Responsible Fishery Management (RFM)

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

Full Assessment Report

Certification Body (CB):	**Global Trust Certification**
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Fishery client:	Bering Sea Crab Client Group
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Foreword

The Responsible Fisheries Management (RFM) Certification program is a third-party sustainable seafood certification program for wild capture fisheries owned by the Certified Seafood Collaborative (CSC), a 501(c)(3) non-profit foundation led by a diverse board of seafood and sustainability industry experts.

The program was previously owned by the Alaska Seafood Marketing Institute (ASMI) when it was known as the Alaska RFM program but when ownership passed to the CSC in July 2020 scope of the program was expanded to include other North American fisheries outside the State of Alaska.

The Responsible Fisheries Management (RFM) Standard is composed of Conformance Criteria 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 RFM program may be found at: https://www.alaskaseafood.org/rfm-certification/.

1 Contents

1.1 List of Figures

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2 Glossary

Acronym	Complete Name
AAC	Alaska Administrative Code
ABC	Allowable Biological Catch
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
ASMI	Alaska Seafood Marketing Institute
BOF	Board of Fisheries
BSAI	Bering Sea and Aleutian Islands
BSFRF	Bering Sea Fisheries Research Foundation
CCRF	Code of Conduct for Responsible Fisheries
CDQ	Community Development Quota
CFEC	Commercial Fisheries Entry Commission
CFR	Code of Federal Regulations
CPT	Crab Plan Team
CPUE	Catch per Unit Effort
EIS	Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESP	Ecosystem and Socioeconomic Profile
FAO	Food and Agriculture Organization of the United Nations
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
GOA	Gulf of Alaska
GHL	Guideline Harvest Level
IFQ	Individual Fishing Quota
IPHC	International Pacific Halibut Commission
IRFA	Initial Regulatory Flexibility Analysis
IRIU	Improved Retention/Improved Utilization
LLP	License Limitation Program
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fisheries Management and Conservation Act
MSE	Management Strategy Evaluation
mt	Metric tons
MSY	Maximum Sustainable Yield
NC	Non-conformity
NEPA	National Environmental Policy Act
nm	Nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NPFMC	North Pacific Fishery Management Council
OFL	Overfishing Level

Acronym	Complete Name
OLE	Office for Law Enforcement
OY	Optimum Yield
PSC	Prohibited Species Catch
RACE	Resource Assessment and Conservation Engineering
REFM	Resource Ecology and Fisheries Management
RFM	Responsible Fisheries Management
SAFE	Stock Assessment and Fishery Evaluation (Report)
SSC	Scientific and Statistical Committee
SSL	Steller Sea Lion
TAC	Total Allowable Catch
USCG	U.S. Coast Guard

3 Executive Summary

3.1 Brief intro and description of surveillance process.

This Surveillance Report documents the 4th Surveillance Assessment of the U.S. Alaska Bering Sea and Aleutian Islands King and Snow crab commercial fisheries originally certified of April 16th 2012, and the Eastern Bering Sea Tanner Crab and Aleutian Islands Golden King Crab fisheries that were recently certified on December 7th 2017, and presents the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

Unit of Certification

The U.S. Alaska Bering Sea and Aleutian Islands King, 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. This is a voluntary program that has been supported by ASMI who wish to provide an independent, third-party certification that can be used to verify that these fisheries are responsibly managed.

The assessment was conducted according to the Global Trust procedures for Alaska RFM Certification using the fundamental clauses of the Alaska RFM Conformance Criteria Version 1.3 (November 2015) 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:

Section A. The Fisheries Management System
Section B. Science and Stock Assessment Activities
Section C. The Precautionary Approach
Section D. Management Measures
Section E. Implementation, Monitoring and Control
Section 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 AK RFM Certification Program surveillance assessment.

The surveillance process included a desktop review of relevant new documentary information including but not limited to: the most current fishery assessment and stock evaluation reports; Crab Plan team reports and meeting minutes; Council publications; relevant scientific publications; ecosystem status reports; fishery management plans and amendments thereof; changes to state and federal regulations; fishery enforcement statistics; environmental impact statements; marine mammal stock assessments; and strategic plans (see Section 10 - References for a more complete listing of documents reviewed).

The surveillance process also included substantive meetings with representatives from each of the key fishery management agencies charged with management of the BSAI King, Tanner and Snow Crab commercial fisheries. Assessment team meetings included: North Pacific Fishery Management Council (NPFMC); Alaska Department of Fish & Game (ADFG); Alaska Fisheries Science Center (Alaska FSC); and NOAA National Marine Fisheries Alaska Regional Office (NOAA Regional). The assessment team also met with the Bering Sea Crab Client Group (BSCCR) – fishery client and certificate holder. Owing to constraints imposed by COVID-19, all meetings were held remotely via videoconferencing.

As described more fully in the following report sections, the assessment team did note some minor changes to the fishery management system. However, none of these changes were seen to undermine continued compliance of the fishery management system for BSAI King, Tanner and Snow Crab commercial fisheries with requirements of the Alaska RFM Standard. Progress in addressing non-conformities, as judged against defined milestones in client action plans, was judged to be adequate and on target.

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).

3.2 Summary of main findings.

The Audit team has determined that the AK BSAI Crab commercial fishery operated within the defined Alaskan UoA remained in compliance with the RFM Fishery Standard's Fundamental Clauses for the Fisheries Management System component (Clauses 1, 2, and 3) Precautionary approach (Clauses 4, 5, 6) Management Measures (Clauses 7, 8, 9), Monitoring and Control component (Clauses 10 and 11) and Ecosystem Impact (Clauses 12 and 13). No evidence exists to indicate that nonconformance situations arose during the 4th Surveillance audit.

3.3 Recommendation with respect to continuing Certification.

Following this 4th Surveillance Assessment, the assessment team recommends that continued Certification under the Alaska Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fisheries, 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.

3.4 Assessment Team Details

The Assessment Team for this assessment was as follows; further details are provided in Appendix 1:

- Dr. Ivan Mateo – Lead Assessor, Responsible for Fundamental Clauses 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.
- Dr. Wesley Toller – Assessor, Responsible for Fundamental Clauses 12, 13.

3.5 Details of Applicable RFM Documents

This assessment was conducted according to the relevant program documents outlined in Table 1 below.

Table 1. Relevant RFM program documents including applicable versions.

Document title	Version number, Issue Date	Usage
RFM Procedure 2: Application to Certification Procedures for the RFM Fishery Standard	Version 6, September 2020	Process
Responsible Fisheries Management Certification Program Fisheries Standard.	Version 1.3, November 2015	Standard

4 Client contact details

Table 2. Client details and key contact information.

Applicant Information		
Organization/Company Name:		Bering Sea Crab Client Group
Address:	Street:	23929 22ND Drive, SE, Bothell
	City:	Seattle
	State:	Washington
	Country:	United States of America
	Zip code	98199
Applicant Key Contact Information		
Name:		Scott Goodman
Position:		General Manager
E-mail:		sgoodman@nrccorp.com

5 Units of Certification

5.1 Units of Certification

The Units of Certification (i.e., what is covered by the certificate) are as described in Table 3 below.

Table 3. Units of Certification

Unit of Certification 1 of 5		
Species:	Common name:	Red King crab
	Latin name:	*Paralithodes camtschaticus*
Stock(s):		Bristol Bay Red King crab
Geographical area:		U.S. Federal and State waters off the U.S. State of Alaska
Fishing gear/method:		Baited pot/trap gears
Client group:		Bering Sea Crab Client Group LLC
Unit of Certification 2 of 5		
Species:	Common name:	Snow crab
	Latin name:	*Chionocetes opilio*
Stock(s):		Eastern Bering Sea Snow crab
Geographical area:		U.S. Federal and State waters off the U.S. State of Alaska
Fishing gear/method:		Baited pot/trap gears
Client group:		Bering Sea Crab Client Group LLC
Unit of Certification 3 of 5		
Species:	Common name:	Blue King crab
	Latin name:	*Paralithodes platypus*
Stock(s):		St. Matthew Island Blue King crab
Geographical area:		U.S. Federal and State waters off the U.S. State of Alaska
Fishing gear/method:		Baited pot/trap gears
Client group:		Bering Sea Crab Client Group LLC
Unit of Certification 4 of 5		
Species:	Common name:	Tanner Crab
	Latin name:	*Chionoecetes bairdi*
Stock(s):		Eastern Bering Sea Tanner crab
Geographical area:		U.S. Federal and State waters off the U.S. State of Alaska
Fishing gear/method:		Baited pot/trap gears
Client group:		Bering Sea Crab Client Group LLC
Unit of Certification 5 of 5		
Species:	Common name:	Golden King Crab
	Latin name:	*Lithodes aequispinus*
Stock(s):		Aleutian Islands Golden King crab
Geographical area:		U.S. Federal and State waters off the U.S. State of Alaska
Fishing gear/method:		Baited pot/trap gears
Client group:		Bering Sea Crab Client Group LLC
Management system: (All Units of Certification)		U.S. Federal and State fisheries within the Gulf of Alaska and the Bering Sea & Aleutian Islands managed by: - National Marine Fisheries Service (NMFS) - North Pacific Fishery Management Council (NPFMC) - Alaska Department of Fish and Game (ADFG) - Alaska Board of Fisheries (BOF)

5.2 Changes to the Units of Certification

There have not been any changes to the units of certification.

6 Summary of site visits and/or consultation meetings

Desktop reviews are the preferred assessment vehicle within the RFM program. In general, on-site/off-site audits are required only if the Certification Body deems that a desktop review may be inadequate for determining whether the fishery is continuing to comply with the RFM Fishery Standard, based on the performance of the fishery, status of non-conformances and related corrective actions.

Table 4. Summary of site visits and/or consultation meetings.

Meeting Date and Location	Personnel	Areas of discussion
08/03/2021 Location: Remote [video call]	NOAA Regional Office: Krista Milani Alicia Miller Molly Zaleski Doug Duncan Abby Jahn Assessment Team Members: Ivan Mateo, Lead Assessor Wes Toller, Assessor	Topics Discussed: ▪ Overview/2020 Update on Stock Status ▪ The Fisheries Management System ▪ Stock Assessment and Precautionary Approach ▪ Management Measures ▪ Serious Impacts of the Fishery on the Ecosystem
08/04/2021 Location: Remote [video call]	Alaska Department of Fish & Game: Forrest Bowers Mark Stichert Ben Daly, Jie Zheng Assessment Team Members: Ivan Mateo, Lead Assessor Wes Toller, Assessor	Topics Discussed: ▪ Overview/2020 Update on Stock Status ▪ The Fisheries Management System ▪ Stock Assessment and Precautionary Approach ▪ Management Measures ▪ Serious Impacts of the Fishery on the Ecosystem ▪ Enhancement
08/11/2021 Location: Remote [video call]	North Pacific Fishery Management Council: Jim Armstrong Katie Palov Diana Evans, Sara Marrinan Assessment Team Members: Ivan Mateo, Lead Assessor Wes Toller, Assessor	Topics Discussed: ▪ Overview/2020 Update on Stock Status ▪ The Fisheries Management System ▪ Stock Assessment and Precautionary Approach ▪ Management Measures ▪ Serious Impacts of the Fishery on the Ecosystem
08/12/2021 Location: Remote [video call]	Alaska Fisheries Science Center William Stockhausen Cody Szuwalski Assessment Team Members: Ivan Mateo, Lead Assessor Wes Toller, Assessor	Topics Discussed: ▪ Overview/2020 Update on Stock Status ▪ The Fisheries Management System ▪ Stock Assessment and Precautionary Approach ▪ Management Measures ▪ Serious Impacts of the Fishery on the Ecosystem
08/24/2021 Location: Remote [video call]	Bering Sea Crab Client Group Scott Goodman Jamie Goen, Madison Shipley Assessment Team Members: Ivan Mateo, Lead Assessor Wes Toller, Assessor	Topics Discussed: ▪ Stock Assessment and Precautionary Approach ▪ Serious Impacts of the Fishery on the Ecosystem ▪ Progress on Non conformances

7 Summary findings

Surveillance audits are summary audits intended to evaluate continued compliance with the RFM Fishery Standard. Each aspect of the fishery they are intended to focus on is addressed below.

7.1 Update on topics that trigger immediate failure

The following fisheries management issues cause a fishery to immediately fail RFM assessment:

- Dynamiting, poisoning, and other comparable destructive fishing practices.
- Significant illegal, unreported, and unregulated (IUU) fishing activities in the country jurisdiction.
- Shark finning.
- Slavery and slave labor on board fishing vessels.
- Any significant lack of compliance with the requirements of an international fisheries agreement to which the U.S. is signatory. A fishery will have to be formally cited by the International Governing body that has competence with the international Treaty in question, and that the US has been notified of that citation of non-compliance.

The Assessment Team has, as part of this surveillance, carried out a review of any new evidence with respect to these issues and found no evidence that any of the above issues are occurring/describe any issues identified and the consequences for the fishery.

7.2 Changes in the management regime and processes

There were no changes in the management regime and processes that may affect the outcome of certification or that have potential to change the effect of the fishery on resources.

7.3 Changes to the organizational responsibility of the main management agencies

There were no changes to the organizational responsibility of the main management agencies that form part of the fishery management framework.

7.4 New information on the status of stocks[1]

7.4.1 Eastern Bering Sea Snow crab

Stock Status

Fishery information relative to OFL setting

Total catch mortality in 2019/20 was 20,800 t (with discard mortality rates applied), while the retained catch in the directed fishery was 15,400 t. Because the total catch mortality for this stock was below the 2019/20 OFL of 54,900 t, **overfishing did not occur**. 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.

Stock biomass and recruitment trends

Observed mature male biomass in the NMFS EBS bottom trawl survey, based on applying a maturity ogive, decreased from a peak of 167,100 t in 2011 to 97,500 t in 2013, increased to 163,500 t in 2014, fell to 63,200 t in 2016, then increased once again to 84,000 t in 2017, 198,400 t in 2018, and 169,100 t in 2019. Observed survey mature female biomass rose quickly from a low of 52,200 t in 2009 to 175,800 t in 2011, its highest value since 1991, decreased steadily to 55,400 t in 2016, then increased to 106,800 t in 2017 and to a peak of 165,900t in 2018. Observed survey mature female biomass decreased in 2019 to 110,400 t.

[1] https://www.fisheries.noaa.gov/resource/data/2019-alaska-crab-stock-assessment-and-fishery-evaluation-report

The model estimates for mature male biomass-at-mating (MMB) declined from a 10-year high of 209,600 t in 2009/10 to a low in 2015/16 of 66,900 t. MMB increased in subsequent years and was estimated to be 560,200 t in 2020/21. Model-estimated mature female biomass-at-mating (MFB) began to decline somewhat later, from a peak in 2011/12 (546,700 t) to a low in 2016/17 (201,200 t), followed by increases to 432,900 t in 2019/20. MFB declined to 352,800t in 2020/21.

Estimated recruitment to the population has been episodic, with peaks in recruitment generally preceding peaks in mature biomass by a few years. The most recent peaks were in 2008/09 (1,370,000 crab), preceding peaks in MMB and MFB in 2009/08 and 2011/12, respectively, and in 2015/16 (15,720,000 crab), preceding the increases in MMB and MFB that began in 2015/16. The estimate of 2015/16 recruitment is substantially higher in this year's assessment than the 2019 assessment

Tier determination/Plan Team discussion and resulting OFL/ABC determination Status and catch specifications
The CPT recommends that the EBS snow crab is a Tier 3 stock so the OFL will be determined by the FOFL control rule using F35% as the proxy for FMSY. The proxy for *BMSY* (*B35%*) is the mature male biomass at mating (113.7 kt) based on average recruitment over 1982 to 2018. Consequently, the minimum stock size threshold (MSST) is 56.8 kt. Projected MMB for 2020/21 (276.7kt) is above the MSST, so the stock is not overfished. The CPT recommends that the ABC be less than maximum permissible ABC. The buffer between the ABC and OFL was 20% for 2017, 2018 and 2019 assessments, reflecting uncertainty about model misspecification (growth) and parameter confounding, the ongoing evidence for retrospective patterns, and the uncertainty surrounding rates of natural mortality. There is less concern about growth in the 2020 assessment, but the CPT was concerned about the reasons for the substantial increase in 2015/16 recruitment, which may be a consequence of GMACS imposing only weak penalties on the recruitment deviations. Thus, ignoring the effect of the lack of a 2020 survey, the CPT recommends a buffer of 25% based only on uncertainties related to the model fit.

The 2020 NMFS bottom trawl surveys were cancelled due to concerns related to the COVID-19pandemic, and this stock assessment is missing survey data for the terminal year. The 2020 assessment of EBS snow crab is the most sensitive of the 2020 model-based assessments to the lack of terminal year survey data, with a median relative over-estimate of the OFL of close to 25%. The CPT therefore recommends an additional 25% buffer resulting in a total buffer of 50% between the OFL and ABC for the 2020/21 fishing year.

7.4.2 Bristol Bay Red King Crab

Fishery information relative to OFL setting
The commercial harvest of Bristol Bay red king crab (BBRKC) dates to the 1930s. The fishery was initially prosecuted mostly by foreign fleets but shifted to a largely domestic fishery in the early 1970s. Retained catch peaked in 1980 at 58.9 kt but harvests dropped sharply in the early 1980s, and population abundance has remained at relatively low levels over the last two decades compared to those seen in the 1970s. The fishery is managed for a total allowable catch (TAC) coupled with restrictions for sex (males only), a minimum size for legal retention (6.5-in carapace width; 135-mm carapace length is used a proxy for 6.5-in carapace width in the assessment), and season (no fishing during mating/molting periods). In addition to the retained catch that occurs during the commercial fishery, which is limited by the TAC, there is also retained catch that occurs in the ADF&G cost-recovery fishery.

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 thresholds of 8.4 million mature-sized (≥90 mm CL) females and 6.6 kt of effective spawning biomass (ESB) to prosecute a fishery. Annual non-retained catch of female and sublegal male RKC during the fishery has averaged less than 8.6 kt since data collection began in

1990. Total catch (retained and bycatch mortality) increased from 7.6 kt in 2004/05 to 10.6 kt in 2007/08 but has decreased since then; retained catch in 2019/20 was 1.78 kt and total catch mortality was 2.22 kt.

Stock biomass and recruitment trends

The MMB at the time of mating is estimated to have been highest in the early 1970s (approximately 400 kt), with secondary peaks in 1991 (99 kt), 2008 (108 kt), and in 2014 (111 kt). The estimated MMB at time of mating in 2019/20 was 56.15 kt and the projection for 2020/21 is 35.33 kt. Estimates of recruitment since 1999 have been generally low relative to the peaks estimated for the period prior to 1990. There was a relatively strong recruitment estimated for 2016, 2017, and 2018, but these estimates remain uncertain and will need to be confirmed by subsequent assessments.

Stock biomass and recruitment trends

Based on the CPT-recommended scenario, 19.3, the MMB at the time of mating is estimated to have been highest early in the late 1970s (approximately 120 kt), with secondary peaks in 1989 (27 kt) and 2002/03 (~33 kt), followed by a gradual decline. The estimated MMB at time of mating in 2019/20 was 14.24 kt. The projection for the 2020/21 time of mating, which assumes the fishing mortality in 2020/21 matches that corresponding to the OFL, is 14.93 kt. Estimates of recruitment since 1985 have been generally low relative to those estimated for the period prior to 1985 and intermittent peaks in 1995, 2002, and 2005 (61, 52, and 42 million crab, respectively). The relatively low estimate of recruitment for 2019 (3.8 million crab) was the second lowest since 1994. The estimate for 2020, 18.9 million, was the largest since 2010 but was highly uncertain due to the lack of 2020 survey data to inform the model.

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

Bristol Bay red king crab is in Tier 3. Based on previous discussion at the January and May 2018 CPT meetings regarding an apparent reduction in stock productivity associated with the 1976/77 climate regime shift in the EBS, the CPT concurred with the author's recommendation to drop the terminal year recruitment from the time period for average recruitment when calculating B35% because it is highly uncertain. The CPT recommends computing average recruitment as has been done in recent assessments (i.e., based on model recruitment using the time period 1984 and corresponding to fertilization in 1977) to the penultimate year of the assessment. Based on scenario 19.3, the estimated *B35%* is 25.4 kt. MMB projected for 2020/21 is 14.93 kt, 59% of *B35%*. Consequently, the BBRKC stock is in Tier 3b for 2020/21. The corresponding OFL is 2.14 kt.

MMB for 2019/20 was estimated to be 14.24 kt and above MSST (10.62 kt); hence the stock was not overfished in 2019/20. The total catch mortality in 2019/20 (2.22 kt) was less than the 2019/20 OFL (3.40 kt); hence overfishing did not occur in 2019/20. However, several CPT members expressed concern that the stock will be overfished in a few years and that king crab stocks do not seem to rebuild easily, once an overfished condition is reached. It was suggested that it may be time to review the use of F35% as a proxy for FMSY for this and other Alaskan crab stocks.

