Supporting clauses	10
Supporting clauses applicable	10
Supporting clauses not applicable	0
Overall level of conformity	Full Conformity
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.

A framework comprised of policy, legal and institutional capacities is in place to achieve sustainable and integrated use of marine resources and this framework provides for mechanisms to avoid conflict among users. 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.

Representatives of the fisheries sector and fishing communities are consulted in decision making processes and information related to management measures is disseminated. 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.

Information related to management measures is disseminated in a timely manner. For example, ADF&G regularly publishes and distributes booklets summarizing current regulations (e.g. Commercial Fisheries Regulations for King and Tanner Crab Fisheries; ADF&G 2017⁶) which are also made available online.

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.

Assessment of the economic, social and cultural value of Alaskan fisheries is an integral part of the decision-making process for management of coastal resources. The primary job of the NPFMC and the BOF is to manage fisheries resources sustainably and to determine the allocation of resources to different users in accordance with provisions of the Magnuson Stephens Act (MSA).

⁶ <http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial>

Alaska Fisheries Science Center (AFSC) runs the Economic and Social Sciences Research (ESSR) Program in Alaska⁷. The aim of the Program is to provide economic and sociocultural information to assist NMFS in meeting its stewardship responsibilities with activities being conducted in support of this mission. AFSC maintains online access to community profiles of baseline socioeconomic information for 136 Alaska communities most involved in commercial fisheries. Comprehensive community profiles, concise snapshots and searchable maps of communities involved in commercial, recreational and subsistence fishing may be found on the AFSC website⁸. AFSC has also recently published a wholesale market profile for Alaska groundfish and crab (AFSC 2016).

Many of the activities of the AFSC Program are conducted in collaboration with other Federal and State agencies and universities. Current research topics being addressed include regional economic impact models, behavioral models of fishing operations, indicators of economic performance, and the non-market valuation of living marine resources.

Additional information about the value of coastal resources comes from the Alaska Fisheries Information Network (AKFIN). 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 Alaska⁹. 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 provides that data in a usable format.

Assessment results are presented annually in Economic Stock Assessment and Fishery Evaluation (Economic SAFE; Garber-Yonts and Lee 2017¹⁰) reports together with comprehensive information on stock assessments and updates on ecosystem status and trend (Ecosystem SAFE).

2.6./2.7/2.8. Research and monitoring of the coastal environment, mechanisms for cooperation and coordination, appropriate technical capacities and financial resources, conflict avoidance amongst user groups

State and Federal agencies coordinate ongoing research and monitoring programs for the coastal environment. There are well-established multidisciplinary research programs to assess physical, chemical, biological, economic and social aspects of the coastal area which contribute to improved management. As detailed in the BSAI Crab Re-assessment Report¹¹, the NPFMC, NMFS and ADF&G are engaged monitoring of coastal resources either during the NEPA review of plan amendments or during their on-going studies and evaluations. Other State and federal entities also cooperate at the sub-regional level via NEPA processes in order to improve coastal area management. These entities include: Alaska Department of Environmental Conservation (ADEC); Alaska Department of Natural Resources (ADNR); DNR Office of Project Management and Permitting (OPMP); U.S. Fish and Wildlife Service (USFWS); and Bureau of Ocean Energy Management (BOEM), as well as the North Pacific Research board (NPRB) and Institute of Marine Science (IMS) of the UAF's School of Fisheries and Ocean Science.

There are well-established mechanisms for domestic cooperation and coordination that are secured by appropriate technical capacities and financial resources. For example, State and federal management authorities have established a framework for management of artificial reefs and fish aggregation devices in the coastal waters of Alaska. These management systems require approval for the construction and deployment of such reefs and devices, and management takes into account the interests of fishers, including artisanal and subsistence fishers.

⁷ <https://www.afsc.noaa.gov/REFM/Socioeconomics/Default.php>

⁸ <https://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/communities/profiles.php>

⁹ <http://www.akfin.org/about-akfin>

¹⁰ <https://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/crab.php>

¹¹ <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

Mechanisms for international cooperation and coordination are in place as well. If an incident were to occur with potential for adverse environmental effects (e.g. oil spill, escape of an invasive species), there are management systems and action plans in place for response and containment. Additionally, there are systems to ensure the early sharing of information with the relevant Canadian authorities should such events have the potential for spill-over impacts on Canadian waters.

8.1.3. Fundamental Clause 3

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

Number of Supporting clauses	7
Supporting clauses applicable	7
Supporting clauses not applicable	0
Overall level of conformity	Full Conformity
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 objectives for the fishery are outlined in the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (NPFMC 2011)¹². FMP objectives are dictated by, and consistent with, the Magnuson-Stevens Act (MSA)¹³. Management decisions are made by the Council and BOF, and implemented and enforced by AWT, NMFS-OLE and USCG (see discussion of enforcement under clause 10). Both NPFMC and ADF&G make Council and Board deliberation and associated records publicly available on their websites. The decision-making processes of both agencies are extremely transparent and inclusive of all stakeholders, thereby ensuring that the plan is subscribed to by all interested parties.

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.

Conservation and management measures ensure that excess fishing capacity is avoided and exploitation of the stocks remains economically viable. 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 NMFS¹⁴. 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.

¹² <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

¹³ <https://www.law.cornell.edu/uscode/text/16/chapter-38/subchapter-IV>

¹⁴ <https://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/crab.php>

8.2. Section B. Science and Stock Assessment Activities

8.2.1. Fundamental Clause 4

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

Number of Supporting clauses	13
Supporting clauses applicable	7
Supporting clauses not applicable	6
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized evidence:

4.1. All fishery removals and mortality of the target stock(s) shall be considered by management.

All fishery removals and mortality of the target stocks is considered by management. ADFG undertakes a comprehensive, annual monitoring program to collect data on retained catch, bycatch/discards in all BSAI directed crab fisheries as well as crab bycatch/discards in all groundfish fisheries. Collectively, these monitoring and observer programs provide the basis for reliable estimation of total removals from all crab stocks annually for assessment and management purposes. Complete and reliable statistics are compiled on catch and fishing effort and subjected to rigorous statistical analysis in each annual stock assessment. Research results have been used as a basis for the setting of management objectives, reference points and performance criteria, as well as for annual adjustment of allowable catch levels. Historical and most recent data are available in the 2018 crab stock assessments report.^{15 16}

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

A scheme of at-sea and dock-side observers is established to collect accurate data for research and support compliance with applicable fishery management measures. Historical and most recent data are available in the 2018 crab stock assessments report.^{17 18}

4.3. Management entities shall make data available in a timely manner and in an agreed format in accordance with agreed procedures.

Data collected as part of 4.1 and 4.2 above are made available as required to conduct annual assessments of all BSAI crab stocks. Policies and procedures are prescribed at the federal and state levels to protect the confidentiality of data submitted to and collected by employees and contractors. Only authorized users have access to confidential data to perform an official duty.^{19 20}

¹⁵ <http://www.adfg.alaska.gov/FedAidPDFs/FDS14-49.pdf>

¹⁶ <http://www.npfmc.org/SAFE/CrabSAFE/2018CrabSAFE.pdf>

¹⁷ <http://www.adfg.alaska.gov/FedAidPDFs/FDS14-49.pdf>

¹⁸ http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2015.pdf

¹⁹ http://www.st.nmfs.noaa.gov/st1/recreational/documents/Intercept_Appendices/Appendix%20M%20031408%20NOAA%20administrative%20order%20216-100.pdf

²⁰ <http://www.adfg.alaska.gov/FedAidPDFs/SP12-14.pdf>

4.4/4.5. States shall stimulate the research required to support national policies related to fish as food and collect sufficient knowledge of social, economic and institutional factors relevant to the fishery in question to support policy formulation.

There is strong promotion of research into all aspects of seafood use by federal and state agencies and industry organizations that support national policies related to fish as food. Extensive knowledge of the economic, social, marketing and institutional aspects of the BSAI crab fisheries has been acquired through dedicated research. Annual collection and analysis of relevant data provide the basis for ongoing monitoring, analysis and policy formulation related to these aspects of the fisheries. The most recent information is available in the 2017 socioeconomic evaluation of these fisheries.^{21 22 23 24 25}

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.

Traditional fisheries knowledge is obtained through ongoing opportunity for public/community input to the fisheries management process to ensure its application to sustainable fisheries conservation, management and development.^{26 27}

4.7. States conducting scientific research activities in waters under the jurisdiction of another State shall ensure that their vessels comply with the laws and regulations of that State and international law.

N/A

4.8. States shall promote the adoption of uniform guidelines governing fisheries research conducted on the high seas.

N/A

4.9/4.10/4.11. States shall promote and enhance the research capacities of developing countries, support (upon request) States engaged in research investigations aimed at evaluating stocks which have been previously un-fished or very lightly fished.

N/A

²¹ <http://www.alaskaseafood.org>

²² <http://www.sfos.uaf/fitc/>

²³ <http://afdf.org>

²⁴ <http://www.afsc.noaa.gov/REFM/Socioeconomics/Default.php>

²⁵ http://www.afsc.noaa.gov/REFM/Socioeconomics/SAFE/crab_safe/Crab_Economic_SAFE_2017.pdf

²⁶ <http://www.alaskafisheries.noaa.gov/fisheries/cdq>

²⁷ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main>

8.2.2. 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.

Number of Supporting clauses	7
Supporting clauses applicable	7
Supporting clauses not applicable	0
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized Evidence:

5.1 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.

A well-organized institutional framework is in place that conducts the research required for fishery management purposes. The BSAI crab fisheries are jointly managed by the NPFMC and the BOF under the Fishery Management Plan (FMP).²⁸ A requirement of the FMP is the production of an annual stock assessment and fishery evaluation (SAFE) report. For each stock/fishery, the SAFE report provides a detailed description of the data and methodology used in the stock assessment, any changes in approaches, 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.

Stock status criteria used in the assessment of BSAI crab stocks ensure more precautionary approaches to managing fisheries when uncertainty is high. None of the BSAI crab fisheries can be considered small scale or low value. Nevertheless, the assessment methodology and degree of reliability varies between stocks. Status determination criteria for these stocks are 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.

Well established institutions with qualified staff are in place that conduct research into all aspects of fisheries. Results are made available as needed to ensure that the best scientific evidence is used for fisheries conservation, management and development. The research branch of the NMFS Alaska Region is the Alaska Fisheries Science Center (ASFC).²⁹ Its mission is to plan, develop, and manage scientific research programs which generate the best scientific data available for understanding, managing, and conserving the region's living marine resources and the environmental quality essential for their existence. The Resource Assessment and Conservation Engineering (RACE) Division³⁰ 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 shellfish stocks in the region, and to investigate ways to reduce bycatch, bycatch

²⁸ <http://www.fakr.noaa.gov/npfmc/fishery-management-plans/crab.html>

²⁹ <http://www.afsc.noaa.gov/>

³⁰ <http://www.afsc.noaa.gov/race/default.php>

mortality and the effects of fishing on habitat. Resource Ecology and Fisheries Management (REFM) Division³¹ conducts research and data collection to support an ecosystem approach to management of fish and crab resources. Division scientists evaluate how fish stocks, ecosystem relationships and user groups might be affected by fishery management actions and climate. The Habitat and Ecological Processes Research (HEPR) Program³² develops scientific research that supports implementation of an ecosystem approach to fishery management.