7.4.3 Eastern Bering Sea Tanner crab

Fishery information relative to OFL setting

Eastern Bering Sea (EBS) Tanner crab are caught in directed Tanner crab fisheries, as bycatch in the groundfish and scallop fisheries, as bycatch in the directed Tanner crab fishery (mainly as non-retained females and sublegal males), and other crab fisheries (notably, eastern Bering Sea snow crab and, to a lesser extent, Bristol Bay red king crab). A single OFL is set for Tanner crab in the EBS. Under the Crab Rationalization Program, ADF&G sets separate TACs for directed fisheries east and west of 166° W longitude. The mature male biomass was estimated to be below the Minimum Stock Size Threshold (0.5*B*MSY) 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. The directed fishery was closed from 2010/11 through 2012/13 crab fishery years.

NMFS determined the stock was rebuilt in 2012 based on a new assessment model with a revised estimate of *B*MSY. 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. In 2017/18, ADF&G determined that a directed fishery could occur in the area west of 166°W longitude. The TAC was set at 1,110 t for 2018/19, of which 100% was taken. In 2019/20, mature female biomass again did not meet ADF&G criteria for opening a fishery, and there was no directed harvest.

In March 2020, the harvest control rule for Tanner crab was changed by the Alaska Board of Fisheries based on results from an extensive management strategy evaluation (MSE) conducted with input from industry stakeholders, NMFS and academic scientists, and ADF&G managers. The current HCR defines the period for calculating average mature biomass as 1982-2018, and determines exploitation rates on mature males using sliding scale functions of the ratios of MMB and mature female biomass to their long-term averages.

Stock biomass and recruitment trends

The MMB at the time of mating is estimated to have been highest in the early 1970s (approximately 400 kt), with secondary peaks in 1991 (99 kt), 2008 (108 kt), and in 2014 (111 kt). The estimated MMB at time of mating in 2019/20 was 56.15 kt and the projection for 2020/21 is 35.33 kt. Estimates of recruitment since 1999 have been generally low relative to the peaks estimated for the period prior to 1990. There was a relatively strong recruitment estimated for 2016, 2017, and 2018, but these estimates remain uncertain and will need to be confirmed by subsequent assessments.

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

The CPT recommends the OFL for this stock be based on the Tier 3 control rule. Application of the Tier 3 control rule requires a set of years for defining average recruitment corresponding to *BMSY* under prevailing environmental conditions. This recommended time period is 1982 – 2019. The 1982-and-onwards time period had been used in previous OFL determinations, but this year a decision was made to exclude the recruitment estimate for the terminal year in this calculation. This estimate is extremely uncertain this year due to the lack of survey information.

Based on the estimated biomass at 15 February 2020, the stock is at 96% of *BMSY*, and therefore is in Tier 3b. The *FMSY* proxy (*F*35%) is 0.98 yr-1, and the 2020/21 *F*OFL is 0.94 yr-1 under the Tier 3b OFL Control Rule, which results in a total OFL of 21.13 kt. The CPT recommends a 20% buffer to account for model uncertainty and stock productivity uncertainty be applied to the OFL to set ABC = 16.90 kt. The 20% buffer is the same that the SSC recommended for determination of the 2019/20 ABC. The CPT concluded that no additional buffer was needed to account for the cancelled NMFS EBS bottom trawl survey in 2020.

7.4.4 St. Matthew blue king crab

Fishery information relative to OFL setting

The fishery was prosecuted as a directed fishery from 1977 to 1998. Harvests peaked in 1983/84 when 4,288 t (9.453 million lb.) were landed by 164 vessels. Harvest was fairly stable from 1986/87 to 1990/91, averaging 568 t (1.252 million lb.) annually. 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. In November 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 *B*MSY for two years and the stock declared rebuilt in 2009.

The fishery re-opened in 2009/10, closed in 2013/14, opened from 2014/15 – 2015/16, and has been closed since 2016/17. Bycatch of non-retained blue king crab has occurred in the St. Matthew blue king crab fishery, the eastern Bering Sea snow crab fishery, and trawl and fixed-gear groundfish fisheries. The stock declined below the minimum stock size threshold in 2018 and was declared overfished. A rebuilding plan is under development.

Stock biomass and recruitment trends

Following a period of low values after the stock was declared overfished in 1999, trawl-survey indices of stock abundance and biomass generally increased to well above average during 2007–2012. In 2013 survey biomass declined (~40% of the mean value) but was followed by average biomass estimates in 2014 and 2015, but with survey CVs of 77% and 45%, respectively). The 2016 survey biomass fell to 3,485 t, followed by continued declines to the 2018 survey estimate of 1,731 t. The 2019 survey estimate of 3,170 t represents an increase of 83% from 2018 but remains low in a historical context.

Because little information about the abundance of small crab is available for this stock, recruitment has been assessed in terms of the number of male crabs within the 90–104 mm CL size class in each year. The 2019 trawl-survey area-swept estimate of 0.403 million males in this size class is the twelfth lowest in the 42-year time series since 1978 and follows two of the lowest observed recruitments in 2017 and 2018.

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

The stock assessment examines four model configurations: (1) Model 16.0 - the 2019 recommended model; (2) Model 16.0 – the base model, i.e., last year's model updated with new data; (3) Model 16.0a, which fixes the estimate of the terminal year of recruitment as the average of the past seven years; and (4) Model 20.1, which excludes the ADF&G pot survey.

The CPT concurs with the author's recommendation to use the base model 16.0 for the 2020/21 crab year. This stock is in Tier 4. The CPT recommends that the full assessment period (1978/79–2019/20) be used to define the proxy for *B*MSY in terms of average estimated *MMBmating*. The projected MMB estimated for 2020/21 under the recommended model is 1,120 t and the *FMSY* proxy is the natural mortality rate (0.18-1 year) and FOFL is 0.047, resulting in a mature male biomass OFL of 0.05 kt. The MMB/BMSY ratio is 0.34.

The author recommended and the CPT concurred with a 25% buffer on the OFL for the ABC which was a return to the correct buffer from a mistakenly applied 20% last year. The ABC based on this buffer is 0.04.

7.4.1 Aleutian Islands Golden King Crab

Fishery information relative to OFL setting

The directed fishery has been prosecuted annually since the 1981/82 season. Management based on a formally established GHL began with the 1996/97 season. The Alaska Board of Fisheries adopted an abundance-based harvest strategy for the stock in March 2019. This fishery has been managed under the Crab Rationalization Program since 2005. Total mortality of AI golden king crab includes retained catch in the directed fishery, mortality of discarded catch, and bycatch in fixed-gear and trawl groundfish fisheries, though bycatch in other fisheries is

low compared to mortality in the directed fishery. Total mortality in the post-rationalized fishery has ranged from 2,506 t in 2006/07 to 3,735t in 2019/20.

Stock biomass and recruitment trends

Estimated mature male biomass (MMB) for the EAG decreased from high levels until the 1990s after which the trend has been increasing. In contrast, the MMB for the WAG increased from a low in the 1990s until 2007/08 and then declined again, and has since recovered to the MMB levels of those in the mid-2000s. Recruitment for the EAG was variable and high during 2014-2016 while recruitment for the WAG was lower in recent years than during the 1980s. Stock trends reflected the fishery standardized CPUE trends in both areas.

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

The CPT recommends that this stock be managed as a Tier 3 stock in 2020/21. A single OFL and ABC is defined for AIGKC. However, separate models are available by area. The CPT recommends that stock status be determined by adding the estimates of current MMB and BMSY by area. This stock status is then used to determine the ratio of FOFL to F35% by area, which is then used to calculate the OFLs by area, which are then added together to calculate an OFL for the entire stock. The SSC has concurred with this approach. The stock is currently estimated to be above BMSY in both areas therefore no adjustment is needed to the FOFL to determine the combined OFL for both areas. As in 2019, the CPT recommends that the BMSY proxy for the Tier 3 harvest control rule be based on the average recruitment from 1987-2012, years for which recruitment estimates are relatively precise.

7.5 Update on fishery catches[2]

Provide an update on fishery catches.

Table 5. Status and catch specifications (1000 t) for snow crab. 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
2016/17	75.8	96.1	9.7	9.7	11.0	23.7	21.3
2017/18	71.4	99.6	8.6	8.6	10.5	28.4	22.7
2018/19	63.0	123.1	12.5	12.5	15.4	29.7	23.8
2019/20	56.8	167.3	15.4	15.4	20.8	54.9	43.9
2020/21		276.7				184.9	92.5

Table 6. Status and catch specifications (1000 t) for Bristol Bay red king crab. 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
2016/17	12.53	25.81	3.84	3.92	4.28	6.64	5.97
2017/18	12.74	24.86	2.99	3.09	3.48	5.60	5.04
2018/19	10.62	16.92	1.95	2.03	2.65	5.34	4.27
2019/20	12.72	14.24	1.72	1.78	2.22	3.40	2.72
2020/21		14.93				2.14	1.61

[2] https://www.fisheries.noaa.gov/resource/data/2019-alaska-crab-stock-assessment-and-fishery-evaluation-report

Table 7. Status and catch specifications (1000 t) for Tanner crab. 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
2016/17	14.58	77.96	0.00	0.00	1.14	25.61	20.49
2017/18	15.15	64.09	1.13	1.13	2.37	25.42	20.33
2018/19	20.54	82.61	1.11	1.11	1.90	20.87	16.70
2019/20	18.31	56.15	0.00	0.00	0.54	28.86	23.09
2020/21		35.31				21.13	16.90

Table 8. Status and catch specifications (1000 t) for St. Matthew blue king crab. 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
2016/17	1.97	2.23	0.00	0.00	0.001	0.14	0.11
2017/18	1.85	2.05	0.00	0.00	0.003	0.12	0.10
2018/19	1.74	1.15	0.00	0.00	0.001	0.04	0.03
2019/20	1.67	1.06	0.00	0.00	0.001	0.04	0.03
2020/21		1.12				0.05	0.04

Table 9. Status and catch specifications (1000 t) for Aleutian Islands golden king crab. 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
2016/17	N/A	N/A	2.515	2.593	2.947	5.69	4.26
2017/18	6.044	14.205	2.515	2.585	2.942	6.048	4.536
2018/19	5.880	17.848	2.883	2.965	3.355	5.514	4.136
2019/20	5.909	16.323	3.257	3.319	3.735	5.249	3.937
2020/21		14.774				4.798	3.599

7.6 Significant changes in the ecosystem effects of the fishery

In the past year, there was no indication of any significant changes in the actual or potential impacts of BSAI crab fisheries on the Eastern Bering Sea ecosystem or Aleutian Islands ecosystem. However, in recent years there have been a number of noteworthy environmental trends detected in the EBS, some of which may impact upon crab stocks. For example, the cold pool extent for summer 2019 was reduced and retracted over the northwest portion of the EBS survey area, reflecting low sea ice extent over the shelf during the winter 2018/2019 (Siddon and Zador, 2019). Trend modeling for ecosystem indicators in 2019 revealed poor conditions for SMBKC, attributed to above average bottom temperatures, a reduction in the cold pool extent, and an increase in mean benthic predator biomass in the St. Matthew Island management boundary (Fedewa *et al.,* 2019). In 2020, the eastern Bering Sea experienced a return to near-normal climatic conditions (Siddon, 2020). Updated trend modeling for SMBKC ecosystem indicators also revealed near-average conditions for SMBKC in 2020, although persistent, corrosive

bottom waters surrounding St. Matthew Island suggest potential impacts on shell formation, growth, and survival of blue king crab (Fedewa et al., 2020).

7.7 Violations and enforcement information

In 2020 the US Coast Guard units conducted 23 boardings on fishing vessels targeting crab throughout Alaska, 11 in the Bering Sea. Representatives from District 17's Commercial Fishing Vessel Safety division travelled to Dutch Harbor, AK prior to the crab opener to conduct courtesy safety exams and outreach. There was only 1 safety violation

7.8 Other information that may affect the outcome of certification

There was no other information that may affect the outcome of certification

7.9 Update on consistency to the fundamental clauses of the RFM Fishery Standard

There were no changes in the fishery relevant to the fundamental clauses of the RFM Fishery Standard. The fishery continues to conform to the requirements of all Fundamental Clauses of the RFM Fishery Standard.

RFM Standard Version 1.3

7.9.1 Section A. The Fisheries Management System

7.9.1.1 Fundamental Clause 1

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.**
Summary of relevant changes:	1.1. There shall be an effective legal and administrative framework established at local and national level appropriate for the fishery resource and conservation and management. The BSAI king and Tanner crab fisheries have an organized and legally mandated management system in place. The Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs governs Alaska's BSAI crab stocks (FMP). A negotiated agreement between the state of Alaska and the federal government resulted in the development of the crab FMP. The result was a state-federal fishery management plan (FMP) that considered NPFMC, NMFS, and MSA regulations on the federal level, as well as ADFG, BOF, and Alaska statutes on the state level. This agreement resulted in actual joint management, which addressed the demands of both Alaskans and those from other states. The crab is a type of crab. The crab FMP is divided into three categories, each reflecting the state and federal priorities. The joint management document was submitted to the Secretary of Commerce, who accepted joint management for the BSAI crab fishery after the state and federal agencies, as well as the BOF and NPFMC, reached an agreement and put it to public scrutiny. The fisheries and management system continue to operate in accordance with all existing laws, 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 Report[3], 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

[3] https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/

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.**	
		produce annually a Stock Assessment & Fishery Evaluation (SAFE) report[4] 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. Investigation of crab stock structure is ongoing. Work includes studies of distribution and movement (Zacher et al. 2018; Murphy et al. 2018, 2020)[5],[6],[7] as well as population genetic research (e.g., Johnson 2019)[8]. However, no compelling information has come to light since re-assessment that indicates a need to revise the current understanding of crab stock unit structure 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. There is evidence for well-established means by which fisheries management activities, organizations, and arrangements are financed, including arrangements aimed at recovering the costs of fisheries conservation, management, and research, in order to maintain compliance with supporting clause 1.6. The Crab Rationalization cost recovery program, which was adopted by NMFS in 2005, covers a major portion of the expenditures incurred during the management, research, and enforcement of BSAI crab fisheries (70 FR 10174, March 2, 2005). The cost recovery program (CR) allows for the collection of costs up to 3% of ex-vessel total revenues in actual management and enforcement costs. Up to 25% of collections are deposited into the U.S. Treasury and made available to Congress for annual appropriations to support the BSAI Crab Quota Share Loan Program. The other remaining funds are placed in a limited access account available only to the Secretary and which must be spent on CR Program management and enforcement[9]. In addition to financing from the Alaska Legislature, the National Marine Fisheries Service (NMFS) provides some funding to the state of Alaska. The Crab Observer Program is supported by business monies as well as grants from Test Fish. The Crab Observer Oversight Task Force (COOTF) is a consultative group made up of crab industry members and others. Its mission is to assess and make recommendations to the Board of Fisheries on all areas of the BSAI crab observer program, including funding options for observers, budget and reserve priorities, to the Board of Fisheries. (RC 020[10], March 2014). In 2017 the Board of Fisheries determined that the COOTF was useful and should continue (RC 033[11], March 2017).

[4] https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/
[5] https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0201190
[6] https://www.sciencedirect.com/science/article/abs/pii/S0165783618301000
[7] https://www.sciencedirect.com/science/article/abs/pii/S0165783619302723
[8] https://scholarworks.alaska.edu/bitstream/handle/11122/10506/Johnson_G_2019.pdf?sequence=1
[9] https://www.fisheries.noaa.gov/resource/document/crab-rationalization-program-cost-recovery-reports
[10] https://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/statewide/rcs/rc020_Bering_Sea_Aleutian_Is_Crab_Observer_Oversight.pdf
[11] http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2016-2017/statewide/rcs/rc033_BOF_Crab_Observer_Task_Force.pdf

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.**	
		Research and management efforts are also supported by industry. For example, the Bering Sea Fisheries Research Foundation (BSFRF[12]) is a non-profit research foundation whose funding comes primarily from private industry. BSFRF has engaged in cooperative research with industry, ADFG, and NMFS since 2005 with the aim of improving the science used to manage Bering Sea crab fisheries. Recent BSFRF research projects include collection of *Chionoecetes* for growth studies, side-by-side trawl survey work, and tagging studies of red king crab movement using saildrones. BSFRF presented an update on these activities at a recent meeting of the Crab Plan Team (CPT Report, January 2020[13]). 1.7. Review and Revision of conservation and management measures The NPFMC has mechanisms in place to guarantee that the effectiveness of conservation and management measures is continually assessed. In light of new information, mechanisms exist to update or eliminate present management measures. The Magnuson-Stevens Act (MSA), for example, requires Regional Fishery Management Councils 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," according to 1852(f)(5). The Alaska BOF, like the NPFMC, has mechanisms in place to guarantee that the efficacy of state conservation and management measures, including those for BSAI crab stocks, is continually reviewed. The BOF meeting calendar is published by ADFG so that stakeholders can suggest changes to existing regulations or provide feedback on current proposals. This includes, for example, the preparation and publication of a Book of Proposals[14] which details all regulatory proposals that will be heard by the BOF during upcoming meetings. Members of the public, groups, advisory committees, and ADFG employees may submit proposals for modifications to the state's fishing regulations. Proposals for BSAI crab regulations are sometimes grouped together and discussed at a single BOF conference (for example, 33 statewide king and Tanner crab proposals were scheduled for review in the March 2020 BOF meeting).[15]. 1.8. Transparent management arrangements and decision making In terms of management arrangements and decision-making processes, the NPFMC and Alaska BOF operations are arranged in a highly transparent manner. On their website, the Council provides a wealth of information[16], including meeting agendas, discussion papers, and records of decisions. All Council deliberations are held in open, public session, and the Council actively promotes stakeholder participation. The Council's Three Meeting Outlook identifies issues that are likely to be of importance and thus covered at the next three NPFMC sessions, allowing stakeholders to prepare and submit views for debate ahead of time. Alaska's Board of Fisheries (BOF) management arrangements and decision-making processes for the fishery are arranged in a transparent manner, similar to NPFMC. On its websites, the Board and ADFG provide a wealth of information, including meeting agendas, discussion papers, news items, and decision records. BOF deliberations are held in an open, public session, which actively encourages stakeholder participation. Anyone can make regulation ideas, and the BOF considers all of them.[17].

[12] http://www.bsfrf.org/
[13] https://meetings.npfmc.org/CommentReview/DownloadFile?p=8234b120-8d15-4a1b-ba99-2ae31ff796de.pdf&fileName=PRESENTATION%20-%20BSFRF%20Research%20Planning%20for%202020%20(Goodman).pdf
[14] http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2019-2020/proposals/2019-2020_proposal_book_digital.pdf
[15] http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2019-2020/proposals/crab.pdf
[16] https://www.npfmc.org/
[17] http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main

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.**
	1.9. Compliance with international conservation and management measures The crab fisheries under consideration 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.
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 1 of the RFM Fishery Standard.**

7.9.1.2 Fundamental Clause 2

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.**
Summary of relevant changes:	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 from the fishing industry and fishing communities must be consulted during decision-making processes, and information on management measures must be widely distributed. To ensure sustainable and integrated use of marine resources, a framework of regulatory, legal, and institutional capacities has been put in place, as well as measures to avoid conflict among users. Through the federal National Environmental Policy Act (NEPA) processes, the NMFS and the NPFMC participate in coastal area management-related institutional frameworks. This occurs whenever they generate, renew, or change resources under their supervision that may be influenced by other developments and each time they create, renew or amend regulations. Potential coastal zone developments and challenges can be brought to official evaluation and involvement through fishery management agencies' processes, committees, and groups, such as the NPFMC meetings or the BOF meetings. In decision-making procedures, representatives from the fishing industry and fishing communities are consulted, and information on management measures is shared. All of the Council's and BOF's deliberations are held in open, public meetings, and they aggressively promote stakeholder input. Decisions are transparently documented on the respective websites of these organizations[18],[19] in a timely manner. Information related to management measures is disseminated in a timely manner. For example, ADFG regularly publishes and distributes booklets summarizing current regulations (e.g. the 2020-2021 King and Tanner Crab Commercial Fishing Regulations; ADFG 2020) which are also made available online[20]. On its website, the NPFMC makes information regarding management measures available to the public by posting up-to-date content about current and upcoming meetings, topical issues, and Council publications. ADFG posts notifications related to the implementation of commercial fisheries management measures, such as fishery advisories, summaries, press releases, and forecasts, on its

[18] http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main
[19] https://www.npfmc.org/
[20] https://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2020_2021_cf_king_tanner_crab.pdf

2.	**Management organizations shall participate in coastal area management institutional frameworks, decision-making processes and activities related to the fishery and its users, in support of sustainable and integrated resource use, and conflict avoidance.**
	website in a timely way. [21] Similarly, NMFS makes available on its websites[22] information about regulatory and management actions and other resources relevant to commercial fisheries. 2.5. The economic, social and cultural value of coastal resources shall be assessed in order to assist decision-making on their allocation and use. The evaluation of Alaskan fisheries' economic, social, and cultural worth is an important aspect of the decision-making process for coastal resource management. The NPFMC and the BOF's main responsibilities are to manage fisheries resources sustainably and to allocate resources to different users in compliance with the Magnuson-Stevens Act's regulations (MSA). The Economic and Social Sciences Research (ESSR) Program in Alaska is managed by the Alaska Fisheries Science Center (AFSC)[23]. The ESSR Program's goal is to offer economic and sociocultural data to help NMFS fulfill its stewardship responsibilities through actions carried out in support of this objective. The Alaska Fisheries Science Center (AFSC) provides online access to community profiles with baseline socioeconomic data for 136 Alaska villages that are heavily involved in commercial fishing. The AFSC website has comprehensive community biographies, concise snippets, and searchable maps of communities participating in commercial, recreational, and subsistence fishing.[24]. AFSC has also recently published a wholesale market profile for Alaska groundfish and crab (AFSC 2016). Many of the AFSC Program's operations are carried out in partnership with other federal and state agencies, as well as colleges. Regional economic effect models, behavioral models of fishing operations, economic performance indicators, and non-market value of living marine resources are all current study areas. The Alaska Fisheries Information Network provides further data on the value of coastal resources (AKFIN). AKFIN was founded in 1997 in response to a growing demand for detailed, organized fishery information to assist managers in making decisions. Its mission is to consolidate, manage, and disseminate information relating to commercial fishing[25]. The AFKIN maintains an analytic database of both State and Federal historic, commercial Alaska fisheries data important to the needs of fisheries analysts and economists, and makes that data available in a format that may be used. These records are necessary for determining the economic value of Alaska's fishing industry, among other things. (McDowell Group 2017[26]). Results from economic assessments are presented annually in Economic Stock Assessment and Fishery Evaluation Reports or "Economic SAFE reports" (Garber-Yonts and Lee 2018[27]), together with comprehensive information on stock assessments and updates on ecosystem status and trend ("Ecosystem SAFE" reports). 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 For the coastal environment, state and federal organizations collaborate on continuous research and monitoring projects. There are well-established multidisciplinary research programs that analyze the

[21] https://www.adfg.alaska.gov/index.cfm?adfg=fishingCommercial.main
[22] https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/sustainable-fisheries-alaska
[23] https://www.afsc.noaa.gov/REFM/Socioeconomics/Default.php
[24] https://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/communities/
[25] https://akfin.psmfc.org/
[26] https://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/Econ/Crab_Economic_SAFE_2018.pdf
[27] https://www.afsc.noaa.gov/REFM/Socioeconomics/SAFE/crab_safe/Crab_Economic_SAFE_2017.pdf

2.	**Management organizations shall participate in coastal area management institutional frameworks, decision-making processes and activities related to the fishery and its users, in support of sustainable and integrated resource use, and conflict avoidance.**
	physical, chemical, biological, economic, and social components of the coastal environment and contribute to better management. As detailed in the BSAI Crab Re-assessment Report[28], the NPFMC, NMFS and ADFG are engaged in 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. Domestic collaboration and coordination structures are well-established and supported by adequate technical capabilities and financial resources. In Alaska's coastal waters, for example, state and federal management authorities have devised a framework for managing artificial reefs and fish aggregation devices. The construction and deployment of such reefs and devices are subject to permission under these management systems, and management takes into account the interests of fishermen, especially artisanal and subsistence fishermen. There are also mechanisms in place to facilitate international cooperation and coordination. There are management systems and action plans in place for reaction and containment if an incident with the potential for detrimental environmental effects occurs (e.g., an oil leak, an invasive species escape). There are also systems in place to guarantee that information is shared with the appropriate Canadian authorities as soon as possible if such incidents threaten to spill over into Canadian seas.
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 2 of the RFM Fishery Standard**

7.9.1.3 Fundamental Clause 3

3.	**Management objectives shall be implemented through management rules and actions formulated in a plan or other framework.**
Summary of relevant changes:	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)[29]. FMP objectives are dictated by, and consistent with, the Magnuson-Stevens Act (MSA)[30]. Management decisions are made by the Council and BOF, and implemented and enforced by AWT, NMFS-OLE and USCG. Both NPFMC and ADFG make Council and Board deliberations 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.

[28] https://www.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/
[29] https://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf
[30] https://www.law.cornell.edu/uscode/text/16/chapter-38/subchapter-IV

3.	Management objectives shall be implemented through management rules and actions formulated in a plan or other framework.
	Excess fishing capacity is prevented, and stock exploitation remains economically viable, thanks to conservation and management efforts. The number of buyers and sellers were capped, seasons were extended, and vessels were able to join cooperatives, resulting in fewer vessels deploying less gear on the grounds, thanks to a Congressionally approved approach in 2005 that created Processor Quota Shares and Individual Fishing Quotas for rationalized crab fisheries in the BSAI. The current economic conditions in the crab fishing industry encourage responsible fishing, and NMFS is actively reviewing and demonstrating these conditions in numerous analyses[31]. NPFMC recently contracted a ten-year review of the effectiveness of crab rationalization[32] which was approved by the Council in 2016 (D. Stram, pers. comm.). Authors of the CR review concluded that the extent to which crab harvesting and processing capacity was reduced [since CR Program implementation] is measurable, and fairly objective when considered in terms of the number of vessels and processing facilities that have participated in CR program fisheries over time. ADFG also tracks the ex-vessel value of the fisheries they manage, and produce Annual Management Reports[33] that support the analysis. NPFMC, NMFS, and ADFG staff economists participate in the economic, social, and cultural evaluation and review process of fishery management recommendations, and their decisions are based on both biological and socioeconomic data collected and processed. Subsistence and community development programs are also taken into account while allocating funds. There are formal systems in place to assure the recovery of stocks that have been found to be exhausted. To prevent overfishing and rebuild depleted species, the Magnuson-Stevens Act section 304(e)(4)(A) and the National Standard Guidelines both require the establishment of a rebuilding plan. Rebuilding should occur as quickly as possible, considering the status and biology of any overfished fish stocks, the needs of fishing communities, recommendations from international organizations in which the US participates, and the interaction of the overfished fish stock with the marine ecosystem.
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 3 of the RFM Fishery Standard**

7.9.2 Section B. Science and Stock Assessment Activities

7.9.2.1 Fundamental Clause 4

4.	There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.
Summary of relevant changes:	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. The ADFG conducts an annual monitoring program to collect information on retained catch, bycatch/discards, and crab bycatch/discards in all BSAI directed crab fisheries, as well as crab bycatch/discards in all groundfish fisheries. These monitoring and observer programs, taken together, provide the foundation for a reliable annual estimate of total removals from all crab stocks for assessment and management reasons. In each yearly stock assessment, complete and trustworthy statistics on catch and fishing effort are produced and subjected to rigorous statistical analysis. The findings of the research have been used to create management objectives, reference

[31] https://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/crab.php
[32] https://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/Crab10yrReview_Final2017.pdf
[33] http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2016-2017/statewide/WR3_FMR17-10.pdf

4.	There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.
	points, and performance standards, as well as for annual adjustment of allowable catch levels. Historical and most recent data are available in the 2020 crab stock assessments [34][35]. 4.2. An observer scheme designed to collect accurate data for research and support compliance with applicable fishery management measures shall be established. To collect accurate data for research and assist compliance with appropriate fishery management measures, a program of at-sea and dock-side observers has been established[36]. Historical and most recent data are available in the 2020 crab stock assessments. 4.3. Management entities shall make data available in a timely manner and in an agreed format in accordance with agreed procedures. The information gathered in steps 4.1 and 4.2 above is made available in order to conduct annual assessments of all BSAI crab stocks. At the federal and state levels, policies and processes are in place to ensure the confidentiality of data submitted to and collected by workers and contractors. Only authorized users have access to confidential data[37][38]. 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. Federal and state agencies, as well as business organizations that support national policy on fish as food, actively promote research into all areas of seafood utilization. Dedicated research has yielded extensive information of the BSAI crab fishery' economic, social, marketing, and institutional elements. The annual collection and analysis of pertinent data serves as the foundation for continuous fisheries monitoring, analysis, and policy formation. The most up-to-date data may be found in the 2019 socioeconomic evaluation of these fisheries.[39]. 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 acquired through continual opportunities for public/community participation into the fisheries management process, ensuring that it is applied to sustainable fisheries conservation, management, and development. 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. NA 4.8. States shall promote the adoption of uniform guidelines governing fisheries research conducted on the high seas. NA

[34] http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS14-49.pdf
[35] https://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/#currentcrab
[36] https://www.fisheries.noaa.gov/webdam/download/100373573
[37] https://www.st.nmfs.noaa.gov/st1/recreational/documents/Intercept_Appendices/Appendix%20M%20031408%20NOAA%20administrative%20order%20216-100.pdf
[38] http://www.adfg.alaska.gov/FedAidPDFs/SP12-14.pdf
[39] https://meetings.npfmc.org/CommentReview/DownloadFile?p=56dfdaec-02d5-4b22-a24f-e9d0d2af0c4f.pdf&fileName=D7%20Crab%20Economic%20SAFE%202019.pd

4.	**There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.**
	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. NA
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 4 of the RFM Fishery Standard**

7.9.2.2 Fundamental Clause 5

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.**
Summary of relevant changes:	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. There is a well-organized institutional framework in place for doing the necessary research for fishery management. The NPFMC and the BOF jointly manage the BSAI crab fishery under the Fishery Management Plan (FMP).[40] An annual stock assessment and fisheries evaluation (SAFE) report is one of the FMP's requirements. The SAFE report includes a detailed description of the data and methodology used in the stock assessment, any changes in approaches, the estimated stock status 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 for each stock/fishery. When uncertainty is high, stock status criteria employed in the assessment of BSAI crab stocks ensure more precautionary methods to managing fisheries. There are no small-scale or low-value crab fisheries in the BSAI. Nonetheless, each stock's assessment technique and degree of reliability differs. These stocks' status determination criteria are derived using a five-tier system that accounts for varying levels of information uncertainty. As new scientific knowledge becomes available, the five-tier system incorporates it and provides a means to continuously enhance the status determination criteria. There are well-established institutions with trained personnel conducting research on all aspects of fishing. The results are made available as needed to ensure that the most up-to-date scientific evidence is used to conserve, manage, and develop fisheries. The Alaska Fisheries Science Center (ASFC) is the NMFS Alaska Region's research arm.[41] 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) Division[42] consists of scientists from a variety of disciplines whose mission 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, as well as to look into ways to reduce bycatch, bycatch mortality, and fishing-related habitat damage.

[40] http://www.fakr.noaa.gov/npfmc/fishery-management-plans/crab.html
[41] http://www.afsc.noaa.gov/
[42] http://www.afsc.noaa.gov/race/default.php

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.**	
		Resource Ecology and Fisheries Management (REFM) Division conducts research and data collection to support an ecosystem approach to management of fish and crab resources[43]. 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) Program[44] 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. The ability to assess and monitor the effects of climate or environmental change on BSAI crab stocks and ecosystems, as well as the state of these stocks and the repercussions of ecosystem changes caused by human activities, is well established. For stock assessment scientists, fisheries management, and the general public, annual Ecosystem SAFE publications provide a brief summary of the status of Alaska's marine ecosystems. It provides thorough information and updates on the state and trends of ecosystem components, as well as early indicators of direct human influences that may require management intervention or evidence of the efficacy of earlier management measures.[45] 5.3. Management organizations shall cooperate with relevant international organizations to encourage research in order to ensure optimum utilization of fishery resources. International partnership and cooperation stimulate research to enable the best possible use of BSAI crab resources. The results of BSAI crab stock research are regularly published in peer-reviewed journals and presented/discussed at important international conferences and symposia[46]. Scientists participate in meetings of different organizations involving attendees from various countries, including, for example, the North Pacific Marine Science Organization (PICES)[47], 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 programs to improve understanding of the biology, environment and status of trans-boundary aquatic stocks. Although the BSAI crab is not a trans-boundary species, the US and Russia share numerous important stocks of living marine resources in the North Pacific Ocean and Bering Sea, making coordination of conservation and management activities between the two countries critical. The "Agreement Between the Governments of the United States of America and the Government of the Union of Soviet Socialist Republics on Mutual Fisheries Relations," which established the US-Russia Intergovernmental Consultative Committee, was signed on May 31, 1988.[48] The Agreement's major goal is to maintain a beneficial fisheries partnership between the two countries. The US and Russia collaborate on scientific research, consult on fisheries issues outside of their EEZs and outside the EEZs of any third party to ensure effective conservation and management, and work together to combat illegal, unreported, and unregulated (IUU) fishing. The United States and Russia signed a Joint Statement on Enhanced Fisheries Cooperation on April 29, 2013, reaffirming

[43] http://www.afsc.noaa.gov/refm/default.php
[44] http://www.afsc.noaa.gov/HEPR/default.php
[45] http://www.afsc.noaa.gov/ABL/Habitat/ablhab_contaminants.htm
[46] http://www.pmel.noaa.gov/foci/publications
[47] http://www.pices.int/
[48] http://www.nmfs.noaa.gov/ia/agreements/bilateral_arrangements/russia/us-russia.html

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.
	the 1988 Agreement while focusing future cooperation on combating IUU fishing, collaborating on Arctic fisheries science and management, and advancing conservation efforts in the Ross Sea region of Antarctica. 5.5. Data generated by research shall be analyzed and the results of such analyses published in a way that ensures confidentiality is respected, where appropriate. The results of BSAI crab fisheries data analysis, which are generated both through commercial fisheries data collection programs and research surveys and other research programs, are published in program reports, and the annual SAFE report describes how the various datasets have contributed to the assessment of stock status. NOAA/National Marine Fisheries Service administrative order 216-100 establishes policies and procedures for safeguarding the confidentiality of data provided to and acquired by the agency. 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 nondisclosure statement affirming their understanding of NMFS obligations regarding confidential data, as well as the penalties for unauthorized use and disclosure. Contractors collecting data with Federal authority must follow all processes that apply to Federal personnel. 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.
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 1 of the RFM Fishery Standard**

7.9.3 Section C. The Precautionary Approach

7.9.3.1 Fundamental Clause 6

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.
Summary of relevant changes:	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. For the management of BSAI crab fisheries, safe target reference points have been devised. The following stock status definitions can be found in the Crab FMP[49]: 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. The annual catch limit (ACL) is the yearly catch level of a stock that is used to trigger accountability measures. The ACL for EBS crab stocks will be set at the ABC. The total allowable catch (TAC) for a stock is the annual catch objective set for the directed fishery in line with section 8.2.2 of the FMP to avoid exceeding the ACL for that stock. The preseason predicted level of allowed fish harvest that will not threaten the fish stocks' long-term output is referred to as the guideline harvest level (GHL). A GHL can be stated as a range of authorized crab harvests for each registration area, district, sub district, or sector [50].Under current ecological and environmental conditions, the maximum

[49] http://www.fakr.noaa.gov/npfmc/fishery-management-plans/crab.html
[50] http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareaaleutianislands.shellfish#management

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.**

sustainable yield (MSY**)** is the biggest long-term average catch or yield that may be obtained from a stock or stock complex. MSY is calculated based on the most up-to-date data. The OFL represents the maximum sustainable yield for crab stocks (MSY). FMSY control rule refers to a harvest technique that, if applied, should yield a long-term average catch that approximates MSY. When a rebuilding plan is needed, the minimal criteria for a rebuilding target is BMSY stock size, which is the biomass that results from fishing at constant FMSY.

Annual biomass estimations are compared to the set MSST to evaluate if a stock is overfished. If the biomass falls below the MSST (or proxies) for stocks where MSST (or proxies) are defined, the stock is deemed overfished.
Any amount of catch in excess of the overfishing level is defined as overfishing (OFL). The OFL is calculated using the FOFL control rule and abundance estimates. Crab stock status determination criteria are calculated annually using a five-tier system that accounts for changing levels of information uncertainty. Section 304(e)(3)(A) of the Magnuson-Stevens Act, as amended, requires the NPFMC to quickly stop overfishing and restore affected stocks if overfishing occurs or the stock is overfished.
.
The MSA also mandates that Fishery Management Plans (FMPs) include accountability measures to prevent ACL violations and to remediate any ACL violations that do occur. Seasonal, area, and gear allocations, restricted areas, bycatch limits, in-season fisheries closures, gear restrictions, limited entrance, catch shares, and observer and vessel monitoring requirements could all be used as accountability measures. All of these techniques are intended to enable for close monitoring of catch levels from all sources, as well as the rapid response to specific bycatch issues and the creation of a database for assessing the potential effects of future management activities.

Individual fishing quotas (IFQs) and efforts to ensure IFQs are not exceeded, measures to limit bycatch in directed crab fisheries, and monitoring and catch accounting measures are among the specific accountability measures utilized by the BSAI crab FMP to prevent the ACL from being exceeded. Furthermore, if the ACL was exceeded in the preceding fishing year, the ACL and TAC were decreased.

Supporting Clause 6.3
Note as this Clause has scored less than Full Conformance it has been scored in full.
Data and assessment procedures shall be installed measuring the position of the fishery in relation to the reference points. Accordingly, the stock under consideration shall not be overfished (i.e. above limit reference point or proxy) and the level of fishing permitted shall be commensurate with the current state of the fishery resources, maintaining its future availability, taking into account that long term changes in productivity can occur due to natural variability and/or impacts other than fishing.

Evidence Rating:	Low ☐	Medium ☐		High ☐
Non-	Critical ☐	Major ☐	Minor ☐	None ☐

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.

Evidence:

The SSC reviewed the SAFE chapters and information provided by the CPT with respect to the stock status information from 2020/2021 and relative to total catch during the 2020-2021 season (Figure 1). In addition, Table 10 contains the SSC recommendations for 2020/2021 catch specifications, with maximum permissible ABCs for 2020/2021 shown in Table 11.

The SSC endorsed all OFL and ABC recommendations of the CPT. St. Matthew Island blue king crab and Pribilof Islands blue king crab are overfished; none of the other crab stocks were overfished or approaching overfished status. None of the crab stocks were subject to overfishing.

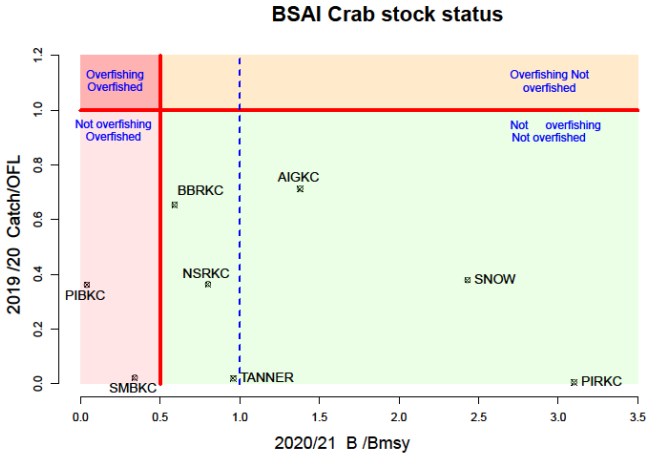

Figure 1. Status of Bering Sea crab stocks in 2019 in relation to status determination criteria (BMSY, ½ BMSY, OFL).

Table 10. Summary recommendations for each BSAI crab stock from the final 2020 SAFE.

SAFE Chapt.	Stock	Tier	F_{OFL}	B_{MSY} or $B_{MSYproxy}$	B_{MSY} basis years[1]	2020/21[2] MMB	2020/21 MMB / MMB_{MSY}	γ	Natural Mortality (M)	2020/21 [3] OFL	2020/21 ABC[3]	ABC Buffer	Add'l 2020 Buffer[4]
1	E. Bering Sea snow crab	3a	1.65	113.7	1982-2019 [recruitment]	276.7	2.43		0.34 (mat.fem) 0.36 (imm.). 0.36 (mat.male)	184.90	92.5	25%	25%
2	Bristol Bay red king crab	3b	0.16	25.4	1984-2019 [recruitment]	14.93	0.59		0.18	2.14	1.61	20%	5%
3	E. Bering Sea Tanner crab	3b	0.93	36.62	1982-2018 [recruitment]	35.31	0.96		0.32 (mat.fem) 0.24 (imm.) 0.29 (mat.male)	21.13	16.90	20%	0%
4	Pribilof Is. red king crab	4a	0.21	1.73	2001-2018 [MMB]	6.43	3.72	1	0.18	0.86	0.65	25%	
5	Pribilof Is. blue king crab	4c	0.18	4.11	1980/81-1984/85 & 1990/91-1997/98 [MMB]	0.175	0.04	1	0.18	0.00116	0.00087	25%	
6	St. Matthew blue king crab	4c	0.047	3.34	1978-2019 [MMB]	1.12	0.34	1	0.18	0.05	0.04	25%	0%
7	Norton Sound red king crab	4b	0.141	2.07	1980-2019 [MMB]	1.66	0.80	1	0.18	0.13	0.10	25%	
8	Aleutian Is. golden king crab	3a	EAG (0.61) WAG (0.56)	11.82	1987/88-2012/13	14.77	1.25		0.21	4.798	3.599	25%	
9	Pribilof Is. golden king crab	5	-	-	See intro chapter	-	-	-	-	0.093	0.070	25%	
10	W. Aleutian Is. red king crab	5	-	-	1995/96-2007/08	-	-	-	-	0.056	0.014	75%	

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.**

Table 11. Maximum permissible ABCs for 2020/21 and SSC recommended ABCs for three stocks where the SSC recommendation is below the maximum permissible ABC, as defined by Amendment 38 to the Crab FMP. Values are in thousand metric tons (kt).