5.2. 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.

There is well established research capacity to assess and monitor the effects of climate or environment change on BSAI crab stocks and their ecosystem, the state of these stocks and the impacts of ecosystem changes resulting from human activity. See 5.1 evidence summary. Annual Ecosystem SAFE documents provide a concise summary of the status of marine ecosystems in Alaska for stock assessment scientists, fishery managers, and the public. It provides detailed information and updates on the status and trends of ecosystem components as well as early signals of direct human effects that might warrant management intervention or to provide evidence of the efficacy of previous management actions.³³ The annual crab SAFE report includes a section on ecosystem considerations which provides information on ecosystem indicators which may have an impact on crab stocks. Also, monitoring of and research related to effects of pollution of the marine environment throughout Alaska is an ongoing priority for AFSC and various State agencies.³⁴

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

There is extensive international collaboration/cooperation that encourages research to ensure optimum utilization of BSAI crab resources. Research output on BSAI crab stocks is regularly published in the scientific literature and presented/discussed at relevant international conferences and symposia.³⁵ Scientists participate in meetings of different organizations involving attendees from various countries, including, for example, the North Pacific Marine Science Organization (PICES)³⁶, which has members from the US, Russia, Japan and Canada, to exchange and discuss the latest results and advances stock assessment science and management of fishery resources.

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 BSAI crab are not trans-boundary stocks, the United States and Russia share many important stocks of living marine resources in the North Pacific Ocean and Bering Sea, lending importance to coordination of efforts of the two countries to conserve and manage those resources. On May 31, 1988 the United States and Russia signed the “Agreement Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics on Mutual Fisheries Relations”, establishing the U.S.-Russia Intergovernmental Consultative Committee.³⁷ The main objective of the Agreement is to maintain a fisheries relationship that benefits both countries. The United States and Russia cooperate on scientific research, consult on fisheries matters beyond their EEZs and beyond the EEZ of any third party to

³¹ <http://www.afsc.noaa.gov/refm/default.php>

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

³³ <https://access.afsc.noaa.gov/reem/ecoweb>

³⁴ http://www.afsc.noaa.gov/ABL/Habitat/ablhab_contaminants.htm

³⁵ <http://www.pmel.noaa.gov/foci/publications>

³⁶ <http://www.pices.int>

³⁷ http://www.nmfs.noaa.gov/ia/agreements/bilateral_arrangements/russia/us-russia.html

ensure proper conservation and management, and cooperate to address Illegal, Unreported, and Unregulated (IUU) fishing activities. On April 29, 2013, the United States and Russia signed a Joint Statement on Enhanced Fisheries Cooperation, which reaffirms the 1988 Agreement while focusing future cooperation on combating IUU fishing, collaborating on science and management of Arctic fisheries, and advancing conservation efforts in the Ross Sea region of Antarctica.

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

Results of analysis of 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 are 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 NOAA/National Marine Fisheries Service.³⁸ Only authorized users have access to confidential data, they must have a need to collect or use these data in the performance of an official duty, and they must sign a statement of nondisclosure affirming their understanding of NMFS obligations with respect to confidential data and the penalties for unauthorized use and disclosure. All procedures applicable to Federal employees must be followed by contractors collecting data with Federal authority. 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.

³⁸http://www.st.nmfs.noaa.gov/st1/recreational/documents/Intercept_Appendices/Appendix%20M%20031408%20NOAA%20administrative%20order%20216-100.pdf

8.3. Section C. The Precautionary Approach

8.3.1. 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.

Number of Supporting clauses	4
Supporting clauses applicable	4
Supporting clauses not applicable	0
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized Evidence:

6.1/6.2/6.3/6.4 States shall determine for the stock both safe targets for management (Target Reference Points) and limits for exploitation (Limit Reference Points), shall measure the status of the stock against these reference points and agree to actions to be undertaken if reference points are exceeded.

Safe target reference points have been established for management of BSAI crab fisheries. The FMP³⁹ contains the following stock status definitions: Acceptable biological catch (ABC) is a level of annual catch of a stock that accounts for the scientific uncertainty in the estimate of OFL and any other specified scientific uncertainty and is set to prevent, with a greater than 50 percent probability, the OFL from being exceeded. The ABC is set below the OFL. ABC Control Rule is the specified approach in the five-tier system for setting the maximum permissible ABC for each stock as a function of the scientific uncertainty in the estimate of OFL and any other specified scientific uncertainty. Annual catch limit (ACL) is the level of annual catch of a stock that serves as the basis for invoking accountability measures. For EBS crab stocks, the ACL will be set at the ABC. Total allowable catch (TAC) is the annual catch target for the directed fishery for a stock, set to prevent exceeding the ACL for that stock and in accordance with section 8.2.2 of the FMP. Guideline harvest level (GHL) means the preseason estimated level of allowable fish harvest which will not jeopardize the sustained yield of the fish stocks. A GHL may be expressed as a range of allowable harvests for a species or species group of crab for each registration area, district, sub district, or section. Maximum sustainable yield (MSY) is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. MSY is estimated from the best information available. For crab stocks, the OFL equals the maximum sustainable yield (MSY). FMSY control rule means a harvest strategy which, if implemented, would be expected to result in a long term average catch approximating MSY. BMSY stock size is the biomass that results from fishing at constant FMSY and is the minimum standard for a rebuilding target when a rebuilding plan is required. Maximum fishing mortality threshold (MFMT) is defined by the FOFL control rule, and is expressed as the fishing mortality rate. Minimum stock size threshold (MSST) is one half the BMSY stock size.

Overfished is determined by comparing annual biomass estimates to the established MSST. For stocks where MSST (or proxies) are defined, if the biomass drops below the MSST (or proxy thereof) then the stock is considered to be overfished. Overfishing is defined as any amount of catch in excess of the overfishing level (OFL). The OFL is calculated by applying abundance estimates to the FOFL control rule. Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. If overfishing occurred or the stock is overfished, section 304(e)(3)(A) of the Magnuson-Stevens Act, as amended, requires the NPFMC to immediately end overfishing and rebuild affected stocks.

³⁹ <http://www.fakr.noaa.gov/npfmc/fishery-management-plans/crab.html>

Details of the foregoing and the most recent stock assessment for BSAI crab stocks can be found in the 2017 SAFE report.⁴⁰ Summaries for the five stocks under consideration in this surveillance audit follow.

Eastern Bering Sea Snow Crab

Total catch mortality in 2016/17 was 11,000 t (with discard mortality rates applied), while the retained catch in the directed fishery was 9,700 t (Table 1). This was below the 2016/17 OFL of 23,700 t. Snow crab bycatch occurs in the directed fishery and to a lesser extent in the groundfish trawl fisheries. Estimates of trawl bycatch in recent years are less than 1% of the total snow crab catch. Estimates of stock status were above the BMSY proxy for this stock (B35%) in 2010/11-2012/13, but below the BMSY proxy more recently. For 2017/18, the ratio of projected MMB (99.6 t) fishing at the FOFL to BMSY (139,400 t) remains less than 1 but above 0.5.

Table 8. Historical status and catch specifications for snow crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2013/14	71.5	126.5	24.5	24.5	28.1	78.1	70.3
2014/15	78.9	168.0	30.8	30.8	34.3	69.0	62.1
2015/16	75.8	91.6	18.4	18.4	21.4	83.1	62.3
2016/17	69.7	94.4	9.7	9.7	11.0	23.7	21.3
2017/18		99.6				28.4	22.7

Bristol Bay Red King Crab

The current SOA harvest strategy allows a maximum harvest rate of 15% of mature-sized (≥ 120 mm CL) males, but also incorporates a maximum harvest rate of 50% of legal males and a threshold of 8.4 million mature-sized (≥ 90 mm CL) females and 14.5 million lb (6.6 thousand t) of effective spawning biomass (ESB), to prosecute a fishery (Table 2). Annual non-retained catch of female and sublegal male RKC during the fishery averaged less than 3.9 million lb (8.6 thousand t) since data collection began in 1990. Total catch (retained and bycatch mortality) increased from 16.9 million lb (7.6 thousand t) in 2004/05 to 23.4 million lb (10.6 thousand t) in 2007/08, but has decreased since then; retained catch in 2016/17 was 8.64 million lb (3.92 thousand t) and total catch mortality was 9.44 million lb (4.28 thousand t).

Table 9. Historical status and catch specifications for Bristol Bay red king crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2013/14	12.85	27.12	3.90	3.99	4.56	7.07	6.36
2014/15	13.03	27.25	4.49	4.54	5.44	6.82	6.14
2015/16	12.89	27.68	4.52	4.61	5.34	6.73	6.06
2016/17	12.53	25.81	3.84	3.92	4.28	6.64	5.97
2016/17		21.31				5.60	5.04

⁴⁰ <http://www.npfmc.org/SAFE/CrabSAFE/2017CrabSAFE.pdf>

Eastern Bering Sea Tanner Crab

The mature male biomass was estimated to be below the Minimum Stock Size Threshold (0.5BMSY) in February 2010 (the assumed time of mating) based on trends in mature male biomass from the survey, and NMFS declared the stock overfished in September 2010 (Table 3). The directed fishery was closed from 2010/11 through 2012/13 crab fishery years. NMFS determined the stock was not overfished in 2012 based on a new assessment model with a revised estimate of BMSY. The directed fishery was open for the 2013/14 to 2015/16 seasons with a total allowable catch (TAC) of 1,410 t in 2013/14, 6,850 t in 2014/15, and 8,920 t in 2015/16. The total retained catch in 2015/16 (8,910 t) was the largest taken in the fishery since 1992/93. In 2016/17, ADF&G determined that mature female biomass did not meet the criteria for opening a fishery according to the regulatory harvest strategy, and the TAC was set at zero. Consequently, there was no directed harvest in 2016/17.

Table 10. Historical status and catch specifications for Eastern Bering Sea Tanner crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB)	TAC (East + West)	Retained Catch	Total Catch Mortality	OFL	ABC
2013/14	16.98	72.70	1.41	1.26	2.78	25.35	17.82
2014/15	13.40	71.57	6.85	6.16	9.16	31.48	25.18
2015/16	12.82	73.93	8.92	8.91	11.38	27.19	21.75
2016/17	14.58	77.96	0.00	0.00	1.14	25.61	20.49
2017/18		43.31				25.42	20.33

St. Matthew Island Blue King Crab

Harvest increased to a mean catch of 1,496 t (3.298 million lb) during the 1991/92 to 1998/99 seasons until the fishery was declared overfished and closed in 1999 when the stock size estimate was below the MSST (Table 4). In November of 2000, Amendment 15 to the FMP was approved to implement a rebuilding plan for the St. Matthew Island blue king crab stock. The rebuilding plan included a harvest strategy identified in regulation by the Alaska Board of Fisheries, an area closure to control bycatch, and gear modifications. In 2008/09 and 2009/10, the MMB was estimated to be above BMSY for two years and the stock declared rebuilt in 2009.