Stock	Tier	2020/21 *Max* ABC	2020/21 ABC
EBS Snow Crab[1]	3	184.2	92.5
Bristol Bay RKC[2]	3	2.13	1.61
Tanner Crab[3]	3	20.87	16.90
Pribilof Islands RKC[1]	4	0.857	0.648
Pribilof Islands BKC[4]	4	0.00104	0.00087
Saint Matthew BKC[2]	4	0.05	0.04
Norton Sound RKC[2]	4	0.129	0.10
Aleutian Islands GKC[2]	3	4.773	3.599
Pribilof Islands GKC[4]	5	0.092	0.070
Western Aleutian Islands RKC[4]	5	0.056	0.014

Updates on SMBKC

In June 2020 the Council took final action to adopt a rebuilding plan for St Matthew Island blue king crab and recommend a preferred alternative for Secretarial Action (Alternative 2/Option 2) that is projected to rebuild the stock within the time required under the Magnuson-Stevens Act's National Standard 1, while also providing affected communities with the possibility of directed harvest during rebuilding.

The rebuilding timeframe for the Council's preferred alternative is expected to be protracted (25.5 years), mostly due to the low recruitment that could occur if current, unfavorable ecosystem conditions continue. Environmental stressors affecting survival and recruitment are considered to be the dominant factors in the decline of the stock and in stock recovery, rather than directed fishing or bycatch, and the possibility exists that rebuilding may never occur.

If conditions improve so that the fishery can be opened under the Council's preferred alternative, stock biomass would have to have recovered to a minimum threshold (50% of the average 1978-2012 biomass) as specified in the State of Alaska's St Matthew Island blue king crab harvest strategy.

Every two years during rebuilding, progress on stock recovery will be reported by NMFS to the Secretary of Commerce. Additionally, directed harvest (if it occurs), bycatch, and ecosystem conditions will be monitored throughout rebuilding so that the contributions of these factors to rebuilding progress can be assessed.

The Council was notified that the stock was overfished in October 2018, which started a two-year process for implementing a rebuilding plan. Initial review occurred at the December 2019 Council meeting, and final action at this meeting will allow implementation to occur before the October 22, 2020 deadline

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.**	
		In October 13 2020 The National Marine Fisheries Service (NMFS) announced the approval of Amendment 50 to the Fishery Management Plan (FMP) for Bering Sea/Aleutian Islands (BSAI) King and Tanner Crabs (Crab FMP) (Amendment 50). Amendment 50 adds a new rebuilding plan for St. Matthew blue king crab (SMBKC) to the Crab FMP. The objective of this amendment is to rebuild the SMBKC stock. In the 2nd surveillance assessment of the certified BSAI crab fisheries conducted in 2018, the assessment team found that the St. Matthew Island Blue King Crab unit of certification was not in conformity with RFM Supporting Clause 6.3 because NMFS had determined that the SMBKC stock was "overfished". A minor non-conformity was raised and the fishery client prepared a corrective action plan that was accepted by the assessment team, as documented in the 2nd surveillance report. During the present surveillance assessment (the 4rth surveillance audit), the stock status of SMBKC was found to be unchanged from 2019. That is, the 2020 SAFE report indicates that SMBKC continues to be designated as overfished (Palof et al., 2020). For this reason, the assessment team has again assigned a confidence level of "medium" to RFM Supporting Clause 6.3 and the minor non-conformity remains open. Progress by the client in implementing the agreed upon corrective action plan to resolve the NC is described below further in Section 9 of this report. Update on Corrective Action Plan – for minor non-conformances in St. Mathew Island Blue King Crab. Ref: fm13/AK/CRA/2017.

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.**

Date: October 10, 2021

From: Bering Sea Crab Client Group (BSCCG) *[BSCCG is wholly owned subsidiary of BSFRF]*
Mr. Scott Goodman (Executive Director)
Bering Sea Fisheries Research Foundation (BSFRF)
4039 21st Avenue W, Suite 404
Seattle, WA 98199

To: Dr. Ivan Mateo, Ph.D
Fisheries Assessment Officer
3rd Floor, Block 3
Quayside Business Park
Mill Street, Dundalk
Co. Louth, Ireland

RE: Preliminary **Corrective Action Plan** – for minor non-conformances in the St. Matthew Blue King Crab Unit of Assessment. Ref: AK/CRA/002.2/2018
(Conducted as part of U.S. Alaska Bering Sea and Aleutian Islands King, Tanner, and Snow Crab Commercial Fisheries – Re and Full Assessments, 2020/21

Dear Dr. Mateo,

Please find this summary below to be our response to the approved corrective action plan which we submitted as part of ongoing surveillance and certification work over the last two years in response to our Corrective Action Plan (04-05-19, and 04-06-20). The St. Matthew Blue King Crab (SMTBKC) continues in its official "overfished" status, and our updates for the three action items are below for your review. Updates for the three areas; rebuilding plan progress, stock assessment refinement, and incidental bycatch monitoring and reporting, are generally built into parts of the normal NPFMC-CPT-SSC process and the MSA requirements for monitoring of a stock in an overfished status.

Action Plan Item 1: Support of and Attention to St. Matthew Blue King Crab Rebuilding Plan

Since our last update, the official rebuilding plan has been reviewed and adopted as an official amendment (Amendment 50) into the Bering Sea king and Tanner crab Fishery Management Plan (FMP) and is currently part of the normal status review activities. The primary objective of this plan is to rebuild the St. Matthew blue king crab stock, and currently the projected time for rebuilding is 25.5 years which takes into account the biology of the species and the current environmental conditions. This comports with MSA guidelines to rebuild within a time as short as possible. It is important to note that the rebuilding plan will allow directed fishing pursuant to the State of Alaska harvest strategy. However, the State's harvest strategy is more conservative than the FMP's control rule parameters for the stock because, under the harvest strategy, directed fishing is prohibited at or below a larger biomass level than under the FOFL control rule (Crab SAFE Intro, Figure 1). Throughout the rebuilding plan for SMBKC, several sources of information will be maintained to facilitate the determination of adequate progress. The primary survey providing information on abundance and biomass densities comes from the National Ocean and Atmospheric Administration (NOAA) Bering Sea summer shelf surveys. The 2021 survey was cancelled due to COVID-19 pandemic logistical difficulties. The 2021 NMFS survey was completed and survey estimates reflect a legal male biomass of 1,426 (t) which is below the long term average. Further 2021 survey results by size and sex category show continuing downward trends.

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.**

Fishing mortality is not considered to be the primary constraining factor for SMBKC. The groundfish fisheries incur low levels of bycatch of SMBKC (covered more below), but in analytical projections, average bycatch rates had no constraining effect on rebuilding. Instead, rebuilding will depend on successful recruitment of crab under ecosystem conditions that have recently been very unfavorable. Warm bottom temperatures, low pre-recruit biomass, and northward movement of predator species, primarily Pacific cod, have constrained stock growth. For this reason, the rebuilding plan aims to maintain existing low levels of fishing mortality with the hope that future ecosystem conditions will support SMBKC stock growth. We will report at the next update on the Council's official actions and subsequent steps.

Action Plan Item 2: Support of and Participation in SMBKC Stock Assessment – GMACs Support

The Generic Models for Alaskan Crab (GMACs) program was originally initiated by a collaboration of the stakeholder group BSFRF which has client ownership of BSCCG. The generic project has since broadened and been renamed Generic Models for Assessment of Crustaceans (GMACs). The SMBKC stock has been the first of the Alaskan stocks to utilize and rely on GMACs for approved management action. We have been attentive to the utility provided by GMACs to SMBKC stock status evaluation and concur with the stock assessment scientists and current high level of concern. Moreover, we would note that our support and funding of portions of the GMAC project have led to the current level of review and precaution in managing this stock. The stock was last assessed by the CPT in September 2020 with the SSC and NPFMC recommending OFL and ABC specifications for the 2020/21 crab season that were low. The CPT recommended and the SSC approved that this stock be moved to a biennial cycle for assessment, and 2021/22 crab season specifications were carried over.

As we noted in our last update, the SMBKC stock is assessed, as it has been since 2016, using the GMACS model, which is now a standardized modeling framework that has been reviewed extensively by crustacean stock assessment authors in Alaska. As of 2019 the NPFMC crab plan team and SSC has approved this model for use with two other stocks, and is encouraging stock assessment authors for the additional stocks to migrate to this modeling framework in the near future. We will continue to report as part of action plan updates on the continued status of GMACs for STMTBKC management.

Action Plan Item 3: Record Keeping & Reporting for SMBKC Stock – Bycatch Monitoring

We are reporting no substantial SMBKC bycatch activity occurring in crab or non-crab fisheries in the SMBKC management area. Further, we would note again that no SMBKC directed fishery has occurred over the last several seasons. Consistent with our prior updates, we report again that management summaries indicate that the only SMBKC bycatch from directed crab pot fishing comes during snow crab fishing, has been negligible for the last several years, and is expected to be even lower given the very small recently announced opilio fishery. We also report again, the CPT and SSC note that bycatch overall does not appear to be a significant driver in stock status review, but is importantly considered for its influence in rebuilding plan options –the continuing close review of bycatch in other fisheries, at its current levels, is insignificant and does not influence the rebuilding time for this stock.

Please let me know if there are further questions you may have at this time.

Sincerely,
BERING SEA CRAB CLIENT GROUP LLC

SMBKC Corrective Action Plan Update
BSCCG 10/10/21 Page 2

References:	
Statement of consistency to the RFM Fishery Standard	**The fishery does NOT continue to conform to the requirements of Fundamental Clause 6 of the RFM Fishery Standard**

7.9.3.2 Fundamental Clause 7

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.**
Summary of relevant changes:	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. To conserve BSAI crab resources and preserve their ecosystem, the precautionary approach is used in their conservation, management, and exploitation. The MSA mandates the creation of FMPs for all federally managed and regulated fisheries. OFL (MSY) is seen as an upper limit rather than a target by the NPFMC. To account for the risks involved in calculating MSY, catches are in line with the TAC and substantially below the OFL. The precautionary approach, as used in the management of BSAI crab fisheries, takes into account uncertainties about stock size and productivity, 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 social factors. Of note, in March of 2019 the BOF approved a state harvest strategy for Aleutian Islands Golden King Crab (Daly et al., 2019a, b). 7.2. For new and exploratory fisheries, procedures shall be in place for promptly applying precautionary management measures, including catch or effort limits. NA: there are no new and exploratory species
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 7 of the RFM Fishery Standard**

7.9.4 Section D. Management Measures

7.9.4.1 Fundamental Clause 8

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.**
Summary of relevant changes:	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 procedures have been put in place to preserve the long-term viability of BSAI crab resources at levels that promote optimum usage, based on verifiable and objective scientific, traditional, fisher, and community sources. The NPFMC's fishery management plan (FMP) for BSAI crab stocks provides stock status definitions, a five-tier approach for determining stock status, and a step-by-step framework for setting final overfishing levels (OFLs) and permissible biological catches (ABCs). According to the MSA, the NPFMC's Science and Statistical Committee (SSC) develops scientific benchmarks, and the Council recommends quotas based on these benchmarks. This division of

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.**	
		responsibility is an important step toward ending overfishing and improving the recovery of overfished stocks. The cost-effectiveness and social impact of potential conservation and management approaches for BSAI crab fisheries are taken into account while evaluating them. The NMFS AFSC's Resource Ecology and Fisheries Management (REFM) Division runs a research program to support an ecosystem approach to managing BSAI crab stocks, which includes examining climate and environmental changes, as well as a socio-economic program that includes evaluating economic impacts of fisheries rationalization programs and compiling and evaluating socio-cultural data on BSAI crab stocks. Economic and ecosystem assessments evaluate how fish stocks, ecosystem relationships and user groups might be impacted 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 crab resources. 8.3. States shall seek to identify domestic parties having a legitimate interest in the use and management of the fishery. The Crab Rationalization program identified all domestic parties with a genuine interest in the use and management of BSAI crab fisheries, and the impact of the CR Program on these parties has been studied over time (see Weidlich and Downs 2016[51].) Indigenous peoples' traditional customs, needs, and interests are recognized, as are the interests of local fishing communities. All relevant parties will be consulted to secure their cooperation in attaining responsible fisheries. The process of identifying domestic par ties having a legitimate interest in a fishery is still a top priority for the Council, according to recent activities. For example, during drafting of the Rebuilding Plan for Saint Matthew Island Blue King Crab (NPFMC 2019)[52], those domestic parties with a legitimate interest in the SMBKC fishery were identified as part of the Council's socio-economic analysis to determine impacts of proposed alternative actions. 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 have been put in place to restrict capacity to levels that are compatible with the long-term sustainability of BSAI crab resources. The capacity of the fleet has been determined and is being closely monitored. All fishing activities have statistics updated on a regular basis, and a record of all fishing authorizations is kept. Crab fisheries managed by the BSAI are rationalized and have a limited number of participants. Since 2002, the number of fish caught has decreased. The remaining vessel ownership has tended to accumulate in fewer and larger towns as a result of the fleet consolidation that accompanied the rationalization. (See NPFMC 2017: Ten-Year Program Review for the Crab Rationalization Management Program in the Bering Sea/ Aleutian Islands[53]). The crab fleet capacity

[51] https://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/AppendixA-SocialimpactAssessment.pdf
[52] https://meetings.npfmc.org/CommentReview/DownloadFile?p=c45c58ad-ec18-44f2-abc5-95ed49be1fd1.pdf&fileName=C6%20SMBKC%20Rebuilding%20Initial%20Review%20Analysis.pdf
[53] https://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/Crab10yrReview_Final2017.pdf

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.**	
		has been fixed since 2006 and participation has been continuously monitored by NMFS's Restricted Access Management Program (RAM)[54] and the Alaska Commercial Fisheries Entry Commission (CFEC).[55] 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. In BSAI crab fisheries, measures are in place to limit the size of crabs that can be kept, mandate escape systems to safeguard undersized and female crabs, establish closed seasons and closed zones, and set aside areas for local, aboriginal fishing.[56] The BSAI crab FMP gives the state the authority to change size limitations in accordance with state rules. Biological considerations are typically utilized to create minimum legal size limitations in order to meet conservation goals. Female crabs cannot be seized unless a surplus is confirmed to be available. Crabs are protected during the molting and mating stages of their life cycle by fishing seasons. Closed seasons have been established to maximize crab populations' reproductive capacity. Because of the significant death rates that can be imposed on nonlegal crab, the FMP specifically restricts the use of trawls and entangle net gear for crab catching. In the BSAI crab fisheries, pots and ring nets are the only allowed commercial gear. FMPs must describe and identify Essential Fish Habitat (EFH), minimize the adverse effects of fishing on EFH to the degree practical, and identify alternative actions to maintain and enhance EFH. The BSAI crab FMP describes crab EFH and contains ecological and biological needs for each stage of the species' life cycle. 8.6. Fishing gear shall be marked. Gear used in BSAI crab fisheries must be marked so the owner can be identified (5 AAC 34.051.King crab gear marking requirements; 5 AAC 35.051 Tanner crab gear marking requirements)[57]. 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 have been put in place to detect and safeguard depleted and threatened resources, as well as to assist their long-term recovery/restoration. In addition, measures have been put in place to ensure that resources and habitats vital to the well-being of BSAI crab resources have been restored after being harmed by fishing or other human activity. 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.

[54] http://www.fakr.noaa.gov/ram
[55] http://www.cfec.state.ak.us/
[56] http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2017-2020_cf_king_tanner_crab.pdf
[57] http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2017-2020_cf_king_tanner_crab.pdf

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.**
	For each federal activity that may have a major impact on the quality of the human environment, the The National Environmental Policy Act (NEPA)[58] requires the development of an Environmental Impact Statement (EIS). NEPA is a thorough procedure that establishes checks and balances against environmental changes that may have an impact on ecosystems, natural processes, and the socioeconomic sphere of fisheries. The EIS Database[59] contains thorough information on EISs that address the potential implications of government action on Alaska's resources and habitats. requires preparation of an Environmental Impact Statement (EIS) for any federal action that may significantly affect 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. There are formal systems in place to assure the recovery of stocks that have been found to be exhausted. To prevent overfishing and rebuild depleted species, the Magnuson-Stevens Act section 304(e)(4)(A) and the National Standard Guidelines both require the establishment of a rebuilding plan. Rebuilding should occur as quickly as possible, taking into account the status and biology of any overfished fish stocks, the needs of fishing communities, recommendations from international organizations in which the US participates, and the interaction of the overfished fish stock with the marine ecosystem. There is indication that the MSA-mandated protocols for dealing with decreased stocks are being followed in the BSAI crab fisheries. In response to NMFS's notice in October 2018 that the population was overfished, the Council has created a draft rebuilding plan for SMBKC[60]. . For the past three years, the commercial fishing on the SMBKC stock has been closed, and bycatch in fixed gear fisheries has been the main source of SMBKC fishery mortality (bycatch for 2018/19 was 2,553 kg[61]. SMBKC is now considered a BSAI prohibited species and, as such, prohibited species catch (PSC) data for SMBKC are reported weekly on the NMFS website[62] to safeguard against overfishing. 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 must use gear and technology that have been proven to be environmentally safe, cost effective, and sufficiently selective to reduce non-target species catch, waste, and discards, as well as gear and practices that increase escaping fish and crab survival rates. For a long time, the use of highly selective pots to reduce unwanted catch of target species as well as bycatch of non-target species, as well as the development of handling practices to reduce rejected catch mortality, have

[58] https://www.epa.gov/nepa/national-environmental-policy-act-review-process
[59] https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/search;jsessionid=0875ED9C2F29B516C92603E60A7D62EF?search=&__fsk=-1062329806#results
[60] https://meetings.npfmc.org/CommentReview/DownloadFile?p=c45c58ad-ec18-44f2-abc5-95ed49be1fd1.pdf&fileName=C6%20SMBKC%20Rebuilding%20Initial%20Review%20Analysis.pdf
[61] https://meetings.npfmc.org/CommentReview/DownloadFile?p=735d3abb-51ad-4601-9ca2-3c9251264648.pdf&fileName=C4%20CPT%20Report%20Sept%202019.pdf
[62] https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports#bsai-prohibited-species

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.**	
	been significant parts of the management of BSAI crab fisheries. There has been extensive investigation into every area of gear performance and discard mortality. Discards are recorded by on-board observers in all fisheries and estimates of total discard mortality are factored into overall fishery removals. This has offered a strong incentive to reduce the amount of undesirable catch to the greatest extent possible. Their records show that legal crab of the target species dominates captures, with significantly lesser amounts of other species.[63] To reduce the loss of gear and the ghost fishing consequences of lost or abandoned gear, pollution, and waste, BSAI crab fisheries have designed and implemented selective, environmentally safe, and cost-effective fishing gear and practices. After the BSAI crab fisheries were rationalized, the number of participating vessels fell, resulting in a slower-paced fishery with lower rates of lost fishing gear and longer soak times, giving undersized and female crab more chance to escape. Crabbers are making pots with broader web on the panels to let female and juvenile crabs out before the gear is dragged back. State regulations[64] require crab pots have escape rings and other mechanisms to minimize the potential for ghost fishing. Prior to each fishing season, the ADFG inspects pots and vessel holding tanks. Alaska Wildlife Troopers (AWT) enforce all restrictions at sea, and the ADFG's on-board observer program collects information that can be used for enforcement. There is no proof that gadgets were used to get around the intent of the gear regulations. Professional associations and the licensing system provide harvesters with information on new gear developments and any corresponding regulatory requirements. Prior to their introduction, new fishing technologies (i.e., new fishing gear, tactics, and operations) are thoroughly evaluated to determine their potential for disrupting BSAI crab habitats and ecosystems. Any commercial-scale introduction of a novel fishing method would have to go through a thorough evaluation process before coming live, as well as demonstrate regulatory compliance and be subject to continued monitoring. Since the re-assessment, no new fishing technology relevant to BSAI crab fisheries have been recorded. 8.14. Policies shall be developed for increasing stock populations and enhancing fishing opportunities through the use of artificial structures. NA	
References:		
Statement of consistency to the RFM Fishery Standard		**The fishery continues to conform to the requirements of Fundamental Clause 8 of the RFM Fishery Standard**

[63] http://www.adfg.alaska.gov/FedAidPDFs/FDS14-49.pdf
[64] https://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2017-2020_cf_king_tanner_crab.pdf

7.9.4.2 Fundamental Clause 9

9.	**Fishing operations shall be carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations.**
Summary of relevant changes:	9.1./9.2./9.3. Education and training programs. Fishermen can take use of advanced education and training programs to improve their abilities and professional certifications.[65],[66],[67] At the Federal level, NOAA has formulated a plan to implement the FAO CCRF across all US fisheries (NMFS 1997)[68]. The plan, recently updated (NMFS 2012)[69], includes objectives for education, safety and training of fishers. As part of their required education and training, all those involved in BSAI crab fishing operations are given 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. United Fishermen of Alaska (UFA) and Alaska Fisheries Development Foundation (AFDF) released a study in 2019 that details the documents and permissions required for commercial fishing in Alaska.[70] 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.[71],[72]
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 9 of the RFM Fishery Standard**

7.9.5 Section E. Implementation, Monitoring and Control

7.9.5.1 Fundamental Clause 10

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.**
Summary of relevant changes:	10.1. Enforcement agencies and framework: Between the USCG and the AWT, there is a coordinated effort focusing on at-sea enforcement. Both state and federal laws must be enforced under combined supervision, and both state and federal agents actively perform at-sea enforcement. The USCG is in charge of enforcing the major federal vessel rules, such as safety at sea, narcotics enforcement, vessel compliance with ESA and EFH requirements, and ensuring that federal permits, observer coverage, licenses, and VMS in the crab fisheries are all in order. AWT has vessels capable of conducting at-sea compliance with gear regulations, hauling and confiscating crab pots, sampling crab harvests at sea, ensuring that sex and size standards are satisfied, and ensuring that the vessels have all requisite state and federal licenses. Additionally, AWT, in collaboration with ADFG area biologists and technicians, inspects vessels dockside, conducts hold inspections, and monitors harvested crab offloads for compliance. The entire crab collection is carried out by American vessels in Alaskan seas. In Alaska's EEZ, no foreign fleets are permitted to fish. Crab regulations are primarily enforced at sea by the NMFS Office of Law Enforcement, which uses the US Coast Guard's at-sea platforms, and ashore by the NMFS Office of Law Enforcement and the

[65] http://www.avtec.edu/
[66] http://seagrant.uaf.edu/map/fishbiz/index.php
[67] http://amsea.org/
[68] https://repository.library.noaa.gov/view/noaa/3063
[69] https://repository.library.noaa.gov/view/noaa/4057/noaa_4057_DS1.pdf
[70] https://www.afdf.org/wp-content/uploads/Social-Responsibility-on-Vessels-in-Alaska-Med-Res-FINAL-2019-03-08.pdf
[71] http://www.fakr.noaa.gov/ram
[72] http://www.cfec.state.ak.us/

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.
	State of Alaska's Division of Wildlife Troopers (AWT). The AWT vessel E/V Stinson also undertakes at-sea enforcement, examining gear and catch for legal specifications. Alaska fisheries laws and regulations, particularly 50 CFR 679, are enforced by the United States Coast Guard (USCG) and the National Marine Fisheries Service (NMFS) Office of Law Enforcement (OLE). In 2020 Coast Guard units conducted 23 boardings on fishing vessels targeting crab throughout Alaska, 11 in the Bering Sea. Representatives from District 17's Commercial Fishing Vessel Safety division travelled to Dutch Harbor, AK prior to the crab opener to conduct courtesy safety exams and outreach. There was only 1 safety violation 10.2./10.3/10.4. Fishing permit requirements: According to federal laws, all vessels collecting BSAI crab must be approved and permitted to fish. Without explicit permission, fishing vessels are not permitted to operate on the resource in question. A Federal Crab Vessel Permit is required for all crab vessels participating in the BSAI rationalized crab fishery (FCVP). Owners of any vessel engaged in the rationalized crab fisheries (CR crab, including IFQ/IPQ fisheries; CDQ fisheries except Norton Sound king crab; and the Golden King Crab allocation to Adak) are required to submit an annual FCVP. SFP (Stationary Floating Processor), CPR (catcher-processor), and CAT (Catch-and-Transfer) are the three types of operation endorsements (catcher vessel). This permit has VMS and logbook reporting requirements. A copy of the permit must be carried on board any fishing vessel and must be available for examination by an authorized officer at any time. Vessels participating in directed fishing for LLP groundfish species in the GOA or BSAI, or fishing in any BSAI LLP crab fisheries, must have a Federal LLP license as of January 1, 2000. An original LLP license that is onboard the vessel must be used to name the vessel. 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. No foreign fleet is allowed to fish in the Alaska's EEZ. All fishing vessels must be at least 75% U.S. ownership.
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 10 of the RFM Fishery Standard**

7.9.5.2 Fundamental Clause 11

11.	There shall be a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations.
Summary of relevant changes:	11.1/11.2/11.3. Enforcement policies and regulations, state and federal: 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 (50 CFR 600.740 Enforcement policy)[73]: 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.

[73] https://www.law.cornell.edu/cfr/text/50/600.740

11.	There shall be a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations.
	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[74] 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. [75]In 2019, the NOAA policy was revised again This revised Policy included legislation passed and regulations promulgated since issuance of the 2014 Policy, in particular: • The Illegal, Unreported, and Unregulated Fishing Enforcement Act of 2015, Pub. L. 114-81, which implemented the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing and amended the enforcement provisions of a number of statutes administered by NOAA; and • The most recent adjustments to the maximum civil monetary penalties authorized under statutes administered and enforced by NOAA, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990 (see 83 Fed. Reg. 706 (January 8, 2018)). The effective date of this Policy is June 24, 2019. This Policy supersedes all previous guidance regarding the assessment of penalties or permit sanctions, and all previous penalty and permit sanction schedules issued by the NOAA Office of General Counsel. For significant violations, the NOAA attorney may recommend charges under NOAA's civil administrative process (see 15 CFR 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 (50 CFR 600.740 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.

[74] https://www.gc.noaa.gov/enforce-office3.html.
[75] https://www.gc.noaa.gov/documents/Penalty-Policy-CLEAN-June242019.pdf

11.	**There shall be a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations.**
	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/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 US 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
References:	
Statement of consistency to the RFM Fishery Standard	**The fishery continues to conform to the requirements of Fundamental Clause 11 of the RFM Fishery Standard**

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

7.9.6.1 Fundamental Clause 12

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.**
Summary of relevant changes:	Summary There is in place a robust fisheries management system that appropriately and adequately considers fishery interactions and effects on the ecosystem (NPFMC, 2011). The BSAI crab fishery management system is based on the best available science while allowing for inputs from fishery participants and other stakeholders including the provision of local and/or traditional knowledge. 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

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.**
	assessed and effectively addressed. Habitat protection areas, prohibited species catch (PSC) limits 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, and yellowfin sole 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 Final Environmental Impact Statement (NMFS, 2004), 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 annual EBS bottom trawl surveys, Pacific cod, Pacific halibut and skates are the primary predators of large or legal-sized crab although legal-sized crabs 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. <u>12.1 Assessment of environmental effects on target stocks and ecosystem</u> 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, 2020) and other species belonging to the same ecosystem (e.g., EBS Pacific Cod SAFE; Thompson *et al*., 2020). Ecosystem assessments for BSAI crab fisheries are updated annually in the BSAI Crab SAFE. In 2019, an Ecosystem and Socioeconomic Profile (ESP) was introduced for St. Matthew Blue King Crab stock (Fedewa et al., 2019). In 2020, ESPs were included for SMBKC and BBRKC stock assessments (Fedewa et al., 2020a, b). These ESP followed a new standardized framework for evaluating ecosystem and socioeconomic considerations, and may be considered a proving ground for potential operational use in main stock assessments. Additionally, the status of habitats and ecosystems are monitored within the broader framework of Alaska's large marine ecosystems and results are updated and published annually (e.g., Siddon, 2020). Collectively, these ecosystem assessments consider target stocks, associated or dependent species, and the relationship among populations in the ecosystem. In 2018, the Council approved the Bering Sea Fisheries Ecosystem Plan (NPFMC, 2019), thereby formalizing its commitment to ecosystem-based fisheries management (EBFM) of the Bering Sea. The Council has acknowledged that moving toward EBFM is an ongoing process and as new information or tools become available the Council will respond by improving the fishery management program. The BS FEP will serve as a framework for continued incorporation of ecosystem goals and actions in regional management. The BS FEP sits alongside the Fishery Ecosystem Plan already developed for the Aleutian Islands (NPFMC, 2007) and it augments ongoing efforts for monitoring ecosystems in the Alaska Region (e.g., Siddon and Zador, 2019; Siddon, 2020). <u>12.2 Research and Institutional capacity for environmental impact assessment</u> 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). Findings and conclusions are published in the Ecosystem section of the annual SAFE document (e.g., NPFMC, 2020), annual marine Ecosystem Status Reports (e.g., Siddon, 2020), and scientific journals (Punt *et al*., 2016; Duffy-Anderson *et al.*, 2017; Stevensen and Lauth, 2019; Murphy, 2020; Szuwalski *et al.*, 2020).

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	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 accounted for 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 ADFG, NMFS and NPFMC scientists. 12.3-6 Non-target catches, discards, and associated, dependent or endangered species 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, ADFG; pers. comm.). The majority of non-target catch taken in each of the five fisheries consists of FMP managed crab – mostly sub-legal males and females of the targeted species but also some quantity of non-targeted species of FMP crabs which are not retained. A limited number of groundfish, such as Pacific cod, Pacific halibut, and yellowfin sole, are caught in the directed pot fishery (Barnard and Burt, 2008; Gaeuman, 2014). 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). Such gear modifications are described in the Crab FMP (NPFMC, 2011). Gear restrictions are established in the Alaska Administrative Code (AAC)[76] as summarized in statewide commercial fishing regulations for King and Tanner crab (ADFG, 2020). ADFG has in place a mandatory observer program for BSAI crab fisheries (see Gaeuman, 2014). Non-target catches, including discards, of stocks other than the "stock under consideration" are monitored. ADFG maintains an observer database and provides relevant information to stock assessment authors. As part of the 4th surveillance audit, ADFG (M. Stichert, pers. comm.) provided the assessment team with a summary of bycatch for each of the stocks under consideration for the latest fishing season (2020/21 or the most recent year for which information was available). Review of these datasets indicate that the composition and level of bycatch is consistent with previous years. 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. Interviews with Council staff and scientists from other federal and state agencies confirmed that there had been no changes in the management of ETP species since the

[76] http://www.akleg.gov/basis/aac.asp?title=20
[77] https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act
[78] https://www.fws.gov/endangered/laws-policies/

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	previous audit and there were no reports of the crab fishery having unusual or adverse interactions with ETP species over that time frame. 12.7 Role of the stock under consideration in the ecosystem The role of BSAI crab stocks in the food web has been adequately considered. The King and Tanner crab stocks under assessment are not key prey species in BSAI ecosystems (Chilton et al., 2011). As in previous surveillance audits, this remains the consensus view among experts. 12.8 Pollution and MARPOL Laws and regulations based on the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) are in place and enforced. The US Senate ratified MARPOL and Congress implemented it by the Act to Prevent Pollution from Ships (APPS; 33 U.S.C. §§1905-1915) on October 21, 1980. The US EPA and USCG have established protocols for managing its enforcement[79]. 12.9 Knowledge of EFH and the potential for fishery impacts on EFH In accordance with requirements of the MSA, management agencies have knowledge of essential fish habitat (EFH) for the BSAI crab stocks under consideration. Crab EFH was described in Appendix F of the Crab FMP (NPFMC, 2011). FMP amendment 49, approved on May 31, 2018 (Final Rule: 83 FR 31340), updates the description and identification of EFH, and updates information on adverse impacts to EFH based on the best scientific information available (NOAA Fisheries, 2018). The potential for fishery impacts on is assessed through the EFH process. 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 2017, NFMS updated the five-year plan for EFH research in Alaska (Sigler *et al*., 2017) with the following priorities: 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. Specific objectives were to develop EFH Level 1 information (distribution) for life stages and areas where missing; and raise EFH level from Level 1 or 2 (habitat-related densities) to Level 3 (habitat-related growth, reproduction, or survival rates). NOAA staff have made significant progress towards these goals, adding data from 2015-2019 bottom trawl surveys to historical data going back to 1982, updated terrain and ROMS covariates, updated life stages and maturity schedules, refined methodology to use numerical abundance, advanced EFH for all models to Level 2 (abundance), and introduced Level 3 (vital rates). The next EFH 5-year review is scheduled for 2022. NMFS Alaska Regional staff gave an overview of the 2022 EFH 5-year Review Plan to the Crab Plan team, highlighting the EFH components that relate to crab (CPT, 2021). In addition, a recent report by the Alaska Regional Habitat Assessment Prioritization Team (McConnaughey et al., 2017) 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). 12.10 Research on environmental and social impacts of fishing gear 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.

[79] https://www.epa.gov/enforcement/marpol-annex-vi-and-act-prevent-pollution-ships-apps

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	The Council[80], AFSC[81] and the NPRB[82] all regularly produce or update lists of research priorities that focus on timely and important management concerns. Prioritization helps NMFS, NPRB and other research funding agencies focus their tight research funds to resolve topical fishery management issues (e.g., NPRB, 2018; NOAA Fisheries, 2018; NPFMC, 2021). 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. The Crab Plan Team regularly updates research priorities which are made available online via the NPFMC Research Priority Database[83]. Other organizations, including university researchers and industry groups[84], are also actively involved in relevant research on the environmental impacts of fishing gear on biodiversity, habitats, socioeconomics and ecosystems (Webb, 2014). 12.11 Outcome indicators and management objectives for non-target stocks There are outcome indicators for non-target stocks taken in the BSAI crab fisheries. 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). Evidence is reviewed below in relation to four categories of non-target stock: 1. Crab (FMP species); 2. Finfish; 3. Invertebrates; and 4. Seabirds. Crab Bycatch (crab FMP species) The largest component of bycatch in BSAI crab fisheries is crab (undersized, female, and non-target species). For the crab stocks under assessment, 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 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 (NPFMC 2020) compiled by ADFG, NMFS and NPFMC scientists. Annual NMFS bottom trawl surveys (Zacher *et al*., 2019) 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. Finfish Bycatch The ADFG observer program collects data to monitor bycatch in BSAI crab fisheries. Finfish - 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). These species are widely distributed and highly abundant representatives of the greater groundfish community. Pacific cod is managed by NPFMC as a Tier 3 stock in the Eastern Bering Sea (Thompson et al., 2020), yellowfin sole is managed as a Tier 1 stock in BSAI (Spies *et al*., 2020), and BSAI sculpin are managed by NPFMC as a species complex within Tier 5 (Spies et al. 2019). As such, there are outcome indicators whose explicit aim is to avoid overfishing. Similarly, outcome indicators (reference points) exist for

[80] https://www.npfmc.org/research-priorities/
[81] https://www.fisheries.noaa.gov/resource/document/2018-alaska-fisheries-science-center-priorities-and-annual-guidance
[82] https://www.nprb.org/nprb/about-the-science/
[83] https://research.psmfc.org/
[84] https://www.alaskaberingseacrabbers.org/

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	Pacific halibut, a species managed by the International Pacific Halibut Commission (IPHC). Halibut fisheries are closely monitored, heavily regulated, and the resource is currently healthy (not overfished and fishing intensity below reference level; IPHC, 2021). 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). Invertebrate Bycatch (excluding crab FMP species) Data on invertebrate bycatch are also collected in the ADFG observer program. These data were reviewed by NFMS during preparation of the Final Environmental impact Statement for BSAI crab fisheries (NMFS, 2004). The Final EIS discusses invertebrate bycatch: 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. As part of the 4th surveillance audit, ADFG (M. Stichert, pers. comm.) provided the assessment team with a summary of bycatch for each of the stocks under consideration for the latest fishing season (2020/21 or the most recent year for which information was available). Review of these datasets indicate that the composition and level of bycatch is consistent with previous years. Seabirds NOAA's National Marine Fisheries Service annually updates their estimates of seabirds caught as bycatch in commercial groundfish fisheries operating in Federal waters off Alaska (Eich *et al*., 2016; Krieger *et al*., 2019). The most recent catch accounting data from 2007 through 2015 attribute 88% of seabird bycatch in the groundfish and halibut fisheries (hook-and-line, trawl, and pot gear, combined) to hook-and-line fisheries, 10% to trawl fisheries, and < 2.5% to pot fisheries. The combined bycatch of non-ESA listed seabirds in groundfish and crab pot fisheries is approximately 100 birds per year consisting of primarily northern fulmars (NMFS, 2004). NMFS concluded that fisheries on crab FMP species have very limited interactions with seabirds and that the interactions that do occur do not impact any species of seabird on a population level (NMFS, 2004). <u>12.12 Outcome indicator(s) and management objectives for endangered species</u> 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 (MMPA) requires stock assessment reports to be reviewed annually for stocks designated as strategic, annually for stocks where there is significant new

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	information available, and at least once every three 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 (see Muto *et al*., 2019 for the most recent Marine Mammal stock assessment for the Alaska region). The annual Ecosystems Status Reports for the Aleutian Islands (Ortiz and Zador, 2020) and Eastern Bering Sea (Siddon, 2020) elaborate on additional outcome indicators which are consistent with monitoring for adverse impacts on endangered species. For marine mammals, ecosystem indicators include estimations of stock abundance and/or related parameters for Stellar sea lions, northern fur seals, harbor seals, arctic ice seals (bearded seal, ribbon seal, ringed seal, spotted seal) and bowhead whales. For seabirds, the EBS Ecosystem Status Report includes an Integrated Seabird Information section which synthesizes seabird information to provide an overview of environmental impacts to seabirds and what that may indicate for ecosystem productivity as it pertains to fisheries management. Seabird information comes a wide variety of sources including long-term monitoring programs such as the Alaska Maritime National Wildlife Refuge (e.g., 2019 Seabird Report Card) as well as agency/university researchers, citizen science organizations, and coastal community members. As noted in the Crab Ecosystem Considerations Report (Chilton *et al*., 2011), there is very limited potential for BSAI crab fisheries to have adverse impacts on endangered species or marine mammals. The USFWS website137 identifies three seabird species that are listed as endangered or threatened in Alaska: Steller's eider, *Polysticta stelleri* (threatened); Spectacled eider, *Somateria fischeri* (threatened); and Short-tailed albatross, *Phoebastria albatrus* (endangered). In the Final EIS for BSAI crab (NMFS, 2004), NOAA Fisheries concluded that the actions considered in the Biological Assessment are not likely to (1) adversely affect the listed seabirds, or (2) destroy or adversely modify designated critical habitat. Results from ongoing monitoring of seabirds (Eich *et al*., 2016) continue to support the conclusion that there is little if any bycatch of these species in BSAI crab fisheries. <u>12.13 Outcome indicator(s) and management objectives for EFH & vulnerable habitats</u> 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. 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-

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assessment. On October 10, 2021, the Bering Sea Crab Client Group (BSCCG) provided an update on the corrective action plan to address the NC (Figure 2).

Figure 2. BSCCG Letter, Update on CAP for AIGKC non-conformity.

Date: October 10, 2021

From: Bering Sea Crab Client Group (BSCCG)
Mr. Scott Goodman (Executive Director)
Bering Sea Fisheries Research Foundation (BSFRF)
4039 21st Avenue W, Suite 404
Seattle, WA 98199
(BSCCG is wholly owned subsidiary of BSFRF)

To: Dr. Ivan Mateo, Ph.D
Fisheries Assessment Officer
3rd Floor, Block 3
Quayside Business Park
Mill Street, Dundalk
Co. Louth, Ireland

RE: Preliminary Update on **Corrective Action Plan** – for minor non-conformances in the Aleutian Islands Golden King Crab Unit of Assessment. Ref: fm13/AK/CRA/2017
(Conducted as part of U.S. Alaska Bering Sea and Aleutian Islands King, Tanner and Snow Crab Commercial Fisheries – Re and Full Assessments, 2020/2021

Dear Dr. Mateo,

Please find this summary below to be an update of our April 2020 report on our collaborative work to address the three Action Plan items originally referenced in August 2017. The items covered in this update address summary information from spatial review of bycatch in the AIGKC fishery, specifically with reference to documented bycatch of sensitive species (coral, etc.) and compliance with area closures. These primary focus items in this update are #s 2 and 3 in the Action Plan, but I have provided a status update for #1, also.

Action Plan Item 1: Historical spatial review of AIGKC pot fishing effort

This item is the same information as we provided in our last update but we have updated the maps reflecting spatial effort (Figure 1). We have worked with Dr. Chris Siddon and staff (ADFG, Juneau) continuing progress of mapping and reviewing spatial effort. As we noted in our prior updates the detailed work steps involved in spatially reviewing the fishing activity require closely reconciling the positional information of fishing data which is confidential based on State of Alaska policies for data from 3 or fewer entities. The fishermen have agreed to sign waivers of confidentiality for other related spatial research in the area, which has allowed us to review and provide the updated mapping results. Generally, the current spatial review of annual effort conducted by ADFG is completed as part of AIGKC pot survey research planning. The survey planning involves mapping of gridded spatial areas of historical fishing activity in both eastern and western AIGKC districts and selecting focused seasonal survey areas for continued surveying. This review is represented in Figure 1 below by the three most recent mapping reviews. The AIGKC eastern and western pot survey effort is currently in its seventh season, although there was some interruption to these efforts related to COVID-19 last year and into this year, currently. The cooperative survey information is considered during seasonal management with plans for implementation into the formal assessment as progress on this stock is completed to move to GMACs in the coming seasons.