The fishery re-opened in 2009/10 with a TAC of 529 t (1.166 million lb) and 209 t (0.461 million lb) of retained catch were harvested. The 2010/11 TAC was 726 t (1.601 million lb) and the fishery reported a retained catch of 573 t (1.263 million lb). The 2011/12 harvest of 853 t (1.881 million lb) represented 80% of the 1,152 t (2.540 million lb) TAC. In 2012/13, by contrast, harvesters landed 99% (733 t, 1.616 million lb) of a reduced TAC of 740 t (1.630 million lb), though fishery efficiency, at about 10 crab per pot, was little changed from what it had been in each of the previous three years. The directed fishery was closed in 2013/14 due to declining trawl survey estimates of abundance and concerns about the health of the stock. The directed fishery resumed again in 2014/15 with a TAC of 300 t (0.655 million pounds), but the fishery performance was relatively poor with the retained catch of 140 t (0.309 million pounds). The TAC in 2015/16 was 190 t (0.410 million pounds) with a retained catch of 47 t (0.105 million pounds). The fishery was closed in 2016/17.

Table 11. Historical status and catch specifications for Saint Matthew blue king crab (thousand t). Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.

Year	MSST	Biomass (MMB _{mat})	TAC	Retained Catch	Total Male Catch	OFL	ABC
2013/14	1.50	3.01	0.00	0.00	0.0003	0.56	0.45
2014/15	1.86	2.48	0.30	0.14	0.15	0.43	0.34
2015/16	1.84	2.11	0.19	0.05	0.05	0.28	0.22
2016/17	1.97	2.23	0.00	0.00	0.05	0.14	0.11
2017/18		2.18				0.12	0.10

Aleutian Islands Golden King Crab

Average harvests dropped sharply from 1989/90 to 1990/91 to a level of 6.9 million lb for the period 1990/91 – 1995/96. Management based on a formally established GHL began with the 1996/97 season. The 5.9 million lb GHL established for the 1996/97 season, which was based on the previous five-year average catch, was subsequently reduced to 5.7 million lb beginning in 1998/99. The GHL (or TAC, since 2005/06) remained at 5.700 million lb for 2007/08, but was increased to 5.985 million lb for the 2008/09-2011/12 seasons, and to 6.290 million lb starting with the 2012/13 season (Table 5). The TAC was reduced to 5.545 million lb for the 2016/17 season.

Table 12. Status and catch specifications (1000 t) of Aleutian Islands golden king crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch ^a	Total Catch ^a	OFL	ABC
2013/14	N/A	N/A	2.853	2.894	3.192	5.69	5.12
2014/15	N/A	N/A	2.853	2.771	3.079	5.69	4.26
2015/16	N/A	N/A	2.853	2.729	3.073	5.69	4.26
2016/17	N/A	N/A	2.515	2.593	2.829	5.69	4.26
2017/18 ^b	6.044	14.205				6.048	4.838

a. Total retained catch plus estimated bycatch mortality of discarded bycatch during crab fisheries and groundfish fisheries.

b. Approach 2 above.

8.3.2. 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.

Number of Supporting clauses	5
Supporting clauses applicable	4
Supporting clauses not applicable	1
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized Evidence:

7.1. 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.

The precautionary approach is applied to conservation, management and exploitation of the BSAI crab resources in order to protect them and preserve their environment. The MSA dictates the development of FMPs for all the federally managed/overseen fisheries. The NPFMC treats OFL (MSY) as an upper limit rather than a target. Catches are in line with the TAC and well below the OFL to take into account the risks involved when calculating MSY. As implemented in management of BSAI crab fisheries, the precautionary approach takes into account uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities on non-target and associated or dependent species as well as environmental and socio-economic conditions.

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

N/A

8.4. Section D. Management Measures

8.4.1. Fundamental Clause 8

Management shall adopt and implement effective management measures designed to maintain stocks at levels capable of producing maximum sustainable yields, including harvest control rules and technical measures applicable to sustainable utilization of the fishery and be based upon verifiable evidence and advice from available scientific and objective, traditional sources.

Number of Supporting clauses	17
Supporting clauses applicable	16
Supporting clauses not applicable	1
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized evidence:

8.1. 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.

Conservation and management measures are in place to ensure the long-term sustainability of BSAI crab resources at levels which promote optimum utilization that are based on verifiable and objective scientific and traditional, fisher and community sources. The NPFMC's fishery management plan (FMP) 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 MSA requires that the Science and Statistical Committee (SSC) of the NPFMC determines the scientific benchmarks while the Council itself recommends quotas based on these benchmarks. This separation of responsibilities is a key step forward in of eliminating overfishing and enhancing recovery of overfished stocks.

In the evaluation of alternative conservation and management measures for BSAI crab fisheries, their cost-effectiveness and social impact are considered. Resource Ecology and Fisheries Management (REFM) Division at the NMFS AFSC conducts a program of research to support an ecosystem approach to management of BSAI crab stocks, examining climate and environmental changes as well as 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. Economic and ecosystem assessments provide a basis for scientific evaluation of how fish stocks, ecosystem relationships and user groups might be affected by fishery management actions and climate.

8.2. States shall prohibit dynamiting, poisoning and other comparable destructive fishing practices.

Dynamiting, poisoning and other comparable destructive fishing practices are prohibited in Alaska. The BSAI crab FMP authorizes the use of pot gear to harvest the crab resources.

8.3. States shall seek to identify domestic parties having a legitimate interest in the use and management of the fishery.

All domestic parties with a legitimate interest in the use and management of BSAI crab fisheries have been identified and recognition is given to the traditional practices, needs and interests of indigenous people and local fishing communities. Arrangements are in place to consult all interested parties to gain their collaboration in achieving responsible fisheries.

8.4. Mechanisms shall be established where excess capacity exists, to reduce capacity. 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.

Mechanisms are in place to reduce capacity to levels commensurate with sustainable use of the BSAI crab resources. Fleet capacity has been measured and is monitored. Statistics are updated regularly on all fishing operations and a record is maintained of all authorizations to fish these resources. BSAI crab fisheries are limited entry rationalized fisheries. Fishing capacity has been reduced since 2002. Fleet consolidation accompanying rationalization was substantial and remaining vessel ownership has tended to aggregate in fewer and larger communities. The capacity of the crab fleet has been fixed since 2006 and continuously monitored by NMFS's Restricted Access Management Program (RAM)⁴¹ and the Alaska Commercial Fisheries Entry Commission (CFEC).⁴²

8.5. Technical measures shall be taken into account, where appropriate, in relation to: fish size, mesh size or gear, closed seasons, closed areas, areas reserved for particular (e.g. artisanal) fisheries, protection of juveniles or spawners.

Measures are in place in BSAI crab fisheries that restrict sizes that can be retained, require escape mechanisms to protect undersize and female crabs, establish closed seasons and closed areas and reserve areas for local, aboriginal fisheries.⁴³ The BSAI crab FMP authorizes the State to adjust size limits under State regulations. Typically, biological considerations are used to establish minimum legal size limits to ensure that conservation needs are served. Unless a surplus is determined to be available, female crabs cannot be taken. Fishing seasons are used to protect crabs during the molting and mating portions of their life cycle. Closed seasons have been set to maximize the reproductive potential of crab populations. The FMP specifically prohibits the use of trawls and tanglenet gear for catching crab because of the high mortality rates that could be inflicted on nonlegal crab. Pots and ring nets are the specified legal commercial gear in the BSAI crab fisheries. FMPs are required to describe and identify Essential Fish Habitat (EFH), minimize to the extent practicable adverse effects of fishing on EFH, and identify other actions to conserve and enhance EFH. The BSAI crab FMP describes crab EFH and includes information on habitat and biological requirements for each life history stage of these species.

8.6. Fishing gear shall be marked.

Gear used in BSAI crab fisheries has to be marked so the owner can be identified.

8.7. Measures shall be introduced to identify and protect depleted resources and those resources threatened with depletion, and to facilitate the sustained recovery/restoration 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.

Measures are in place to identify and protect depleted resources and those resources threatened with depletion, and to facilitate their sustained recovery/restoration. Also, measures are in place to ensure that resources and habitats critical to the well-being of BSAI crab resources which have been adversely affected by fishing or other human activities are restored. The MSA also requires that the FMP include accountability measures to prevent ACLs from being exceeded and to correct overages if they do occur. Clearly defined management measures, including harvest strategies and control rules, designed to maintain crab stocks at levels capable of producing maximum sustainable levels are included in the FMP. Measures require reducing fishing mortality if a stock is declining and closure of the directed fishery if depleted.

⁴¹ <http://www.fakr.noaa.gov/ram/> <http://www.cfec.state.ak.us/>

⁴² http://www.fakr.noaa.gov/npfmc/PDFdocuments/catch_shares/Crab/SlAexS_911.pdf

⁴³ http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2017-2020_cf_king_tanner_crab.pdf

The National Environmental Policy Act (NEPA)⁴⁴ 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.

8.8/8.9/8.10/8.11/8.12/8.13. States shall encourage the development and implementation of technologies and operational methods that reduce waste and discards and reduce the loss of fishing gear. The implications of the introduction of new fishing gears, methods and operations shall be assessed and the effects of such introductions monitored. New developments shall be made available to all fishers and shall be disseminated and applied appropriately.

BSAI crab fisheries are required to use gear and technologies that research has demonstrated are environmentally safe, cost effective and sufficiently selective to minimize catch, waste and discards of non-target species as well as the use of gear and practices that increase survival rates of escaping fish. Use of highly selective pots to minimize unwanted catch of target species as well as the bycatch of non-target species, along with development of handling practice to minimize mortality of discarded catch, have been key aspects of the management of BSAI crab fisheries for a long time. All aspects of gear performance and discard mortality have been extensively researched. On-board observers in all fisheries record discards and estimates of total discard mortality are included in total fishery removals. This has provided considerable incentive to minimize unwanted catch to the fullest extent possible. Their reports demonstrate catches are dominated by legal crab of the target species, with much smaller amounts of other species.⁴⁵

Selective, environmentally safe and cost-effective fishing gear and techniques have been developed and applied in BSAI crab fisheries to minimize the loss of gear and the ghost fishing effects of lost or abandoned gear, pollution and waste. After rationalization of the BSAI crab fisheries, vessel numbers decreased which resulted in a slower paced fishery with decreased rates of lost fishing gear and allowing for longer soak times and more time for escapement of undersized and female crab. 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. Alaska Administrative Code 39.145 requires escape mechanisms related to ghost fishing for shellfish and bottom-fish pots.

ADFG perform pot and vessel holding tank inspections prior to each fishing season. At-sea enforcement of all regulations is conducted by State Fish & Wildlife Troopers and the ADFG on-board observer program collects information that can be used for enforcement. There is no evidence to indicate any use of devices to circumvent the intent of gear regulations. Information on new gear developments and any related regulatory requirements are readily available to harvesters through professional associations and the licensing system.

Assessment and scientific evaluation is carried out on the implications of habitat disturbance impact on the BSAI crab fisheries and ecosystems prior to the introduction of new fishing gear, methods and operations and the effects of any such introductions are monitored. Any commercial-scale introduction of any new fishing method would necessarily undergo extensive prior evaluation and ongoing monitoring as well as meet existing regulatory requirements.

⁴⁴ <http://www.alaskafisheries.noaa.gov/sustainablefisheries/crab/eis/default.htm>

⁴⁵ <http://www.adfg.alaska.gov/FedAidPDFs/FDS13-54.pdf>

There has been extensive international cooperation/collaboration with respect to research focused on fishing gear selectivity, fishing methods and strategies as well as the dissemination of results and transfer of technology from such research. The subject of fishing gear selectivity, fishing methods and strategies as well as the behavior of target and non-target species to such gear has been studied extensively in the case of Alaskan crab fisheries. Publication of results ensures wide collaboration and standardization with respect to associated methodologies.

8.14. Policies shall be developed for increasing stock populations and enhancing fishing opportunities through the use of artificial structures.

N/A

8.4.2. Fundamental Clause 9

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

Number of Supporting clauses	3
Supporting clauses applicable	3
Supporting clauses not applicable	0
Overall level of conformity	Full Conformity
Non Conformances	0

Summarized evidence:

9.1./9.2./9.3. Education and training programs.

Advanced education and training programs are readily available and required by fishers to enhance their skills and professional qualifications.^{46 47 48 49} All those engaged in BSAI crab fishing operations are provided information on the most important provisions of the FAO CCRF (1995), as well as provisions of relevant international conventions and applicable environmental and other standards that are essential to ensure responsible fishing operations, as part of required education and training.⁵⁰ Records of all BSAI crab fishers are maintained as part of licence and permit programs which contain information on their service and qualifications, including certificates of competency.^{51 52 53}

⁴⁶ <http://www.npfvoa.org>

⁴⁷ <http://www.avtec.edu>

⁴⁸ <http://seagrant.uaf.edu/map/fishbiz/index.php>

⁴⁹ <http://amsea.org>

⁵⁰ <http://sustainability.alaskaseafood.org/fao>

⁵¹ <http://www.fakr.noaa.gov/ram>

⁵² <http://www.fakr.noaa.gov/ram/llp.htm#list>

⁵³ <http://www.cfec.state.ak.us>

8.5. Section E. Implementation, Monitoring and Control

8.5.1. Fundamental Clause 10

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.

Number of Supporting clauses	6
Supporting clauses applicable	2
Supporting clauses not applicable	4
Overall level of conformity	Full Conformance
Non Conformances	0

Summarized evidence:

10.1. Effective mechanisms shall be established for fisheries monitoring, surveillance, control and enforcement measures including, where appropriate, observer programs, inspection schemes and vessel monitoring systems, to ensure compliance with the conservation and management measures for the fishery in question. This could include relevant traditional, fisher or community approaches, provided their performance could be objectively verified.

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.

In 2017, there were a total of 858 total federal fisheries & safety boardings documented by US Coast Guard. Of all those boardings there were 12 violations accounting for almost 1% of annual violation rate. There were 3 boardings for Bering Sea Snow Crab fishing vessels and 2 boardings for Bering Sea Bristol Bay Red/Golden King Crab. No violations were detected for crab fishing vessels.

10.2 Fishing vessels shall not be allowed to operate on the resource in question without specific authorization.

All vessels harvesting BSAI crab must be authorized and permitted to fish, in accordance with federal regulations,

50CFR679⁵⁴. Fishing vessels are not allowed to operate on the resource in question without specific authorization. All crab vessels participating in the BSAI rationalized crab fishery must obtain a Federal Crab Vessel Permit (FCVP)⁵⁵188.

An annual FCVP is required for owners of any vessel used in the rationalized crab fisheries (CR crab, includes IFQ/IPQ fisheries; CDQ fisheries except Norton Sound king crab; and the golden king crab allocation to Adak). Operation Type endorsements are: SFP (Stationary Floating Processor); CPR (catcher-processor); and CAT (catcher vessel). This permit has requirements for VMS and logbook reporting. A copy of the permit must be on board any vessel of the fishery and must be available for inspection at any time by an authorized officer.

As of January 1, 2000 a Federal LLP license is required for vessels participating in directed fishing for LLP groundfish species in the GOA or BSAI, or fishing in any BSAI LLP crab fisheries⁵⁶189. A vessel must be named on an original LLP license that is onboard the vessel.

10.3 States involved in the fishery shall, in accordance with international law, within the framework of sub-regional or regional fisheries management organizations or arrangements, cooperate to establish systems for monitoring, control, surveillance and enforcement of applicable measures with respect to fishing operations and related activities in waters outside their national jurisdiction.

Not Applicable. The crab fisheries 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

10.3.1 States which are members of or participants in sub-regional or regional fisheries management organizations or arrangements shall implement internationally agreed measures adopted in the framework of such organizations or arrangements and consistent with international law to deter the activities of vessels flying the flag of non-members or non-participants which engage in activities which undermine the effectiveness of conservation and management measures established by such organizations or arrangements. In that respect, Port States shall also proceed, as necessary, to assist other States in achieving the objectives of the FAO CCRF (1995), and should make known to other States details of regulations and measures they have established for this purpose without discrimination for any vessel of any other State.

Not Applicable. The crab fisheries 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.

10.4 Flag States shall ensure that no fishing vessels entitled to fly their flag fish on the high seas or in waters under the jurisdiction of other States unless such vessels have been issued with a Certificate of Registry and have been authorized to fish by the competent authorities. Such vessels shall carry on board the Certificate of Registry and their authorization to fish.

⁵⁴ <https://alaskafisheries.noaa.gov/fisheries-679regs>

⁵⁵ https://alaskafisheries.noaa.gov/permits-licenses?field_fishery_pm_value=BSAI+Crab&=Apply

⁵⁶ https://alaskafisheries.noaa.gov/permits-licenses?field_fishery_pm_value=License+Limitation+Program+%28LLP%29#list

Not Applicable. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska's EEZ. All fishing vessels must be at least 75% U.S. ownership

10.4.1 Fishing vessels authorized to fish on the high seas or in waters under the jurisdiction of a State other than the flag State shall be marked in accordance with uniform and internationally recognizable vessel marking systems such as the FAO Standard Specifications and Guidelines for Marking and Identification of Fishing Vessels.

Not Applicable. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska's EEZ. All fishing vessels must be at least 75% U.S. ownership

8.5.2. Fundamental Clause 11

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

Number of Supporting clauses	3
Supporting clauses applicable	2
Supporting clauses not applicable	1
Overall level of conformity	Full Conformance
Non Conformances	

Summarized evidence:

11.1 National laws of adequate severity shall be in place that provide for effective sanctions.

The Magnuson-Stevens Act (MSA) provides four basic enforcement remedies for violations (50CFR600.740 Enforcement policy)⁵⁷:

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.⁵⁸

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.

⁵⁷ <https://www.law.cornell.edu/cfr/text/50/600.740>

⁵⁸ https://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.

11.2 Sanctions applicable in respect of violations and illegal activities shall be adequate in severity to be effective in securing compliance and discouraging violations wherever they occur. Sanctions shall also be in force that affects authorization to fish and/or to serve as masters or officers of a fishing vessel, in the event of non-compliance with conservation and management measures.

The MSA provides four basic enforcement remedies for violations (50CFR600.740 Enforcement policy):

1. Issuance of a citation, 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 summary, 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.

NOAA's OLE Agents and Officers can assess civil penalties directly to the violator in the form of Summary Settlements (SS) or can refer the case to NOAA's Office of General Counsel for Enforcement and Litigation (GCEL). GCEL can then assess a civil penalty in the form of a Notice of Permit Sanctions (NOPS) or Notice of Violation and Assessment (NOVAs), or they can refer the case to the U.S. Attorney's Office for criminal proceedings. For perpetual violators or those whose actions have severe impacts upon the resource criminal charges may range from severe monetary fines, boat seizures and/or imprisonment may be levied by the United States Attorney's Office.

There are very few repeat offenders. Sanctions include the possibility of temporary or permanent revocation of fishing privileges. Withdrawal or suspensions of authorizations to serve as masters or officers of a fishing vessel are also among the enforcement options. Within the USA EEZ, penalties can range up through forfeiture of the catch to forfeiture of the vessel, including financial penalties and prison sentences.

Finally, the cooperation of citizens and industry is cultivated through programs such as AWT's Fish & Wildlife Safeguard program, which encourages the reporting of violations, and "leverages" the range of enforcers

11.3 Flag States shall take enforcement measures in respect of fishing vessels entitled to fly their flag which have been found by them to have contravened applicable conservation and management measures, including, where appropriate, making the contravention of such measures an offence under national legislation.

Not applicable. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska's EEZ. All fishing vessels must be at least 75% U.S. ownership.

8.6. Section F. Serious Impacts of the Fishery on the Ecosystem

8.6.1. Fundamental Clause 12

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.

Number of Supporting clauses	16
Supporting clauses applicable	16
Supporting clauses not applicable	0
Overall level of conformity	Medium Conformity
Non Conformances	1 open NC (no new NCs)

Summarized evidence:

12.1. Assessment of environmental effects on target stocks and ecosystem

There is an assessment of the impacts of environmental factors on target stocks and species belonging to the same ecosystem. NPFMC and NMFS regularly assess the impacts of environmental factors on BSAI crab stocks (e.g. Crab SAFE; NPFMC 2017)⁵⁹ and other species belonging to the same ecosystem (e.g. Groundfish SAFE)⁶⁰. Ecosystem assessments for BSAI crab fisheries are updated annually in the BSAI Crab SAFE. Additionally, the status of habitats and ecosystems are monitored within the broader framework of Alaska's ecosystems and results are updated and published annually⁶¹. Collectively, these ecosystem assessments consider target stocks, associated or dependent species, and the relationship among populations in the ecosystem. Additional ongoing and related ecosystem research and monitoring initiatives are described in greater detail in the BSAI Crab Re-assessment Report⁶².

12.2 Research and Institutional capacity for environmental impact assessment

Adverse environmental impacts on BSAI crab resources from human activities are assessed. NPFMC and NMFS conduct regular assessments of crab ecosystems and habitats and investigate how environmental factors affect crab resources (e.g. Chilton et al. 2011)⁶³. Findings and conclusions are published in the Ecosystem section of the annual SAFE document (e.g. NPFMC 2017)⁶⁴, annual Ecosystem Considerations documents⁶⁵, and the various other research reports^{66, 67}.