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Action Plan Item 2: Update of recent fishing season effort in proximity to closure areas

We have completed a review of the updated charting through the most recent season available (2020/21) of AIGKC pot fishing effort overlain with the closure areas (6 polygonal no-fishing areas). Figure 2 from ADFG staff continues to reflect a high degree of compliance of no fishing activity within the closed areas. There are approximately 21,250 GKC pots observed over the period after the closures went into effect through the most recently available data (2007-2020). For this update there are no new instances of pot effort reported inside the closure areas. As noted in our last update, there were two (2) observed pots reported inside the southern-most closure area that reflected 99.88% of pots were observed and reported outside the closures in 2013 for that season. We noted after review with fishery managers that observations for the 2 pots of interest may contain positional errors. Further, part of required compliance during AIGKC fishing operations is an active vessel monitoring system (VMS) which documents each boat's activity with a high degree of positional precision, especially adjacent to closed or sensitive areas. We consulted with all fishermen in the stakeholder group and further with ADFG Westward Region staff (Kodiak and Dutch Harbor) and NMFS (Dutch Harbor) and have found no evidence of a VMS report of activity inside the closed area of interest. We report in this update that full compliance with the regulatory spatial closures is reflected in the information available to us.

Action Plan Item 3: A review of AIGKC observer pot bycatch data for coral species to evaluate trends in bycatch CPUE

In collaboration with ADFG staff in Juneau, we have completed another update of the bycatch database from the AIGKC observer data over the period of interest (2007-2020). As in the prior update, there has been some aggregation to present information that may be confidential and these are summary runs from the observer database (unpublished). Figure 3 below shows the updated email and table from Mr. L. Hulbert (ADFG, Juneau) in response to our update. As we reported in our preparations of the Action Plan, the coral bycatch rates are variable, but are consistently declining over the last 5 reported years (2014-2018). We report that the most recent two seasons show a relative increase in the percentage of observed pots with coral. Prior summaries suggested that about 28% of observed pots have coral bycatch, and the most recent seasons raise this average to about 30%. We note for your review again that coral bycatch, as defined in the observer records, has not been further reviewed at this time to ascertain relative differences between pots with single or many pieces of coral, or any other qualitative factors that may help with further understanding of documented bycatch. We have not conducted a review of these incidence rates further back in time to compare periods before and after the spatial closures. ADFG staff have reported that both database methods and staff tasking have influenced the consistency of the records available to complete a consistent review of "before and after" coral bycatch rates. Given that trends in compliance to avoid identified areas are high, trends of incidence with coral as observed are stable, and that annual spatial reviews are now a normal part of survey planning, a further spatial review before and after coral closures is unnecessary.

For this update we have completed a limited spatial analysis for bycatch trends review. We are continuing to refine these analyses and we have included several maps over the most recent season in TAB 1 to this report. Generally, these maps reflect a variable spatial incidence of coral and sponge noted by observer data. There are areas fished that reflect higher incidence of coral and sponge bycatch but they are spatially inconsistent and are at times very close to areas with no observed bycatch as noted by the summary in the "black" boxes adjacent to the colored (varying scales) boxes. Further, the scales of bycatch depicted in these areas reflecting high or low may be misleading dependent on the nature of the data collection. There are no additional data to characterize the scale and magnitude of

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bycatch per pot with more precision (e.g. one versus multiple pieces, same versus different specimen, size and weight of specimen, etc. within a pot). The current analysis summarizes effort and bycatch from observer data using a 2 nautical mile x 2 nautical mile grid to count effort within each box. As we have noted, the incidence rates and the observer data records for coral and sponge bycatch are limited in terms of an explicit quantitative review. We will continue with this review including a variety of more refined options (differing scales) to note spatially important bycatch areas outside of the current protected areas. Classifications of pots "with and without coral and sponge bycatch" reflect that regulatory monitoring activity is in place and is fully compliant. Currently, our reporting does not identify any notable areas that may require further attention.

We look forward to providing you with further Action Plan updates and continuing toward full compliance for the AIGKC pot fishery. We hope this information will assist with your surveillance and review. Please let me know if there are further questions you may have at this time.

Sincerely,

BERING SEA CRAB CLIENT GROUP LLC

Scott Goodman (BSFRF, Executive Director)

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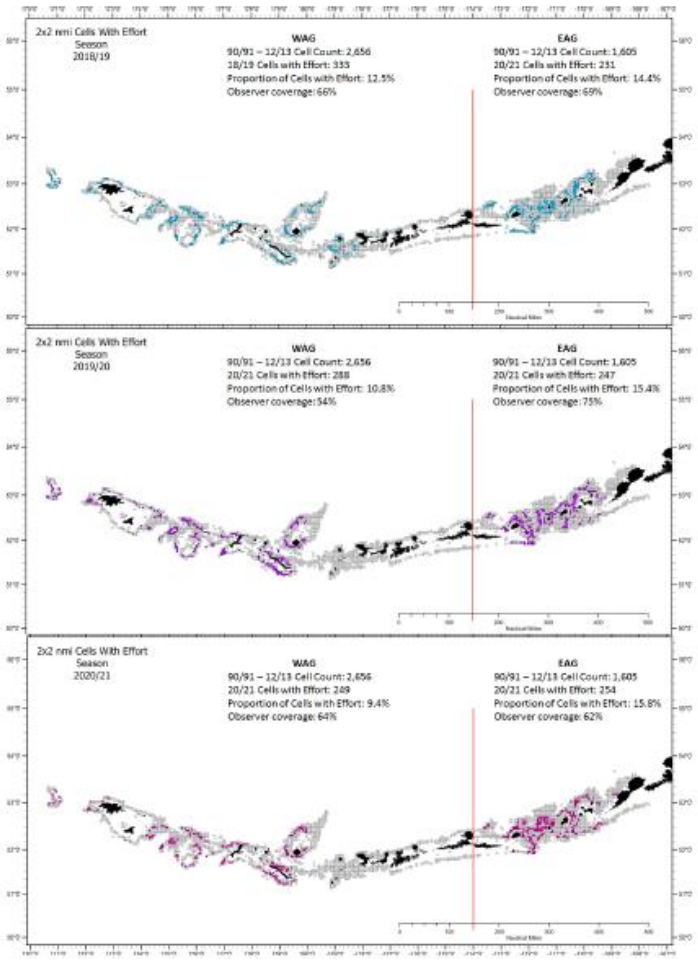

Figure 1. Updated spatial review and mapping of AIGKC pot effort in three most recently completed and reviewed seasons for western (WAG) and eastern (EAG) AIGKC survey planning. Source: ADF&G, C. Siddon, L. Hulbert (Spatial data may be confidential).

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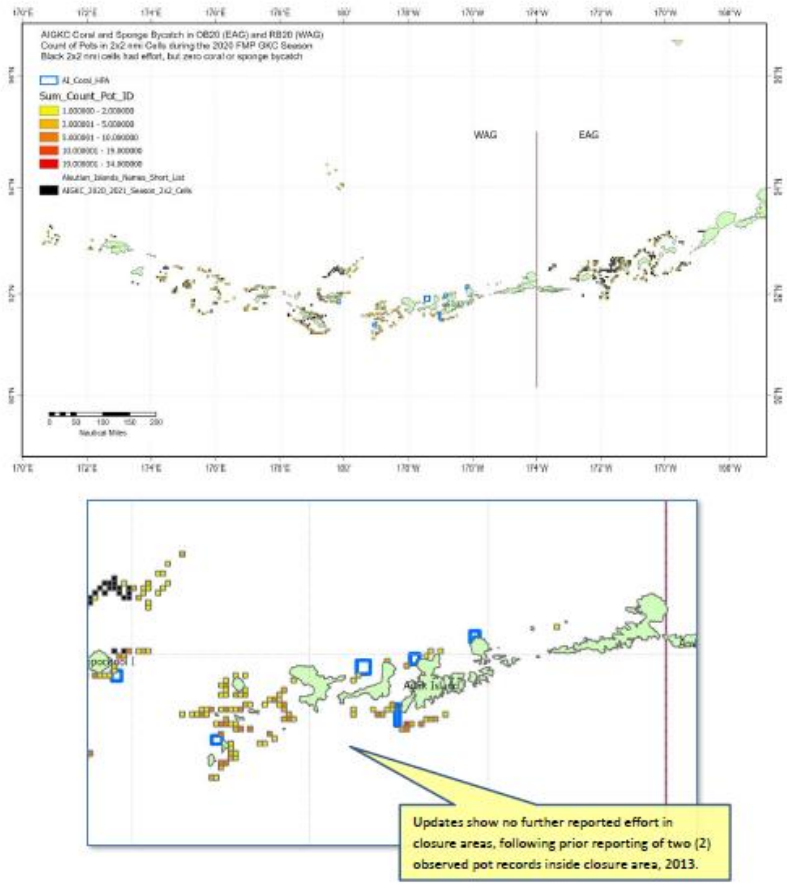

Figure 2. Updated spatial plot of AIGKC pot effort in proximity to AI Coral Closure Areas, 2020/21 (top panel total area, bottom panel zoomed into blue closure areas reflecting no further reported effort inside closure areas). Source: ADF&G, C. Siddon, L. Hulbert (Spatial data may be confidential).

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From: Hulbert, Leland B (DFG) <lee.hulbert@alaska.gov>
10/7/2021 3:30 PM
To: Scott Goodman <sgoodman@nrccorp.com>
Cc: Siddon, Chris E (DFG) chris.siddon@alaska.gov
Subject: AIGKC Observer Pots FMP 1995 - 2019 Seasons Maps

Hi Scott,

I've attached the Excel file with the updated Observer pots with coral table.

I've also attached the Observer pots with coral and or sponge maps, summarized in 2x2 nautical mile cells (both JPEG and PDF).

Please let me know if you have any suggestions for improving the maps.

Lee

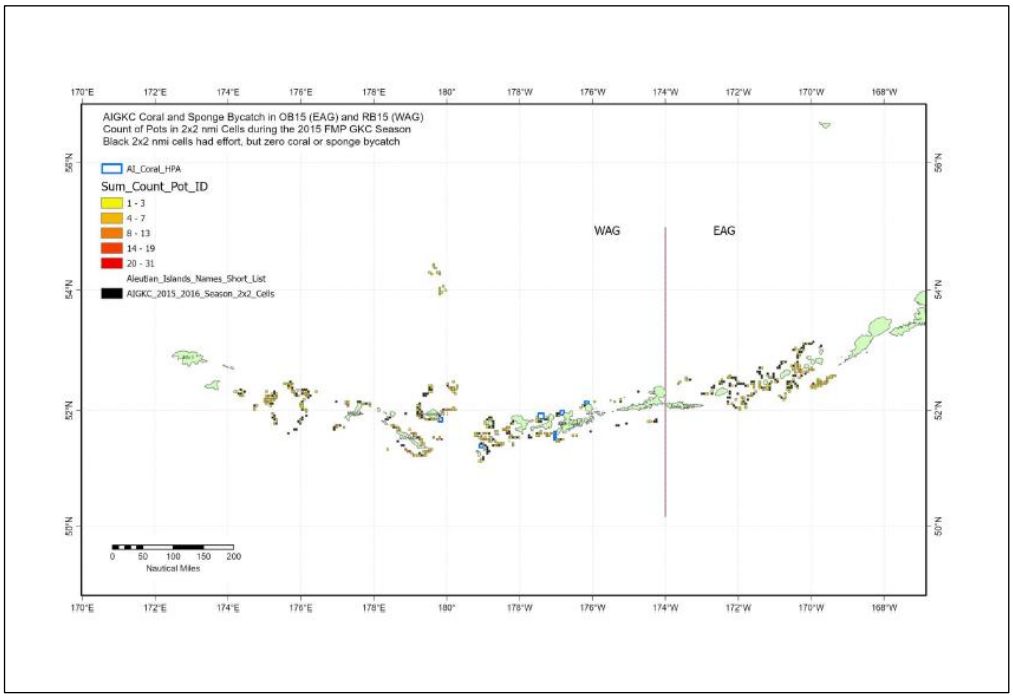
FMP Year	Observer Pot Count - ALL	Pots with Coral Count - ALL	Percent of Pots with Coral
2007	2080	467	22.45%
2008	1592	364	22.86%
2009	1301	452	34.74%
2010	1303	450	34.54%
2011	1198	304	25.38%
2012	1547	462	29.86%
2013	1720	574	33.37%
2014	1513	517	34.17%
2015	1774	464	26.16%
2016	1675	430	25.67%
2017	1393	346	24.84%
2018	1233	296	24.01%
2019	1623	568	35.00%
2020	1284	766	59.66%

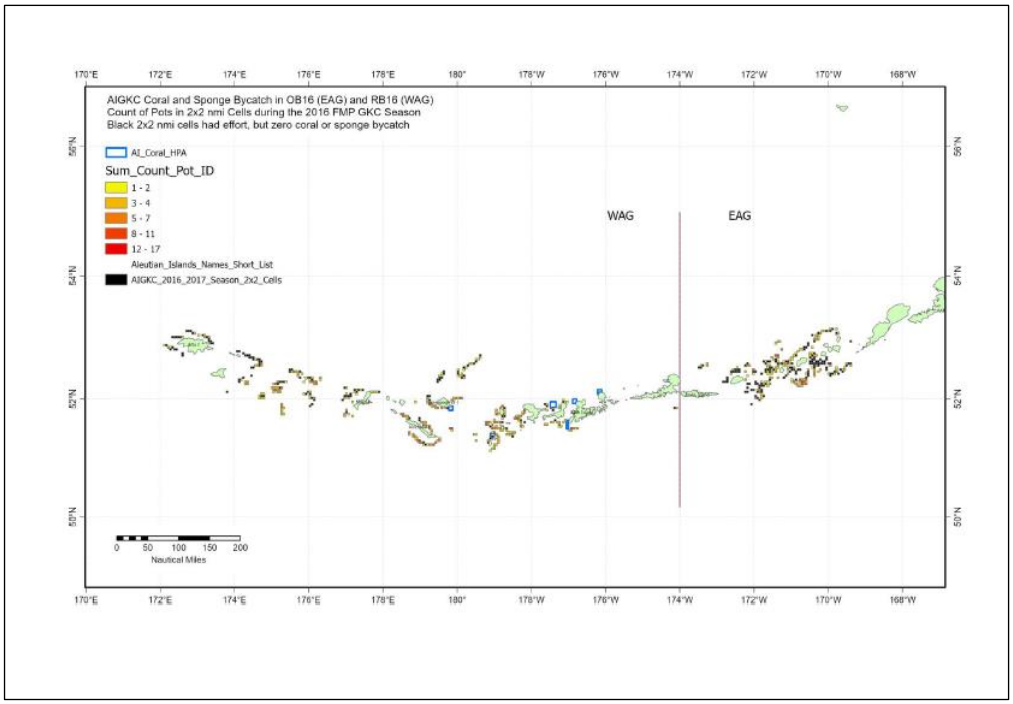
Leland B. Hulbert
Alaska Department of Fish and Game
Commercial Fisheries Division
HQ - Juneau
907-465-6123

Figure 3. Tabular summary of AIGKC pot coral bycatch as recorded in the ADFG observer bycatch database, 2007-2020. Source: ADF&G, C. Siddon, L. Hulbert [10/07/21 email] (summarized data may be confidential).

AIGKC Action Plan Update
BSCCG 10/10/21 Page 6

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.**





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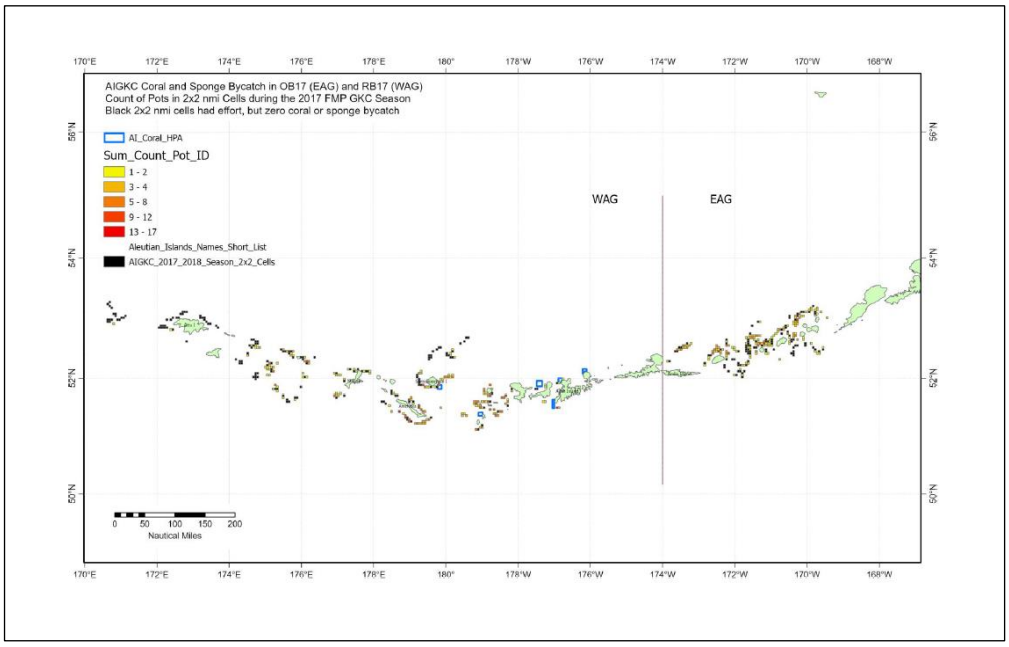

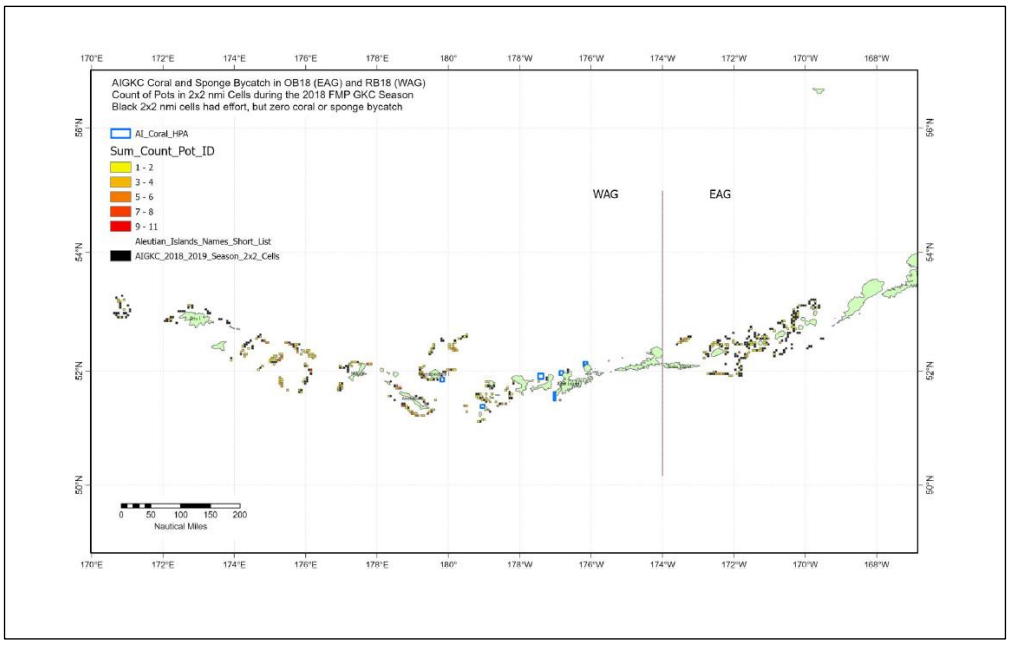

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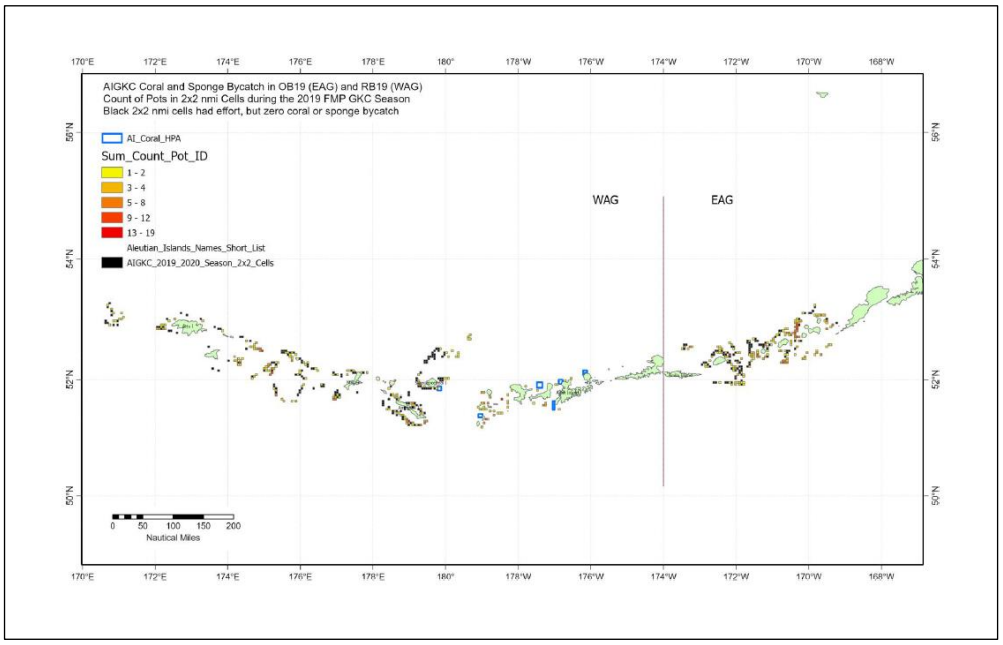