Currently, the best available science indicates that the largest impact resulting from human activities on BSAI crab resources, and more specifically, on the five stocks under consideration here, is fishing. Directed crab fishing as well as crab bycatch in other fisheries such as the groundfish fisheries is assessed yearly and corrected appropriately through yearly stock assessment activities, and through the formulation of overfishing levels (OFLs), acceptable biological catches (ABCs), annual catch limits (ACLs), and total allowable catches (TACs). These determinations and actions are all documented in the yearly crab SAFE report compiled by ADF&G, NMFS and NPFMC scientists

⁵⁹ <https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

⁶⁰ <https://www.afsc.noaa.gov/REFM/stocks/assessments.htm>

⁶¹ <https://access.afsc.noaa.gov/reem/ecoweb/Index.php>

⁶² <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

⁶³ http://www.npfmc.org/wpcontent/PDFdocuments/resources/SAFE/CrabSAFE/511Chapters/Ecosystem_CrabSAFE.pdf

⁶⁴ <https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

⁶⁵ <https://www.afsc.noaa.gov/REFM/Docs/2015/ecosystem.pdf>

⁶⁶ <https://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-178.pdf>

⁶⁷ <http://www.int-res.com/articles/theme/m469p249.pdf>

Where the potential for adverse environmental impacts on crab resources does arise, there is evidence that the Council considers and undertakes appropriate corrective measures. For example, effects on EFH caused by fishing activities such as trawling are routinely assessed and corrected (where possible). The last EFH review (NPFMC 2010)⁶⁸ identified impacts of trawling on EFH habitat of red King Crab in Bristol Bay. These are being considered accordingly by the NPFMC. In addition, there is strong evidence that the Council and NMFS take measures to protect and conserve EFH and HAPCs through establishment of habitat protection areas and habitat conservation areas.

More broadly, NEPA processes ensure that human activities with potential to impact BSAI crab resources are assessed and, where appropriate, corrected. The Council's analytical review documents that evaluate proposed changes to the conservation and management of groundfish and shellfish stocks for which they are responsible, are NEPA compliant documents. These documents are widely distributed and made available so that the public at large and other natural resource, management or development agencies will have an opportunity to testify or comment on possible impacts to their sphere of influence. In like manner, when other resource, development or management agencies that receive federal funds wish to implement new activities or develop new regulations that may impact fisheries under the auspicious of the Council, they must also develop NEPA documents which show their project's plan conform to existing Council FMPs and seek comments from the Council on ways that their proposed activities may impact the resources under Council jurisdiction.

As discussed under clause 2.1, NEPA requires federal agencies to prepare Environmental Assessments or Environmental Impact Statements prior to making decisions. The President's Council on Environmental Quality, referred to as CEQ, which was established along with NEPA, has adopted regulations and other guidance that provide general procedures for federal agencies to follow when preparing these documents. Moreover, each federal agency has adopted its own detailed NEPA procedures, and the federal courts, after more than 30 years of litigation, have played a major role in shaping NEPA's interpretation and implementation. Further details of the process can be found in *The NEPA Book* (Bass et al. 2001)⁶⁹ and *A Citizen's Guide to NEPA* (CEQ 2007)⁷⁰.

12.3./12.4/12.5/12.6. Fishery Interaction with the ecosystem, non-target catches, discards associated, dependent or endangered species

The management system considers the most probable adverse impacts of BSAI crab fisheries on the ecosystem/environment, taking into account available scientific information and local knowledge. Where the risk of adverse impact of crab fisheries on the ecosystem or environment is greater, the Council seeks more specific evidence to support management action by, for example, identifying research priorities and coordinating research plans. Chilton et al. (2011)⁷¹ provide a good summary of available scientific information on the most probable adverse impacts of BSAI crab fisheries on the ecosystem/environment.

The fishery management system addresses impacts that are likely to have serious consequences. NPFMC and NMFS conduct regular assessments of crab ecosystems and habitats and investigate how environmental factors affect crab resources. Findings and conclusions are published in the Ecosystem section of the annual SAFE document (e.g. NPFMC 2017)⁷², annual Ecosystem Considerations documents⁷³, and the various other research reports.

⁶⁸ https://alaskafisheries.noaa.gov/sites/default/files/efh_5yr_review_sumrpt.pdf

⁶⁹ http://www.solano.com/old_site_02/oldsite/bookinfo_nepa.htm

⁷⁰ https://ceq.doe.gov/get-involved/citizens_guide_to_nepa.html

⁷¹ http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chpaters/Ecosystem_CrabSAFE.pdf

⁷² <https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/>

⁷³ <https://access.afsc.noaa.gov/reem/ecoweb/Index.php>

Decisions regarding management responses always proceed from the best available scientific information. Management responses may be immediate (e.g. a Category 2 response taken by the State such as in-season adjustments) or they may be more protracted, following on further analysis of the identified risk (e.g. a Category 1 response such as a decision taken by the Council and NMFS to amend the Crab FMP).

Appropriate measures are applied to minimize the catch, waste and discards of non-target species (of both fish and non-fish species), and to minimize impacts on associated, dependent or endangered species. The BSAI crab fisheries under consideration here have relatively low levels of catch of non-target species and are therefore often described as “clean” fisheries (C. Siddon, Marine Fisheries Scientist, ADF&G Division of Commercial Fisheries, pers. comm.). The majority of non-target species taken in each of the five fisheries are mostly crab. A limited number of groundfish, such as Pacific cod, Pacific halibut, yellowfin sole, and sculpin (*Myoxocephalus* spp.), are caught in the directed pot fishery (Barnard and Burt 2007; Barnard and Burt 2008; Gaeuman 2010)^{74, 75, 76}. The invertebrate component of bycatch includes echinoderms (sea stars and sea urchins), snails, non-FMP crab (hermit crabs and lyre crabs), and other invertebrates (sponges, octopus, anemone, and jellyfish). Typically, low levels of bycatch of these species do not impact their abundance (Final EIS, NMFS 2004). Appropriate conservation and management measures are applied to BSAI crab fisheries to minimize levels of catch, waste and discards of non-target species (crab, fish and non-fish species). Gear modifications are described in the Crab FMP (NPFMC 2011).

Management objectives exist which seek to ensure that endangered species are protected from adverse impacts resulting from interactions with BSAI crab fisheries. All U.S. fisheries management, including that of BSAI crab fisheries, must be consistent with the Magnuson-Stevens Act (MSA), the Marine Mammal Protection Act (MMPA)⁷⁷, and the U.S. Endangered Species Act (ESA)⁷⁸. Each of these acts establishes management guidelines, objectives and legal protections for threatened and endangered species.

ADF&G has in place a mandatory observer program for BSAI crab fisheries (Schwenzfeier et al. 2012)⁷⁹. Non-target catches, including discards, of stocks other than the “stock under consideration” are monitored. Each year ADF&G publishes a summary of the mandatory crab observer program database for the Bering Sea/Aleutian Islands commercial crab fisheries. Representative bycatch data from the ADF&G summary reports were presented in the BSAI Crab Re-assessment Report (SAI Global 2017)⁸⁰.

12.7. Role of the “stock under consideration” in the ecosystem

The role of BSAI crab stocks in the food web is adequately considered. King and Tanner crab stocks under assessment are not considered key prey species in BSAI ecosystems.

12.8. Pollution – MARPOL.

Laws and regulations based on the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) are in place and enforced⁸¹.

⁷⁴ <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds08-05.pdf>

⁷⁵ <http://www.adfg.alaska.gov/FedAidPDFs/fds07-02.pdf>

⁷⁶ <http://www.adfg.alaska.gov/FedAidPDFs/FDS10-01.pdf>

⁷⁷ <http://www.nmfs.noaa.gov/pr/laws/mmpa/>

⁷⁸ <https://www.fws.gov/endangered/laws-policies/>

⁷⁹ <http://www.adfg.alaska.gov/fedaidpdfs/fmr12-22.pdf>

⁸⁰ <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

⁸¹ <https://www.blankrome.com/index.cfm?contentID=37&itemID=2471>

12.9. Knowledge of the essential habitats for the “stock under consideration” and potential fishery impacts on them.

In accordance with requirements of the MSA, management agencies have knowledge of essential fish habitat (EFH) for the BSAI crab stocks under consideration. The potential for fishery impacts on EFH is assessed. Management systems ensure that fishery impacts on EFH and on habitats that are highly vulnerable to damage by the fishing gear are avoided, minimized or mitigated. In assessing fishery impacts, the full spatial range of the relevant habitat is considered.

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat: “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (see Crab FMP; NPFMC 2011). The MSA requires fishery management plans to describe and identify EFH, minimize to the extent practicable adverse effects of fishing on EFH, and identify other actions to conserve and enhance EFH (16 U.S.C. 1853(a)(7)). The NPFMC and NMFS identify and describe crab EFH in section the Fishery Management Plan for BSAI king and Tanner crab (NPFMC 2011).

NPFMC reviewed EFH in 2015 and found there had been a large advance in EFH information, in particular by substantially refining EFH maps for fish and crab species (Simpson et al. 2017)⁸². Refinements were obtained through an analysis to determine the environmental influences on species distributions and this information was used to improve EFH maps. These maps provide EFH Level 2 information (habitat-related densities) for the adult life stage for many FMP species and EFH Level 1 information (habitat distribution) for the juvenile life stages of some FMP species. These maps also provide a solid foundation for the next 5 years of EFH research. According to the most recent NPFMC review of EFH, during 2006-2016 NMFS had spent about \$5 M in total on 91 EFH projects in Alaska resulting in 74 scientific publications (NPFMC 2016).

More recently, NFMS has released a five-year plan for EFH research (Sigler et al. 2017)⁸³. The new EFH research plan retains the original long-term goals that have guided EFH research in Alaska since 2005, namely: 1) characterize habitat utilization and productivity; 2) assess habitat sensitivity and recovery; 3) validate and improve fishing impacts model; 4) map the seafloor; and 5) assess coastal habitats facing development. However, the 2017 EFH plan recognizes two specific objectives that are to be achieved over the next 5 years: 1) Develop EFH Level 1 information (distribution) for life stages and areas where missing; and 2) Raise EFH level from Level 1 or 2 (habitat-related densities) to Level 3 (habitat-related growth, reproduction, or survival rates). In addition, a recent report by the Alaska Regional Habitat Assessment Prioritization Team (McConnaughey et al. 2017)⁸⁴ assigned prioritization scores to the five crab stocks under consideration here that were either ‘high’ (AI Golden King Crab, BB Red King Crab, SM Blue King Crab and EBS snow crab) or ‘medium’ (EBS tanner crab).

⁸² ftp://ftp.library.noaa.gov/noaa_documents.lib/NMFS/TM_NMFS_AFKR/TM_NMFS_FAKR_15.pdf

⁸³ <https://www.afsc.noaa.gov/Publications/ProcRpt/PR2017-05.pdf>

⁸⁴ <https://repository.library.noaa.gov/view/noaa/15500>

The NPFMC is currently evaluating updates to EFH in its FMPs, as required by MSA, that make use of new, model-based descriptions of EFH for Bering Sea (BS), Aleutian Islands (AI), and Gulf of Alaska (GOA) groundfish and crab. The update to EFH also includes an updated assessment of the adverse impacts of non-fishing and fishing activities on EFH that make use of these model-based descriptions. A recent Council discussion paper (NPFMC 2017)⁸⁵ summarizes Council progress on EFH updates. In December 2016, the Council approved a three-tiered method to assess the impacts of fishing on EFH, using the Fishing Effects model that the Council also approved in December 2016. The results of the Fishing Effects model were delivered to stock assessment authors for each species in the GOA and BSAI FMPs. The authors were asked to evaluate whether the current impacts of fishing on EFH presented the potential for impacts that were more than minimal or not temporary. Results for BSAI crab stocks are summarized in Table 13 below.

Table 13. Summary of stock assessment author evaluations of the effects of fishing on EFH for crabs in the Bering Sea and Aleutian Islands.

	Stock < MSST	Average % CEA Disturbed	% CEA Disturbed Nov 2016	Management Change
Pribilof Islands blue king crab	Y	<1.0	0.7	N
St. Matthew blue king crab	N	<1.0	0.2	N
Bristol Bay red king crab	N	<5.0	2.9	N
Pribilof Islands red king crab	N	<1.0	0.4	N
Norton Sound red king crab	N	NA	NA	N*
Western Aleutian Islands red king crab	NA	NA	NA	N*
Aleutian Islands golden king crab	NA	<5.0	2.1	N
Pribilof Islands golden king crab	NA	NA	NA	N*
Snow crab	N	<5.0	0.8	N
Tanner crab	N	<9.0	5.1	N

* Recommend future work with analysts to identify data available for GAM and FE analysis

The authors concluded: “None of the crab stocks habitat reduction within the Core EFH Area (CEA) was greater than 10% when appropriate data was available to make the assessment. Representatives of the BSAI Crab Plan Team concurred with the authors’ assessments and no changes to management of essential fish habitat were recommended for any fisheries. However, the BSAI Crab Plan Team noted that future efforts need to assess the importance of smaller local habitat scales on overall stock health especially when you have areas showing >50% habitat reduction even though the overall habitat reduction average is <10% (e.g. southwest Bristol Bay).”

In addition to the information presented here, there is a considerable amount of ongoing research into EFH. For a more detailed description of EFH research and Habitat Areas of Particular Concern (HAPCs), see the BSAI Crab Re-assessment Report (SAI Global 2017).

⁸⁵ <https://alaskafisheries.noaa.gov/habitat/efh>

12.10. Research shall be promoted on the environmental and social impacts of fishing gear and, in particular, on the impact of such gear on biodiversity and coastal fishing communities.

Management agencies actively promote research on the environmental and social impacts of fishing gear and, in particular, on the impact of such gear on biodiversity and coastal fishing communities. The Council, AFSC and the NPRB all annually produce a list of research priorities^{86,87} that focus on timely and important management concerns. This list helps NMFS, NPRB and other research funding agencies focus their tight research funds to resolve topical fishery management issues. For BSAI crab fisheries, the Council has established an explicit “Research and Management Objective” in the crab FMP (NPFMC 2011) to provide fisheries research, data collection, and analysis to ensure a sound information base for management decisions. Other organizations are also actively involved in relevant research on the environmental impacts of fishing gear on biodiversity, habitats and ecosystems as previously described under clauses 2.5 and 2.6.

With respect to promoting research on the social impacts of gear on coastal fishing communities, the Council and NMFS seek individual, community, NGO and fishing industry input on all regulatory or policy proposals and research proposals. By soliciting feedback on research and regulatory proposals from such a broad base of stakeholders, the Council is assured to include parties who many have concerns that industrial fisheries (such as BSAI king and Tanner crab) may have adverse environmental or social impacts. Because rural coastal Alaskan communities are frequently concerned about the activities of industrial fisheries, they often go directly to the Council and/or BOF with their concerns about potential or perceived social impacts.

12.11. Outcome indicator(s) and management objectives for non-target stocks.

There are outcome indicators for non-target stocks taken in the BSAI crab fisheries under assessment. These outcome indicators are consistent with achieving management objectives for non-target stocks (i.e. avoiding overfishing and other impacts that are likely to be irreversible or very slowly reversible).

Crab Bycatch (crab FMP species)

The largest component of bycatch in BSAI crab fisheries is crab (undersized, female, and non-target species). For those crab species falling within the scope of the BSAI king and Tanner crab FMP (red king crab, *Paralithodes camtschaticus*, blue king crab, *P. platypus*, golden (or brown) king crab, *Lithodes aequispinus*, Tanner crab, *Chionoecetes bairdi*, and snow crab, *C. opilio*, in the BS/Al area, except for the following stocks exclusively managed by the State of Alaska: Aleutian Islands Tanner crab, Dutch Harbor red king crab, St. Matthew golden king crab, and St. Lawrence blue king crab.; NPFMSC 2011⁸⁸), outcome indicators are explicitly incorporated into the Council’s five-tiered system for stock assessment. Non-target crab bycatch of FMP species in directed crab fisheries, as well as FMP crab bycatch in other fisheries (such as the groundfish fisheries) is assessed yearly and corrected appropriately through yearly stock assessment activities, and through the formulation of overfishing levels (OFLs), acceptable biological catches (ABCs), annual catch limits (ACLs), and total allowable catches (TACs). These determinations and actions are all documented in the yearly crab SAFE report compiled by ADF&G, NMFS and NPFMC scientists (e.g. NPFMC 2016)⁸⁹. Annual trawl surveys (Lang et al. 2017)⁹⁰ collect fishery-independent data on the distribution and abundance of crab, groundfish, and other benthic resources in the eastern Bering Sea. These data are used to estimate population abundances for the management of commercially important species in the region.

⁸⁶ <https://www.npfmc.org/research-priorities/>

⁸⁷ <https://www.afsc.noaa.gov/GeneralInfo/FINAL%20FY17%20AFSC%20AGM%20v3.pdf>

⁸⁸ <http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>

⁸⁹ https://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/2016CrabSAFE_final.pdf

⁹⁰ https://www.afsc.noaa.gov/Publications/AFSC.../NOAA-TM_2017_DRAFT_091517.pdf

Finfish Bycatch

The ADF&G observer program collects data to monitor bycatch in BSAI crab fisheries. Fish including a number of crab predators, especially Pacific cod, halibut, yellowfin sole and sculpin account for the greatest proportion of estimated crab pot bycatch (Final EIS, NMFS 2004)⁹¹. These species are widely distributed and highly abundant representatives of the greater groundfish community. In the Final Environmental Impact Statement for BSAI crab fisheries, it was concluded that the effects on species caught as bycatch in the BSAI crab fisheries are insignificant (NMFS 2004).

Pacific cod is managed by NPFMC as a tier 3 stock in the Eastern Bering Sea (Thompson 2016)⁹², yellowfin sole is managed as a tier 1 stock in BSAI (Wilderbuer et al. 2016)⁹³, and BSAI sculpin are managed by NPFMC as a species complex within tier 5 (Spies et al. 2016)⁹⁴. As such, there are outcome indicators whose explicit aim is to avoid overfishing. Similarly, outcome indicators (reference points) exist for Pacific halibut, a species managed by the International Pacific Halibut Commission (IPHC)⁹⁵. Halibut fisheries are closely monitored, heavily regulated, and the resource is currently considered to be healthy (IPHC 2016).

Invertebrate Bycatch (excluding crab FMP species)

Data on invertebrate bycatch are also collected in the ADF&G observer program. These data were reviewed by NMFS during preparation of the Final Environmental impact Statement for BSAI crab fisheries (NMFS 2004). The following excerpt from the Final EIS discusses invertebrate bycatch:

Gastropods: Snails (including *Neptunea borealis*) were the second most common bycatch category after cod. An estimated 354,000 snails were taken as bycatch in BSAI crab fisheries in 2000. Various species of *Neptunea* were common occupants of recovered Bering Sea crab pots (B. Stevens, NOAA Fisheries Kodiak Lab, personal observation). This genus of snails is the most dominant in the middle and outer shelf areas of the southeast Bering Sea (Jewett and Feder 1981; as cited in NMFS 2001d, Section 3.6.1.1). There was historically a small, Japanese fishery for snails in the Bering Sea since 1971. A United States snail fishery began in 1992 and lasted less than a decade with a peak harvest in 1996 of 3.5 million pounds (lbs.) (worth over \$1 million U.S. dollars). Last commercial fishery for snails, with landings of 932,000 lbs., occurred in 1997 (ADF&G 2001).

Echinoderms: Within the BSAI almost 100,000 sea stars, 27,000 brittle stars, 7,000 basket stars and 4,000 sea urchins were estimated to be taken as bycatch during the 2000 BSAI crab fishing seasons. Sea stars were caught in all three crab fisheries but not identified to species. Those taken are most likely of the genera *Asterias*, *Pycnopodia* and/or *Gorgonocephalus*. In the southeast Bering Sea, king and snow crabs rank as the greatest component of total invertebrate epifaunal (animals that live on top of the sea floor) biomass. The sea star (*Asterias amurensis*) represents 12 percent of the biomass at bottom depths 40-100 m, replaced by basket stars (*Gorgonocephalus caryi*) representing 7 percent of total biomass at depths >100 m (Jewett and Feder 1981; as cited in NMFS 2003b). In northeastern Bering Sea, sea urchins and basket stars comprise 22 percent and 56 percent, respectively, of the invertebrate species at bottom depths >40 m (Jewett and Feder 1981; as cited in NMFS 2003b). Since these species represent such a large proportion of the benthic community, loss due to bycatch mortality in the crab fisheries would not be expected to affect their populations.

⁹¹ <https://alaskafisheries.noaa.gov/sites/default/files/analyses/crabeis0804-chapters.pdf>

⁹² <https://www.afsc.noaa.gov/REFM/Docs/2016/EBSpcod.pdf>

⁹³ <https://www.afsc.noaa.gov/REFM/Docs/2016/BSAIyfin.pdf>

⁹⁴ <https://www.afsc.noaa.gov/REFM/Docs/2016/BSAIsculpin.pdf>

⁹⁵ <http://www.iphc.int/about-iphc.html>

Non-FMP Crab: Other crab species caught as bycatch include, lyre crabs, hermit crabs and Korean hair crab (*Erimacrus isenbeckii*). Korean hair crab supported a very small dedicated commercial fishery north of the Pribilof Islands. The Korean hair crab bycatch in the Bering Sea amounted to the estimated catch from the 2000 Bering Sea hair crab fishery. This fishery was closed as of 2001 until there is evidence of hair crab recruitment. Information on distributions and abundances of lyre and hermit crab are lacking. Effects of crab pot bycatch are unknown at this time.

Other Invertebrates: Octopus (*Octopus dofleini*) were caught primarily in the Bering Sea snow crab fishery. Octopus are a crab predator and compete with crabs for prey. Since 1995, there has been a small fishery for octopus in the Bering Sea comprised of bycatch from various groundfish fisheries (ADF&G 2001). During 2000, there is still wastage of this resource; 40,000 lbs. of octopus were discarded at sea compared to the 16,000 lbs. that were retained for fish meal and bait. The effect of octopus mortality due to crab pot bycatch is unknown.

Jellyfish and sea anemones would not be expected to sustain significant impacts from crab pot fishing. Biomass of jellyfish has increased tenfold in the Bering Sea in the past decade with greatest increase occurring over the mid-shelf domain, at 50-100 m depths (NMFS 2003b).