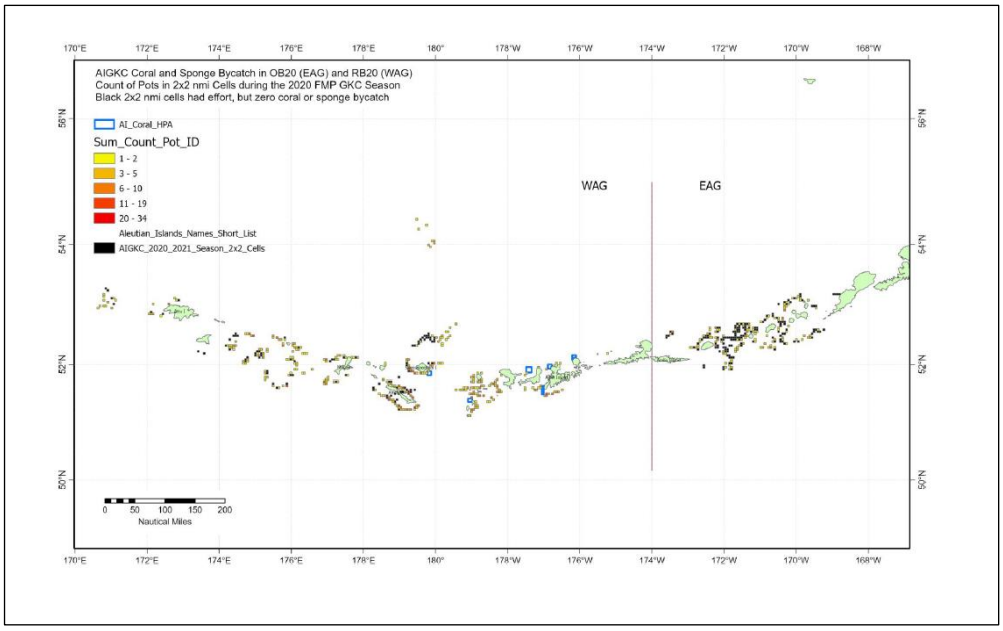

It is also important to acknowledge that in the time since re-assessment of the BSAI crab fisheries, there have been a number of advances made with respect to the knowledge base for habitat outcome indicators. Amendment 49 to the BSAI Crab FMP, which was approved on May 31, 2018 (Final Rule: 83 FR 31340), updates the description and identification of essential fish habitat (EFH), and updates information on adverse impacts to EFH based on the best scientific information available. New or updated information sources include scientific publications by Goddard *et al*.,

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	(2017), MacLean *et al*., (2017), Rooper *et al*., (2017, 2018), Stone and Cairns (2017), and Wilborn *et al*., (2018), as well as a discussion paper on the effects of EFH in Alaska (NPFMC 2017) and a Technical Memorandum summarizing the research completed under the Alaska Deep-Sea Coral and Sponge Initiative (Rooper *et al*., 2017). 12.14 Outcome indicators 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 evidence (Chilton *et al*., 2011) indicates that the BSAI crab stocks under consideration here are not key prey species whose removal adversely impacts on dependent predators. Nonetheless, ongoing programs for monitoring of outcome indicators ensures that adverse impacts to dependent predators do not arise from fishing BSAI crab stocks. 12.15 Outcome indicators and management objectives to minimize ecosystem impacts There are outcome indicators specific to the BSAI king and Tanner crab fisheries. A set of 'Crab Ecosystem Considerations Indicators' or CECIs (Chilton *et al*., 2011) are used to assess impacts of crab fisheries on aquatic ecosystems. These CECIs are consistent with achieving management objectives of identifying and minimizing adverse impacts of BSAI crab fisheries on aquatic ecosystems. In addition to crab-specific indicators, managers utilize outcome indicators which are more broadly applicable to the monitoring of the Alaska's fisheries and marine ecosystems, as described in Alaska Marine Ecosystem Status Reports[85]. The goals of the Ecosystem Status Reports are to (1) provide stronger links between ecosystem research and fishery management and (2) spur new understanding of the connections between ecosystem components by bringing together the results of 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. Ecosystem Status Reports are updated regularly and are accessible online: see Siddon (2020) and Ortiz and Zador (2020) for recent reports for Eastern Bering Sea and Aleutian Islands, respectively. 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.
References:	ADFG, 2020. Alaska Department of Fish and Game 2020-2021 Statewide King and Tanner Crab Commercial Fishing Regulations. Alaska Department of Fish and Game, 194 p. https://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial Barnard, D.R. and Burt, R. 2008. Alaska Department of Fish and Game summary of the 2006/2007 mandatory shellfish observer program database for the rationalized crab fisheries. Alaska Department of Fish and Game, Fishery Data Series No. 08-17, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds08-17.pdf Chilton, E.A., K.M. Swiney, J.D. Urban, J.E. Munk, and Foy, R.J. 2011. Ecosystem consideration indicators for Bering Sea and Aleutian Islands Kind and Tanner Crab Species NOAA NMFS AFSC, 2011. http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chpaters/Ecosystem_CrabSAFE.pdf

[85] https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands

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CPT, 2021. BSAI Crab Plan Team Report, May 17-20, 2021. Online meeting. NPFMC. 24 p. https://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/

Duffy-Anderson, J.T., Stabeno, P.J., Siddon, E.C., Andrews, A.G., Cooper, D.W., Eisner, L.B., *et al*., 2017. Return of warm conditions in the southeastern Bering Sea: Phytoplankton- Fish. PLoSONE 12(6):e0178955. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0178955

Eich, A.M., Mabry, K.R., Wright, S.K., and Fitzgerald, S.M. 2016. Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-12, 47p. https://alaskafisheries.noaa.gov/pr/seabird-bycatch-reports

Fedewa, E., Garbor-Yonts, B., and Palof, K. 2019 Ecosystem and Socioeconomic Profile of the Saint Matthew Blue King Crab stock in the Bering Sea. September 2019. https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

Fedewa, E., Garber-Yonts, B., and Shotwell, K. 2020a. Appendix D. Ecosystem and Socioeconomic Profile of the Saint Matthew Blue King Crab Stock. September 2020. In: Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions. NPFMC. October 2020. https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

Fedewa, E., Garber-Yonts, B., and Shotwell, K. 2020b. Appendix E. Ecosystem and Socioeconomic Profile of the Bristol Bay Red King Crab Stock. September 2020. NPFMC. October 2020. https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

Gaeuman, W. B. 2014. Summary of the 2013/2014 mandatory crab observer program database for the Bering Sea/Aleutian Islands commercial crab fisheries. Alaska Department of Fish and Game, Fishery Data Series No. 14-49, Anchorage. http://www.adfg.alaska.gov/fedaidpdfs/fds14-49.pdf

Goddard, P., Wilborn, R., Rooper, C., Williams, K., and 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

IPHC, 2021. Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2020. IPHC-2021-SA-01. Prepared by: IPHC Secretariat (I. Steward & A. Hicks); 23 December 2020.
https://iphc.int/management/science-and-research/stock-assessment

Krieger, J.R., Eich, A.M., and Fitzgerald, S.M. 2019. Seabird Bycatch Estimates for Alaska Groundfish Fisheries: 2018. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/AKR-20, 41 p. doi:10.25923/hqft-we56. https://www.fisheries.noaa.gov/resource/document/seabird-bycatch-estimates-alaska-groundfish-fisheries-2018

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	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 McConnaughey, R. A., Blackhart, K. E., Eagleton, M. P., and Marsh J. 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. https://repository.library.noaa.gov/view/noaa/15500 Murphy, J.T. 2020. Climate change, interspecific competition, and poleward vs. depth distribution shifts: Spatial analyses of the eastern Bering Sea snow and Tanner crab (*Chionoecetes opilio* and *C. bairdi*). Fisheries Research. Volume 223, March 2020, 105417. https://www.sciencedirect.com/science/article/abs/pii/S0165783619302723 Muto, M. M., Helker, V. T., Delean, B. J., Young, N.C., Freed, J.C., Angliss, R. P., Friday, N.A., Boveng, P. L., Breiwick, J.M., Brost, B. M., Cameron, M. F., Clapham, P. J., Crance, J. L., Dahle, S. P., Dahlheim, M.E., Fadely, B. S., Ferguson, M.C., Fritz, L.W., Goetz, K.T., Hobbs, R.C., Ivashchenko, Y.V., Kennedy, A. S., London, J.M., Mizroch, S.A., Ream, R.R., Richmond, E.L., Shelden, K.E.W., Sweeney, K.L., Towell, R.G., Wade, P.R., Waite, J.M., and Zerbini, A.N. 2020. Alaska marine mammal stock assessments, 2020. July, 2021. U.S. Dep. Commer., NOAATech. Memo. NMFS-AFSC-421, 407 p. https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region NMFS, 2004. Bering Sea Aleutian Islands Crab Fisheries Final Environmental Impact Statement. NOAA NMFS, NPFMC. August 2004. 1003 p. https://alaskafisheries.noaa.gov/sites/default/files/analyses/crabeis0804-chapters.pdf NOAA Fisheries, 2018. Crab FMP Amendment 49 – amendment text for updating EFH description and non-fishing impacts to EFH (EFH Omnibus Amendment). https://www.fisheries.noaa.gov/action/amendment-49-fmp-bering-sea-aleutian-islands-king-and-tanner-crabs NOAA Fisheries, 2018. AFSC Priorities and Annual Guidance for FY2018. 6 p. https://www.fisheries.noaa.gov/resource/document/2018-alaska-fisheries-science-center-priorities-and-annual-guidance NPFMC, 2007. Aleutian Islands Fishery Ecosystem Plan. December, 2007. 198 p. https://www.npfmc.org/aleutian-islands-fishery-ecosystem-plan/ NPFMC, 2011. Fishery Management Plan for Bering Sea and Aleutian Islands King and Tanner Crabs. North Pacific Fishery Management Council. October 2011. 229 p. https://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf 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. https://alaskafisheries.noaa.gov/habitat/efh

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	NPFMC, 2019. Bering Sea Fishery Ecosystem Plan. North Pacific Fishery Management Council. January 2019. 133 p. https://meetings.npfmc.org/CommentReview/DownloadFile?p=c334ad33-4139-4b5a-b205-a8b7c5028562.pdf&fileName=D6%20Final%20BS%20FEP%20Jan%202019.pdf NPFMC, 2020a. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions. NPFMC, Anchorage, AK. https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/ NPFMC, 2021. NPFMC Research Priorities for 2022 - 2024. 19 p. https://www.npfmc.org/research-priorities/ NPRB, 2018. North Pacific Research Board Science Plan. North Pacific Research Board. 132 p. https://www.nprb.org/nprb/about-the-science/ Ortiz, I., and Zador, S. (Eds.) 2020. Ecosystem Status Report 2020 Aleutian Islands. Nov 17, 2020. https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands Punt, A. E., Foy, R. J., Dalton, M. G., Long, W. C., and Swiney, K. M. 2016. Effects of long-term exposure to ocean acidification conditionson future southern Tanner crab (Chionoecetes bairdi) fisheries management. – ICES Journal of Marine Science, 73: 849–864. https://academic.oup.com/icesjms/article/73/3/849/2458912 Rooper, C.N., Wilborn, R., Goddard, P., Williams, K., Towler, R., and Hoff, G.R. 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.alaskaseafood.org/rfm-certification/certified-fisheries/alaska-crab/ Siddon, E. (Ed.) 2020. Ecosystem Status Report 2020 Eastern Bering Sea. December 2020. https://www.fisheries.noaa.gov/resource/data/ecosystem-status-report-2020-eastern-bering-sea Siddon, E. and Zador, S. (Eds.) 2019. Ecosystem Status Report 2019: Eastern Bering Sea. EBS Ecosystem Status. 223 p. https://apps-afsc.fisheries.noaa.gov/refm/reem/ecoweb/index.php Sigler, M. F., Eagleton, M. P., Helser, T. E., Olson, J. V., Pirtle, J. L., Rooper, C. N., Simpson, S.C., and Stone, R. P. 2017. Alaska Essential Fish Habitat Research Plan: A Research Plan for the National Marine Fisheries Service's Alaska Fisheries Science Center and Alaska Regional Office. AFSC Processed Rep. 2015-05, 22 p. http://www.afsc.noaa.gov/Publications/ProcRpt/PR2017-05.pdf Spies, I., Aydin, K., Dan Nichol, D., Palsson, W., Hoff, J., and TenBrink, T.T. 2019. Chapter 19. Assessment of the sculpin stock complex in the Bering Sea and Aleutian Islands. NPFMC Bering Sea and Aleutian Islands SAFE. North Pacific Fishery Management Council. December, 2019.

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	https://www.fisheries.noaa.gov/resource/data/2019-assessment-sculpin-stock-complex-bering-sea-and-aleutian-islands Spies, I., Haehn, R., Siddon, E., Conner, J., Britt, L., and Ianelli, J. 2020. Assessment of the Yellowfin Sole Stock in the Bering Sea and Aleutian Islands. December 2020. 97 p. https://www.fisheries.noaa.gov/alaska/population-assessments/2020-north-pacific-groundfish-stock-assessments#bering-sea-and-aleutian-islands-stock-assessments Stevenson, D. E., and Lauth R. R. 2019. Bottom trawl surveys in the northern Bering Sea indicate recent shifts in the distribution of marine species. Polar Biology, 42: 407–421. https://link.springer.com/article/10.1007/s00300-018-2431-1 Stone, R. P. and S. D. Cairns 2017. Deep-sea coral taxa in the Alaska Region: depth and geographical distribution. In: Hourigan, T. F., P. J. Etnoyer, S. D. Cairns (eds), The State of Deep-Sea Coral and Sponge Ecosystems of the United States: 2017. NOAA Technical Memorandum CRCP-3 Silver Spring MD: 3.27–3.34. https://spo.nmfs.noaa.gov/sites/default/files/OHC4_v2.pdf Szuwalski, C., Cheng, W., Foy, R., Hermann, A. J., Hollowed, A., Holsman, K., Lee, J., Stockhausen, W., and Zheng, J. 2020. Climate change and the future productivity and distribution of crab in the Bering Sea. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsaa140. https://academic.oup.com/icesjms/article/78/2/502/5920400 Thompson, G. G., Conner, J. Shotwell, S. K., Fissel, B., Hurst, T., Laurel, B., Rogers, L., and Siddon, E. 2020. 2. Assessment of the Pacific Cod Stock in the Eastern Bering Sea. Groundfish SAFE. NPFMC, December 2020. https://www.fisheries.noaa.gov/alaska/population-assessments/2020-north-pacific-groundfish-stock-assessments#bering-sea-and-aleutian-islands-stock-assessments Webb, J. 2015. Summary of the interagency crab research meeting held December 11-12, 2013. Alaska Department of Fish and Game, Special Publication No. 15-14, Anchorage. 19 p. http://www.adfg.alaska.gov/FedAidPDFs/SP15-14.pdf Wilborn, R., C.N. Rooper, P. Goddard, L. Li, K. Williams and R. Towler 2018. The potential effects of substrate type, currents, depth and fishing pressure on distribution, abundance, diversity, and height of cold-water corals and sponges in temperate, marine waters. Hydrobiologia, 2018, Volume 811, Number 1, Page 251. https://link.springer.com/article/10.1007%2Fs10750-017-3492-9 Zacher, L.S., Richar, J. I., and Foy, R. J. 2019. DRAFT: The 2019 Eastern Bering Sea Continental Shelf Trawl Survey: Results for Commercial Crab Species. NOAA Technical Memorandum NMFS-AFSC. https://www.fisheries.noaa.gov/resource/document/draft-technical-memorandum-2019-eastern-bering-sea-continental-shelf-trawl-survey
Statement of consistency to the RFM Fishery Standard	

7.9.6.2 Fundamental Clause 13

13.	**Where fisheries enhancement is utilized, environmental assessment and monitoring shall consider genetic diversity and ecosystem integrity.**
Summary of relevant changes:	As detailed more fully in the BSAI Crab RFM Re-assessment Report (Global Trust, 2017), BSAI King and Tanner Crab Fisheries are not enhanced fisheries and there are no associated aquaculture developments nor are habitat modifications undertaken for the purposes of enhancement (Carroll, 2012). 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 Plan (AKCRRAB, 2016). However, exclusive of scientific investigations such as those of Long *et al*. (2018), no facilities are currently permitted by ADFG for the release of cultivated crab into the wild. Interviews during the fourth surveillance audit reconfirmed the determination that BSAI crab fisheries are not enhanced (F. Bowers and M. Stichert, pers. comm.). Therefore, Fundamental Clause 13 is not applicable.
References:	AKCRRAB, 2016. Alaska King Crab Research, Rehabilitation and Biology Program: Strategic Plan 2015 – 2019. Approved January 15, 2016. https://seagrant.uaf.edu/research/projects/kingcrab/general/ Carroll, A. 2012. Why Don't We Grow Red King Crabs in Hatcheries Like Salmon? Alaska Fish & Wildlife News, February 2012. http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=544 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/ Long, W. C., Cummiskey, P. A. and Munk, J. E. 2018. How does stocking density affect enhancement success for hatchery-reared red king crab? Canadian Journal of Fisheries and Aquatic Sciences 75(11). March 2018. https://doi.org/10.1139/cjfas-2017-0330
Statement of consistency to the RFM Fishery Standard	**The fishery does not continue to conform to the requirements of Fundamental Clause 12 of the RFM Fishery Standard**

8 Update on compliance and progress with non-conformances and agreed action plans

This section details compliance and progress with non-conformances and agreed action plans including:

a) A review of the performance of the Client specific to agreed corrective action plans to address non-conformances raised in the most recent assessment or re-assessment or at subsequent surveillance audits including a summary of progress toward resolution.
b) A list of pre-existing non-conformances that remain unresolved, new nonconformances raised during this surveillance, and non-conformances that have been closed during this surveillance.
c) Details of any new or revised corrective action plans including the Client's signed acceptance of those plans.
d) An update of proposed future surveillance activities.