Sponge and corals are routinely hauled up with crab pots that fish deeper waters along the Aleutian Islands for golden king crab. An estimated 22,500 sponges were destroyed by crab pot fishing in 2000. It is assumed that these sessile organisms are not able to reattach to the substrate when returned to the water and thus will die. Destruction of sponge and corals may be crucial to some species of small benthic organisms including newly settled crabs as they provide valuable habitat structure and protection from predation. The ADF&G shellfish observer program has begun to collect coral bycatch data and species composition in the Aleutian Islands golden king crab fisheries to learn about amount caught as bycatch and the variety of coral species. ADF&G, in collaboration with NOAA Fisheries, is developing *A Field Guide to Alaskan Corals* (Wing and Barnard, in prep.) to enable data collection of corals caught in the golden king crab fishery. The extent of coral bycatch is presumed to be insignificant because the golden king crab fisheries occur in a small percentage of coral habitat.

Crab pot bycatch is deemed insignificant for any population of other benthic species routinely caught in the major eastern Bering Sea crab fisheries. Fishes including Pacific cod, yellowfin sole, Pacific halibut, sculpin, walleye pollock, other flatfish, and skates all have very high abundance relative to the level of estimated pot bycatch. Gastropods and echinoderms comprise a major portion of the total biomass of the eastern Bering Sea and small losses due to pot bycatch would have little significance. In some cases crab pot bycatch have become part of small dedicated fisheries as for snails, octopus, and Korean hair crab. Minor losses of other invertebrates are not estimable but assumed to be relatively insignificant. In addition, the minor amount of these species caught as bycatch does not result in declines in species diversity because it does not cause a decline in any species abundance. From this information, NOAA Fisheries concludes that status quo has an insignificant effect on the population levels of benthic species caught as bycatch.

12.12. Outcome indicator(s) and management objectives for endangered species.

There are outcome indicators consistent with ensuring that endangered species are protected from adverse impacts resulting from interactions with BSAI crab fisheries (including recruitment overfishing or other impacts) that are likely to be irreversible or very slowly reversible. Ongoing programs that monitor outcome indicators help to ensure that adverse impacts to endangered species do not arise.

The Marine Mammal Protection Act requires stock assessment reports to be reviewed annually for stocks designated as strategic, annually for stocks where there are significant new information available, and at least once every 3 years for all other stocks. Each stock assessment includes, when available, a description of the stock's geographic range, a minimum population estimate, current population trends, current and maximum net productivity rates, optimum sustainable population levels and allowable removal levels, and estimates of annual human-caused mortality and serious injury through interactions with commercial fisheries and subsistence hunters. The most recent (2016) Alaska Marine Mammal stock assessment was released in 2017 and can be downloaded at <http://www.nmfs.noaa.gov/pr/sars/region.htm>.

The annual Ecosystems Considerations reports⁹⁶ for the Aleutian Islands Ecosystem (Zador 2016) and Eastern Bering Sea (Siddon and Zador, 2017) elaborate on additional outcome indicators which are consistent with monitoring for adverse impacts upon endangered species. For marine mammals, ecosystem indicators include estimations of stock abundance and/or related parameters for Stellar sea lions, northern fur seals, harbour seals, arctic ice seals (bearded seal, ribbon seal, ringed seal, spotted seal) and bowhead whales. For seabirds, The Alaska Maritime National Wildlife Refuge has monitored seabirds at colonies around Alaska in most years since the early-to mid-1970's. In the Eastern Bering Sea, time series of annual breeding success and phenology (among other parameters) are available for common murre, *Uria aalge*, thick-billed murre, *U. lomvia*, blacklegged kittiwake *Rissa tridactyla*, red-legged kittiwake, *R. brevirostris*, and red-faced cormorants, *Phalacrocorax urile*, breeding on the Pribilof Islands (St. Paul and St. George Islands).

As noted in the Crab Ecosystem SAFE Report (Chilton et al. 2011)⁹⁷, there is very limited potential for BSAI crab fisheries to have adverse impacts on endangered species or marine mammals.

12.13. Outcome indicator(s) and management objectives for avoiding, minimizing or mitigating the impacts of the unit of certification on essential habitats for the “stock under consideration” and on habitats that are highly vulnerable to damage by the fishing gear of the unit of certification.

The management system has well-established outcome indicators for avoiding, minimizing or mitigating impacts to essential fish habitat (EFH) for four of the assessed stocks. BB red king crab, SM blue king crab, EBS snow crab, and EBS tanner crab fisheries are not typically prosecuted in areas with habitats that are highly vulnerable to damage by pots. Outcome indicators for these units of assessment are consistent with achieving management objectives. A more detailed description of the evidence which supports this conclusion can be found in the BSAI Crab Re-Assessment Report⁹⁸. Evidence reviewed by the team during the first surveillance assessment reaffirms the reassessment. New or updated information sources of relevance included recent scientific publications such as Goddard et al. (2017)⁹⁹, MacLean et al. (2017)¹⁰⁰ and Rooper et al. (2018)¹⁰¹ as well as a discussion paper on the effects of EFH in Alaska (NPFMC 2017)¹⁰² and a Technical Memorandum summarizing the research completed under the Alaska Deep-Sea Coral and Sponge Initiative (Rooper et al. 2017)¹⁰³.

⁹⁶ <https://access.afsc.noaa.gov/reem/ecoweb/Index.php>

⁹⁷ http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chapters/Ecosystem_CrabSAFE.pdf

⁹⁸ <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

⁹⁹ <https://deepseacoraldata.noaa.gov/library/results-of-the-2012-and-2014-underwater-camera-surveys-of-the-aleutian-islands>

¹⁰⁰ <https://www.frontiersin.org/articles/10.3389/fmars.2017.00142/full>

¹⁰¹ <https://doi.org/10.1093/icesjms/fsx087>

¹⁰² <https://repository.library.noaa.gov/view/noaa/15500>

¹⁰³ <https://www.fisheries.noaa.gov/alaska/habitat-conservation/deep-sea-corals-and-sponge-research-alaska>

As described in the BSAI Crab Re-assessment Report, the Aleutian Islands golden king crab fishery takes place in deep water areas where coral and sponge habitats may be adversely impacted by bottom contact gear such as pots. For the AI GKC unit of certification, it was not shown that outcome indicators are in place that are consistent with avoiding, minimizing, or mitigating the impact on habitats that are highly vulnerable to damage by the fishing gear of the unit of certification (i.e. pots). For example, there are no spatial analyses available which would allow an estimation of current and historic overlap of AIGKC pot fishing effort with the distribution of vulnerable coral and sponge habitats in the Aleutian Islands. The AIGKC unit of certification was therefore assigned a medium confidence rating for clause 12.13 and, consequently, a minor non-conformity was raised at re-assessment (SAI Global 2017).

The minor non-conformance is now being addressed through a Corrective Action Plan that was developed by the Bering Sea Crab Client Group and which was accepted by the assessment team and incorporated into the re-assessment report. According to the action plan, BSCCG will perform...

1. a complete historical spatial review of fishing effort as depicted in Figures 1 and 2 of this document which will include analysis of fishing effort in relation to the distribution of sensitive coral and sponge habitat using the best available information.
2. an update of the recent season's fishing effort in proximity to the coral closure areas.
3. a review of AIGKC observer pot bycatch data for coral species to evaluate trends in bycatch CPUE.

12.14. Outcome indicator(s) and management objectives for dependent predators.

There are outcome indicators consistent with achieving avoidance of severe adverse impacts on dependent predators resulting from fishing on BSAI crab stocks. Available evidence¹⁰⁴ indicates that the BSAI crab stocks under consideration here are not key prey species whose removal adversely impacts on dependent predators. In addition, ongoing programs for monitoring of outcome indicators ensures that adverse impacts to dependent predators do not arise.

12.15. Outcome indicator(s) and management objectives that seek to minimize adverse impacts of the unit of certification, including any enhancement activities, on the structure, processes and function of aquatic ecosystems that are likely to be irreversible or very slowly reversible.

There are outcome indicators specific to the BSAI King and Tanner Crab fisheries which are used to assess impacts to aquatic ecosystems. These indicators are termed 'Crab Ecosystem Considerations Indicators' (CECI) and they are described in the CECI report by Chilton et al. (2011)¹⁰⁵. The CECI report is composed of three main sections: Ecosystem Assessment, Current Status of Ecosystem Indicators (information on the physical and biological components of the BSAI ecosystem), and Ecosystem-based Management Indicators. The latter section provides trends which could indicate early warning signals of direct fishery effects on crab-oriented BSAI ecosystem components, warranting management intervention or providing evidence of the efficacy of previous management actions. Specific indicators include the magnitude of directed fishery effects on BSAI habitat and resulting management efforts, and spatial and temporal removals of the target catch affecting other biological predators. Outcome indicators in the CECI report are consistent with achieving management objectives of identifying and minimizing adverse impacts of BSAI crab fisheries on aquatic ecosystems.

¹⁰⁴ http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chpaters/Ecosystem_CrabSAFE.pdf

¹⁰⁵ http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chpaters/Ecosystem_CrabSAFE.pdf

In addition, managers utilize outcome indicators which are applied more broadly to the monitoring of the Alaska's fisheries and marine ecosystems, as described in the NPFMC Ecosystems Considerations Report (Zador 2015)¹⁰⁶. "The goal of the Ecosystem Considerations report is to provide stronger links between ecosystem research and fishery management and to spur new understanding of the connections between ecosystem components by bringing together the results of many diverse research reports into one document." A wide array of indicators is utilized to assess physical and environmental trends, ecosystem trends, and fishing and fisheries trends. For example, the category of 'Ecosystem-Based Management (Fishing-related) Indicators' includes indicators for discards and non-target catch, fish habitats, sustainability, and humans as part of ecosystems. Ecosystems Consideration Reports are regularly updated (Zador 2016, Siddon and Zador 2016) and published online at <https://access.afsc.noaa.gov/reem/ecoweb/Index.php>.

Taken together, there is strong evidence that management utilizes outcome indicators consistent with achieving management objectives that seek to minimize adverse impacts of BSAI crab fisheries on the structure, processes and function of aquatic ecosystems that are likely to be irreversible or very slowly reversible.

¹⁰⁶ <https://www.afsc.noaa.gov/REFM/Docs/2015/ecosystem.pdf>

8.6.2. Fundamental Clause 13

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

Number of Supporting clauses	19
Supporting clauses applicable	0
Supporting clauses not applicable	19
Overall level of conformity	N/A
Non Conformances	N/A

Summarized evidence:

13.1. States shall promote responsible development and management of aquaculture, including an advanced evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on the best available scientific information.

As detailed more fully in the BSAI Crab RFM Re-assessment Report¹⁰⁷, BSAI King and Tanner Crab Fisheries are not enhanced fisheries and there are no associated aquaculture developments. The Alaska King Crab Research, Rehabilitation and Biology (AKCRRAB) Program continues to research the feasibility of red and blue king crab restoration work as outlined in the AKCRRAB Strategic Plan¹⁰⁸. However, no facilities are currently permitted by ADF&G for the release of cultivated crab (exclusive of scientific investigations). Therefore, Fundamental Clause 13 is not applicable.

13.2. State shall produce and regularly update aquaculture development strategies and plans, as required, to ensure that aquaculture development is ecologically sustainable and to allow the rational use of resources shared by aquaculture and other activities.

N/A

13.3. Effective procedures specific to aquaculture of fisheries enhancement shall be established to undertake appropriate environmental assessment and monitoring, with the aim of minimizing adverse ecological changes (such as those caused by inputs from enhancement activities and related economic and social consequences).

N/A

13.4. Stock assessment of enhanced fisheries consideration of separate contributions from aquaculture and natural production.

N/A

13.5. Habitat modifications for the purposes of enhancement do not cause serious or irreversible harm to the natural ecosystem's structure and function.

N/A

13.6/13.7/13.8. Aquaculture practices and transboundary ecosystems including introduction of non-indigenous species.

N/A

¹⁰⁷ <https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/>

¹⁰⁸ <https://seagrant.uaf.edu/research/projects/kingcrab/general/>

13.9. State shall establish appropriate mechanisms, such as databases and information networks to collect, share and disseminate data related to their aquaculture activities to facilitate cooperation on planning for aquaculture development at the national, sub-regional, regional and global level.

N/A

13.10. State shall cooperate in the elaboration, adoption and implementation of international codes of practice and procedures for introductions and transfers of aquatic organisms.

N/A

13.11. Practices/procedures/national codes of practice and procedures in the selection and genetic improvement of broodstocks, introduction of non-native species, and production, sale and transport of eggs, larvae, fry, broodstock or other live materials.

N/A

13.12. Management of aquaculture production for stocking purposes.

N/A

13.13. Where applicable, enhanced fisheries shall meet the following criteria:

- the species shall be native to the fishery's geographic area or introduced historically and have subsequently become established as part of the "natural" ecosystem;
- there shall be natural reproductive components of the "stock under consideration";
- the growth during the post-release phase shall be based upon food supply from the natural environment and the production system shall operate without supplemental feeding.

N/A

13.14. In the context of avoiding significant negative impacts of enhancement activities on the natural reproductive components of "stock under consideration":

- naturally reproductive components of enhanced stocks shall not be overfished;
- naturally reproductive components of enhanced stocks shall not be substantially displaced by stocked components. In particular, displacement shall not result in a reduction of the natural reproductive stock component below abundance-based target reference points (or their proxies) defined for the regulation of harvest.

N/A

9. Performance specific to agreed corrective action plans

One minor non-conformance is open for the Aleutian Islands Golden King Crab unit of certification. A medium confidence rating and consequent minor nonconformance was issued under:

Fundamental Clause 12:

Considerations of fishery interactions and effects on the ecosystem shall be based on best available science, local knowledge where it can be objectively verified and using a risk based management approach for determining most probable adverse impacts. Adverse impacts of the fishery on the ecosystem shall be appropriately assessed and effectively addressed.

Supporting Clause 12.13:

There shall be outcome indicator(s) consistent with achieving management objectives for avoiding, minimizing or mitigating the impacts of the unit of certification on essential habitats for the “stock under consideration” and on habitats that are highly vulnerable to damage by the fishing gear of the unit of certification.

Details of Nonconformance:

Non-Conformance #2 (MINOR non-conformance: Clause 12.13)

With respect to the AI golden king crab unit of certification, the spatial distribution of pot fishing effort in relation to vulnerable habitats is unclear but may be extensive in some areas. Predictive models of coral and sponge distribution have been developed for the Aleutian Islands. However no spatial analysis is yet available which would allow an estimation of current and historic overlap of AIGKC pot fishing effort with the distribution of vulnerable coral and sponge habitats in the Aleutian Islands.

A corrective action plan from the client shall detail;

1. How Bering Sea Crab Client group intends to address these non-conformances, and
2. a set of specific timelines to allow for assessment during the next surveillance activities in 2018, 2019 and 2020 and the second full assessment audit in 2021, as relevant and if needed.

This NC will remain open throughout the period of certificate validity (5 years) until the confidence level can be re-assigned to a ‘high’ level based on evidence of effective implementation of corrective actions.

Surveillance Update:

This is the first surveillance assessment following re-assessment of the BSAI crab fisheries which was completed on December 7, 2017. Some progress has been made according to the Client Action Plan. However, the actions taken are not yet sufficient to be considered fulfillment of the minor non-conformance.

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

No new non-conformances were raised during the first surveillance assessment. The status of the unclosed minor NC is considered in Section 8 above.

11. Future Surveillance Actions

Next assessment will be the 2nd surveillance assessment which will commence before September 2018 and completed for the anniversary of the re-certification in December 2018. This 2nd surveillance will examine progress made in fulfilling the milestones of the corrective action plan

12. Client signed acceptance of the action plan

The signed Client Action Plan, aligned to the previously mention NCs was accepted by the assessment Team on 28th September 2017 (Complete details are outline in the full assessment report):

<https://uploads.alaskaseafood.org/2018/01/AK-RFM-BSAI-CRAB-Reassessment-v1-3-December-2017-Final.pdf>

13. Recommendation and Determination

Following this 1st 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, the U.S. Alaska Bering Sea and Aleutian Islands King, Tanner, and Snow crab commercial fisheries [Bristol Bay Red King crab (*Paralithodes camtschaticus*), St. Matthew Island Blue King crab (*Paralithodes platypus*), Eastern Bering Sea Tanner Crab (*Chionoecetes bairdi*), Aleutian Islands Golden King Crab (*Lithodes aequispinus*), and Eastern Bering Sea Snow crab (*Chionoecetes opilio*)] legally employing pot gear within the U.S. EEZ off Alaska; therefore, continued Certification is awarded.

14. References

Reference	Hyperlink
NPFMC 2017 Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries in the Bering Sea and Aleutian Islands. 2017 Final Crab SAFE, North Pacific Fishery Management Council, September 2017. 1600p.	http://www.npfmc.org/SAFE/CrabSAFE/2017CrabSAFE.pdf
2017-2019 King and Tanner Crab Commercial Fishing Regulations	http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2017-2020_cf_king_tanner_crab.pdf
Global Trust (2017) Alaska Responsible Fisheries Management Certification: Full Assessment and Certification Report for the U.S. Alaska Bering Sea and Aleutian Islands King, Tanner and Snow Crab Commercial Fisheries, December 7, 2017, 376 p.	https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/
Garber-Yonts, B., and J. Lee., (2017) Stock Assessment and Fishery Evaluation Report for King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: Economic Status of the BSAI Crab Fisheries, 2016.	https://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/crab.php
Goddard P, Wilborn R, Rooper C, Williams K, Towler R (2017) Results of the 2012 and 2014 underwater camera survey of the Aleutian Islands. US Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-351, 509 p.	https://deepseacoraldata.noaa.gov/library/results-of-the-2012-and-2014-underwater-camera-surveys-of-the-aleutian-islands
Rooper, C.N., R. Wilborn, P. Goddard, K. Williams, R. Towler, G.R. Hoff (2018) Validation of deep-sea coral and sponge distribution models in the Aleutian Islands, Alaska. ICES Journal of Marine Science, 75(1):199-209. 1 January 2018	https://doi.org/10.1093/icesjms/fsx087
Rooper, C., R. Stone, P. Etnoyer, C. Conrath, J. Reynolds, H.G. Greene, B. Williams, E. Salgado, C. Morrison, R. Waller, and A. Demopoulos (2017) Deep-Sea Coral Research and Technology Program: Alaska Deep-Sea Coral and Sponge Initiative Final Report. NOAA Tech. Memo. NMFS-OHC-2, 65 p.	https://www.fisheries.noaa.gov/alaska/habitat-conservation/deep-sea-corals-and-sponge-research-alaska
MacLean, S.A., Rooper, C.N. and Sigler, M.F. (2017) Corals, Canyons, and Conservation: Science Based Fisheries Management Decisions in the Eastern Bering Sea. Front. Mar. Sci. 4:142. doi: 10.3389/fmars.2017.00142	https://www.frontiersin.org/articles/10.3389/fmars.2017.00142/full
AKCRRAB (2016) Alaska King Crab Research, Rehabilitation and Biology Program AKCRRAB: Strategic Plan 2015–2019. Approved January 15, 2016, 22 p.	https://seagrant.uaf.edu/research/projects/kingcrab/general/
Muto, M.M., V. T. Helker, R. P. Angliss, B. A. Allen, P. L. Boveng, J. M. Breiwick, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Sheldon, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini (2017) Alaska marine mammal stock assessments, 2016. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-AFSC-355, 366 p. doi:10.7289/V5/TM-AFSC-355.	http://www.nmfs.noaa.gov/pr/sars/region.htm

<p>Zador, S., (Ed.) (2016) Ecosystem Considerations 2016: Status of the Aleutian Islands Marine Ecosystem. NPFMC November 14, 2016, 110 p.</p>	<p>https://access.afsc.noaa.gov/reem/ecoweb/Index.php</p>
<p>Siddon, E. and S. Zador (Eds.) (2017) Ecosystem Considerations 2017: Status of the Eastern Bering Sea Marine Ecosystem. NPFMC, November 13, 2017, 231 p.</p>	<p>https://access.afsc.noaa.gov/reem/ecoweb/Index.php</p>
<p>McConnaughey, R. A., K. E. Blackhart , M. P. Eagleton , and J. Marsh (2017) Habitat assessment prioritization for Alaska stocks: Report of the Alaska Regional Habitat Assessment Prioritization Coordination Team. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-361, 102 p.</p>	<p>https://repository.library.noaa.gov/view/noaa/15500</p>
<p>NPFMC (2017) Assessment of the effects of fishing on EFH in Alaska, April 2017. Prepared by Steve MacLean, Council staff, with input from M. Eagleton, J. Olson, M. Mackey. C6 Fishing Effects Discussion Paper. 22 p.</p>	<p>https://alaskafisheries.noaa.gov/habitat/efh</p>
<p>Lang, C.A., J. I. Richar, and R. J. Foy (2017) The 2017 Eastern Bering Sea Continental Shelf Bottom Trawl Survey: Results for Commercial Crab Species. September 13, 2017 DRAFT. NOAA Technical Memorandum NMFS-AFSC. 185 p.</p>	<p>https://www.afsc.noaa.gov/Publications/AFSC.../NOAA-TM_2017_DRAFT_091517.pdf</p>

15. Appendices

15.1. Appendix 1 – Assessment Team Details

Based on the technical expertise required to carry out the above fishery assessment, SAI Global, is pleased to confirm the 1st surveillance team members for the fishery as follows.

Dr. Ivan Mateo (Lead Assessor)

Dr. Ivan Mateo has over 20 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 (Jerry) 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

Dr. Wes Toller

Wes has an extensive background in fisheries management and habitat conservation. As owner and operator of his own consulting business since 2010, Wes has worked closely with a number of leading certification schemes including the Marine Stewardship Council (MSC) and Aquaculture Stewardship Council (ASC) to develop and improve processes for auditing and accreditation of sustainability standards. He previously worked as a program manager with Accreditation Services International (ASI) where he helped establish the company's nascent MSC Program. Wes has an in-depth knowledge of ISO requirements and international best practices that pertain to eco-labelling. He has a detail-oriented work style and wide ranging interests. Wes has experience in many subject areas within the field of sustainability, and a specialist in sustainable use of fishery resources in the field of fisheries management and marine science. Wes received his doctorate in biological sciences from the University of Southern California. He currently resides in Seattle.