8.1.1 Closed non-conformances

Non-conformance 1 (of 1)	
Clause:	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.
Non-conformance level:	Minor
Non-conformance:	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.
Rationale:	For four of the five crab fisheries under assessment (BBRKC, SMBKC, EBS snow, and EBS Tanner crab), there was sufficient evidence to substantiate outcome indicators for habitat status and trends. For the AI golden king crab unit of certification, however, 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 pot fishing gear. 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.
Corrective Action Plan (CAP):	BSCCG Update on Corrective Action Plan – for minor non-conformances in the Aleutian Islands Golden King Crab Unit of Assessment. Ref: fm13/AK/CRA/2017 October 10, 2021 **Action Plan Item 1: Historical spatial review of AIGKC pot fishing effort** This item is the same information as we provided in our last update but we have updated the maps reflecting spatial effort (Figure 1). We have worked with Dr. Chris Siddon and staff (ADFG, Juneau) continuing progress of mapping and reviewing spatial effort. As we noted in our prior updates the detailed work steps involved in spatially reviewing the fishing activity require closely reconciling the positional information of fishing data which is confidential based on State of Alaska policies for data from 3 or fewer entities. The fishermen have agreed to sign waivers of confidentiality for other related spatial research in the area, which has allowed us to review and provide the updated mapping results. Generally, the current spatial review of annual effort conducted by ADFG is completed as part of AIGKC pot survey research planning. The survey planning involves mapping of gridded spatial areas of

Non-conformance 1 (of 1)	
	historical fishing activity in both eastern and western AIGKC districts and selecting focused seasonal survey areas for continued surveying. This review is represented in Figure 1 below by the three most recent mapping reviews. The AIGKC eastern and western pot survey effort is currently in its seventh season, although there was some interruption to these efforts related to COVID-19 last year and into this year, currently. The cooperative survey information is considered during seasonal management with plans for implementation into the formal assessment as progress on this stock is completed to move to GMACs in the coming seasons. **Action Plan Item 2: Update of recent fishing season effort in proximity to closure areas** We have completed a review of the updated charting through the most recent season available (2020/21) of AIGKC pot fishing effort overlain with the closure areas (6 polygonal no-fishing areas). Figure 2 from ADFG staff continues to reflect a high degree of compliance of no fishing activity within the closed areas. There are approximately 21,250 GKC pots observed over the period after the closures went into effect through the most recently available data (2007-2020). For this update there are no new instances of pot effort reported inside the closure areas. As noted in our last update, there were two (2) observed pots reported inside the southern-most closure area that reflected 99.88% of pots were observed and reported outside the closures in 2013 for that season. We noted after review with fishery managers that observations for the 2 pots of interest may contain positional errors. Further, part of required compliance during AIGKC fishing operations is an active vessel monitoring system (VMS) which documents each boat's activity with a high degree of positional precision, especially adjacent to closed or sensitive areas. We consulted with all fishermen in the stakeholder group and further with ADFG Westward Region staff (Kodiak and Dutch Harbor) and NMFS (Dutch Harbor) and have found no evidence of a VMS report of activity inside the closed area of interest. We report in this update that full compliance with the regulatory spatial closures is reflected in the information available to us. **Action Plan Item 3: A review of AIGKC observer pot bycatch data for coral species to evaluate trends in bycatch CPUE** In collaboration with ADFG staff in Juneau, we have completed another update of the bycatch database from the AIGKC observer data over the period of interest (2007-2020). As in the prior update, there has been some aggregation to present information that may be confidential and these are summary runs from the observer database (unpublished). Figure 3 below shows the updated email and table from Mr. L. Hulbert (ADFG, Juneau) in response to our update. As we reported in our preparations of the Action Plan, the coral bycatch rates are variable, but are consistently declining over the last 5 reported years (2014-2018). We report that the most recent two seasons show a relative increase in the percentage of observed pots with coral. Prior summaries suggested that about 28% of observed pots have coral bycatch, and the most recent seasons raise this average to about 30%. We note for your review again that coral bycatch, as defined in the observer records, has not been further reviewed at this time to ascertain relative differences between pots with single or many pieces of coral, or any other qualitative factors that may help with further understanding of documented bycatch. We have not conducted a review of these incidence rates further back in time to compare periods before and after the spatial closures. ADFG staff have reported that both database methods and staff tasking have influenced the consistency of the records available to complete a consistent review of "before and after" coral bycatch rates. Given that trends in compliance to avoid identified areas are high, trends of incidence with coral as observed are stable, and that annual spatial reviews are now a normal part of survey planning, a further spatial review before and after coral closures is unnecessary.

Non-conformance 1 (of 1)	
	For this update we have completed a limited spatial analysis for bycatch trends review. We are continuing to refine these analyses and we have included several maps over the most recent season in TAB 1 to this report. Generally, these maps reflect a variable spatial incidence of coral and sponge noted by observer data. There are areas fished that reflect higher incidence of coral and sponge bycatch but they are spatially inconsistent and are at times very close to areas with no observed bycatch as noted by the summary in the "black" boxes adjacent to the colored (varying scales) boxes. Further, the scales of bycatch depicted in these areas reflecting high or low may be misleading dependent on the nature of the data collection. There are no additional data to characterize the scale and magnitude of bycatch per pot with more precision (e.g. one versus multiple pieces, same versus different specimen, size and weight of specimen, etc. within a pot). The current analysis summarizes effort and bycatch from observer data using a 2 nautical mile x 2 nautical mile grid to count effort within each box. As we have noted, the incidence rates and the observer data records for coral and sponge bycatch are limited in terms of an explicit quantitative review. We will continue with this review including a variety of more refined options (differing scales) to note spatially important bycatch areas outside of the current protected areas. Classifications of pots "with and without coral and sponge bycatch" reflect that regulatory monitoring activity is in place and is fully compliant. Currently, our reporting does not identify any notable areas that may require further attention.
Progress against the CAP:	This is the 4th surveillance assessment following re-assessment of the BSAI crab fisheries which was completed on December 7, 2017. The assessment team reviewed client progress against the CAP during the four years of surveillance. It is noted that the original CAP was comprised of three separate action plan items, numbered 1 to 3, as set out above. In regards to action plan item #1, BSCCG has made substantial progress in compiling data on the spatial distribution of AIGKC pot fishing effort (Figure 1). In effect, this dataset constitutes an outcome indicator which, going forward, will have more direct application to the evaluation of Habitat Scoring Element 1 of Supporting Clause 12.2.6 in the revised RFM Standard, Version 2.1. In regards to action plan items #2 and #3, the team judges that progress has been satisfactory. Given the amount of data that BSCCG has compiled on these matters prior to and during the four years of surveillance (see Figures 2 and 3 in BSCCG update), the action plan items are hereby judged to be effectively completed. Further, the results may now serve as outcome indicators 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.
Non-conformance status:	Closed – following surveillance audit 4.

8.1.2 Progress against open non-conformances

Non-conformance 1 (of 1)	
Clause:	6.3
Non-conformance level:	Minor
Non-conformance:	Data and assessment procedures shall be installed measuring the position of the fishery in relation to the reference points. Accordingly, the stock under consideration shall not be overfished (i.e. above limit reference point or proxy) and the level of fishing permitted shall be commensurate with the current state of the fishery resources, maintaining its future availability, taking into account that long term changes in productivity can occur due to natural variability and/or impacts other than fishing.

Non-conformance 1 (of 1)	
Rationale:	The RFM Program provides assessment teams with guidance for scoring clause 6.3 which consists of three evaluation parameters: process; current status/appropriateness/effectiveness; and evidence basis. With respect to the first evaluation parameter, we find strong evidence of conformity because the Council process has been followed and the stock assessment was conducted according to procedure using the appropriate datasets to measure the position of the fishery in relation to its limit reference point (MSST). With respect to the third evaluation parameter, we find strong evidence of conformity because the stock assessment of SMBKC, as documented in the SAFE report, was based on high-quality information. With respect to the second evaluation parameter, however, we find that the stock under consideration (SMBKC) does not meet the RFM criterion for current status/appropriateness/effectiveness because the stock is below its limit reference point and therefore designated as 'overfished' (NMFS Letter to NPFMC, Oct 2018). Consequently, clause 6.3 is lacking in one evaluation parameter and must therefore be assigned a medium confidence rating. A minor non-conformity is raised. 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 2019, 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.
Corrective Action Plan (CAP):	**Action Plan Item 1: Support of and Attention to St. Matthew Blue King Crab Rebuilding Plan** The assessment team referred to the NPFMC letter from October 2018, which officially started the"overfished" designation and process for SMBKC stock. We are well aware of the cyclic, dynamic nature of Alaskan crab stocks and have unfortunately been through this process before; snow crab (declared overfished 1999, rebuilt 2011), Tanner crab (declared overfished 2011, rebuilt 2012) and SMBKC (last declared overfished 1999, rebuilt 2008). The current SMBKC designation came as part of the normal review process between State and Federal managers through information shared at the September 2018 Crab Plan Team, subsequent NPFMC Council meetings, and more recently, the January 2019 CPT in Nome, AK. We note for the team that CPT meetings follow rigorous peer review of crab stock status which are followed by the Council's Scientific and Statistical Committee (SSC) review as a final peer review before management actions. State and Federal managers are compliant with and follow a robust process towards precaution when warranted by concern for a declining or low abundance stock. The team's review noted the strong evidence of conformity to all aspects of process. For our proposed action step, we would report back to the assessment team prior to, or during, their next surveillance activities on all important rebuilding plan and status updates. We have a regular presence at these management meetings to both listen and participate as primary stakeholders in the commercial crab stocks of interest. The initial time frame for the development and approval of a SMBKC rebuilding plan is two years, and much can happen which may change the context of plan development or even the status of the SMBKC stock (reference to bairdi). The next CPT meeting is scheduled for April 29 – May 3, 2019. As a part of preliminary reporting, please see the attached presentation summary timeline materials in Figure 1 below. Elements that we would cover in reporting would include those

Non-conformance 1 (of 1)	
	items mentioned by both the Crab Plan Team (January, Nome) and SSC (February, Anchorage) in Figure 2. **Action Plan Item 2: Support of and Participation in SMBKC Stock Assessment – GMACs Support** The Generic Models for Alaskan Crab (GMACs) program was originally initiated by a collaboration of the stakeholder group BSFRF which has client ownership of BSCCG. The GMACs progress has been slow over the last several years, but BSFRF/BSCCG support with NOAA/ADF&G and others has persisted. Importantly, the SMBKC stock has been the first of the Alaskan stocks to utilize and rely on GMACs for approved management action. While most of the SMBKC GMAC technical modelling work has been completed over the last two years by UW and NOAA researchers (Dr. A. Punt and Dr. J. Ianelli), the current stock assessment has been passed to State (ADF&G) managers (K. Palov). We have been attentive to the utility provided by GMACs to SMBKC stock status evaluation and concur with the stock assessment scientists and current high level of concern. Moreover, we would note that our support and funding of portions of the GMAC project have led to the current level of review and precaution in managing this stock. As our second proposed action step, we are committing to continue support of the GMACs as a project for all Alaskan crab, but specifically to SMBKC, with the intent of continued work to more accurately and precisely specify the mature male biomass (MMB), overfishing level (OFL) and allowable biological catch (ABC), as well as GMAC, generated projections completed as part of rebuilding terms. The assessment team should note that most of this work will occur within ADFG/NOAA oversight and process, but BSFRF/BSCCG will continue to support any opportunity that may be appropriate (workshops, coding supplementary work, consulting expertise, etc.). **Action Plan Item 3: Record Keeping & Reporting for SMBKC Stock – Bycatch Monitoring** As a final action step, due to no SMBKC directed fishery occurring over the last three seasons, any substantial bycatch reduction activity would be indirect and outside of the purview of BSCCG as a client group of crab pot fishery stakeholders. Further, we would note that management summaries indicate that the only SMBKC bycatch from directed crab pot fishing comes during snow crab fishing and has generally been negligible for the last several years. Lastly, the CPT and SSC note that bycatch overall does not appear to be a significant driver in stock status review, but will nonetheless be considered for its influence in rebuilding plan options. We would, however, propose a preliminary action step to report any new bycatch activity that may occur in crab or non-crab fisheries in the SMBKC management area. Importantly, any SMBKC bycatch will be covered by current management (observer record keeping and reporting), but we may become of aware of events before they are officially available.
Progress against the CAP:	This is the 4th 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. However, taking into consideration that fishing mortality is not considered to be the primary constraining factor for rebuilding SMBKC and that ecosystem conditions that have recently been very unfavorable for stock growth (i.e., warm bottom temperatures, low pre-recruit biomass, and northward movement of predator species, primarily Pacific cod). This NCs

Non-conformance 1 (of 1)	
	could be carry over to the next following certification cycle, under the premise of exceptional circumstances. The exceptional circumstances are that Environmental stressors affecting survival and recruitment are considered to be the dominant factors in the decline of the stock and in stock recovery, rather than directed fishing or bycatch, and the possibility exists that rebuilding may never occur.
Non-conformance status:	Open – Corrective Actions in place to be reviewed annually at surveillance audits after reassessment
Non-conformance x (of x)	
Clause:	
Non-conformance level:	Critical/Major/Minor
Non-conformance:	
Rationale:	
Corrective Action Plan (CAP):	
Progress against the CAP:	
Non-conformance status:	Open – Corrective Actions in place to be reviewed annually at surveillance audits.

8.1.3 New or revised corrective action plans

There are no new corrective action plans or pre-existing plans at the moment

8.1.4 Proposed surveillance activities

There are no proposed future surveillance activities as this is the 4th surveillance audit.

9 Recommendations for continued certification

9.1 Certification Recommendation

Following this 4th Surveillance Assessment, the assessment team recommends that continued Certification under the Alaska Responsible Fisheries Management Certification Program is maintained for the management system of the 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 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.

10 References

Reference	Hyperlink
ADFG, 2020. Alaska Department of Fish and Game 2020-2021 Statewide King and Tanner Crab Commercial Fishing Regulations. Alaska Department of Fish and Game, 194 p.	http://www.adfg.alaska.gov/FedAidPDFs/fds08-17.pdf
Barnard, D.R. and Burt, R. 2008. Alaska Department of Fish and Game summary of the 2006/2007 mandatory shellfish observer program database for the rationalized crab fisheries. Alaska Department of Fish and Game, Fishery Data Series No. 08-17, Anchorage	http://www.adfg.alaska.gov/FedAidPDFs/fds08-17.pdf
Chilton, E.A., K.M. Swiney, J.D. Urban, J.E. Munk, and Foy, R.J. 2011. Ecosystem consideration indicators for Bering Sea and Aleutian Islands Kind and Tanner Crab Species NOAA NMFS AFSC, 2011.	http://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/511Chpaters/Ecosystem_CrabSAFE.pdf
CPT, 2021. BSAI Crab Plan Team Report, May 17-20, 2021. Online meeting. NPFMC. 24 p	https://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/
Duffy-Anderson, J.T., Stabeno, P.J., Siddon, E.C., Andrews, A.G., Cooper, D.W., Eisner, L.B., *et al*., 2017. Return of warm conditions in the southeastern Bering Sea: Phytoplankton-Fish. PLoSONE 12(6):e0178955	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0178955
Eich, A.M., Mabry, K.R., Wright, S.K., and Fitzgerald, S.M. 2016. Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-12, 47p.	https://alaskafisheries.noaa.gov/pr/seabird-bycatch-reports
Fedewa, E., Garbor-Yonts, B., and Palof, K. 2019 Ecosystem and Socioeconomic Profile of the Saint Matthew Blue King Crab stock in the Bering Sea. September 2019	https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/
Fedewa, E., Garber-Yonts, B., and Shotwell, K. 2020a. Appendix D. Ecosystem and Socioeconomic Profile of the Saint Matthew Blue King Crab Stock. September 2020. In: Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions. NPFMC. October 2020	https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/
Fedewa, E., Garber-Yonts, B., and Shotwell, K. 2020b. Appendix E. Ecosystem and Socioeconomic Profile of the Bristol Bay Red King Crab Stock. September 2020. NPFMC. October 2020	https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/
Gaeuman, W. B. 2014. Summary of the 2013/2014 mandatory crab observer program database for the Bering Sea/Aleutian Islands commercial crab fisheries. Alaska Department of Fish and Game, Fishery Data Series No. 14-49, Anchorage.	http://www.adfg.alaska.gov/fedaidpdfs/fds14-49.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/

IPHC, 2021. Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2020. IPHC-2021-SA-01. Prepared by: IPHC Secretariat (I. Steward & A. Hicks); 23 December 2020.	https://iphc.int/management/science-and-research/stock-assessment
Krieger, J.R., Eich, A.M., and Fitzgerald, S.M. 2019. Seabird Bycatch Estimates for Alaska Groundfish Fisheries: 2018. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/AKR-20, 41 p. doi:10.25923/hqft-we56.	https://www.fisheries.noaa.gov/resource/document/seabird-bycatch-estimates-alaska-groundfish-fisheries-2018
McConnaughey, R. A., Blackhart, K. E., Eagleton, M. P., and Marsh J. 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.	https://repository.library.noaa.gov/view/noaa/15500
Murphy, J.T. 2020. Climate change, interspecific competition, and poleward vs. depth distribution shifts: Spatial analyses of the eastern Bering Sea snow and Tanner crab (*Chionoecetes opilio* and *C. bairdi*). Fisheries Research. Volume 223, March 2020, 105417.	https://www.sciencedirect.com/science/article/abs/pii/S0165783619302723
Muto, M. M., Helker, V. T., Delean, B. J., Young, N.C., Freed, J.C., Angliss, R. P., Friday, N.A., Boveng, P. L., Breiwick, J.M., Brost, B. M., Cameron, M. F., Clapham, P. J., Crance, J. L., Dahle, S. P., Dahlheim, M.E., Fadely, B. S., Ferguson, M.C., Fritz, L.W., Goetz, K.T., Hobbs, R.C., Ivashchenko, Y.V., Kennedy, A. S., London, J.M., Mizroch, S.A., Ream, R.R., Richmond, E.L., Shelden, K.E.W., Sweeney, K.L., Towell, R.G., Wade, P.R., Waite, J.M., and Zerbini, A.N. 2020. Alaska marine mammal stock assessments, 2020. July, 2021. U.S. Dep. Commer., NOAATech. Memo. NMFS-AFSC-421, 407 p.	https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region
NMFS, 2004. Bering Sea Aleutian Islands Crab Fisheries Final Environmental Impact Statement. NOAA NMFS, NPFMC. August 2004. 1003 p.	https://alaskafisheries.noaa.gov/sites/default/files/analyses/crabeis0804-chapters.pdf
NOAA Fisheries, 2018. Crab FMP Amendment 49 – amendment text for updating EFH description and non-fishing impacts to EFH (EFH Omnibus Amendment.	https://www.fisheries.noaa.gov/action/amendment-49-fmp-bering-sea-aleutian-islands-king-and-tanner-crab
NOAA Fisheries, 2018. AFSC Priorities and Annual Guidance for FY2018. 6 p.	https://www.fisheries.noaa.gov/resource/document/2018-alaska-fisheries-science-center-priorities-and-annual-guidance
NPFMC, 2007. Aleutian Islands Fishery Ecosystem Plan. December, 2007. 198 p.	https://www.npfmc.org/aleutian-islands-fishery-ecosystem-plan/
NPFMC, 2011. Fishery Management Plan for Bering Sea and Aleutian Islands King and Tanner Crabs. North Pacific Fishery Management Council. October 2011. 229 p.	https://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf
NPFMC, 2019. Bering Sea Fishery Ecosystem Plan. North Pacific Fishery Management Council. January 2019. 133 p.	https://meetings.npfmc.org/CommentReview/DownloadFile?p=c334ad33-4139-4b5a-b205-a8b7c5028562.pdf&fileName=D6%20Final%20BS%20FEP%20Jan%202019.pdf.
NPFMC, 2020a. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering	https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

NPFMC, 2021. NPFMC Research Priorities for 2022 - 2024. 19 p.	https://www.npfmc.org/research-priorities/
NPRB, 2018. North Pacific Research Board Science Plan. North Pacific Research Board. 132 p.	https://www.nprb.org/nprb/about-the-science/
Ortiz, I., and Zador, S. (Eds.) 2020. Ecosystem Status Report 2020 Aleutian Islands. Nov 17, 2020	https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands
Punt, A. E., Foy, R. J., Dalton, M. G., Long, W. C., and Swiney, K. M. 2016. Effects of long-term exposure to ocean	https://academic.oup.com/icesjms/article/73/3/849/2458912
Siddon, E. (Ed.) 2020. Ecosystem Status Report 2020 Eastern Bering Sea. December 2020.	https://www.fisheries.noaa.gov/resource/data/ecosystem-status-report-2020-eastern-bering-sea
Siddon, E. and Zador, S. (Eds.) 2019. Ecosystem Status Report 2019: Eastern Bering Sea. EBS Ecosystem Status. 223	https://apps-afsc.fisheries.noaa.gov/refm/reem/ecoweb/index.php
Sigler, M. F., Eagleton, M. P., Helser, T. E., Olson, J. V., Pirtle, J. L., Rooper, C. N., Simpson, S.C., and Stone, R. P. 2017.	http://www.afsc.noaa.gov/Publications/ProcRpt/PR2017-05.pdf
Spies, I., Aydin, K., Dan Nichol, D., Palsson, W., Hoff, J., and TenBrink, T.T. 2019. Chapter 19. Assessment of the sculpin	https://www.fisheries.noaa.gov/resource/data/2019-assessment-sculpin-stock-complex-bering-sea-and-aleutian-
Spies, I., Haehn, R., Siddon, E., Conner, J., Britt, L., and Ianelli, J. 2020. Assessment of the Yellowfin Sole Stock in	https://www.fisheries.noaa.gov/alaska/population-assessments/2020-north-pacific-groundfish-stock-
Stevenson, D. E., and Lauth R. R. 2019. Bottom trawl surveys in the northern Bering Sea indicate recent shifts in the	https://link.springer.com/article/10.1007/s00300-018-2431-1
Szuwalski, C., Cheng, W., Foy, R., Hermann, A. J., Hollowed, A., Holsman, K., Lee, J., Stockhausen, W., and Zheng, J. 2020. Climate change and the future productivity and distribution of crab in the Bering Sea. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsaa140.	https://academic.oup.com/icesjms/article/78/2/502/5920400
Webb, J. 2015. Summary of the interagency crab research meeting held December 11-12, 2013. Alaska Department of Fish and Game, Special Publication No. 15-14, Anchorage. 19 p.	http://www.adfg.alaska.gov/FedAidPDFs/SP15-14.pdf
Zacher, L.S., Richar, J. I., and Foy, R. J. 2019. DRAFT: The 2019 Eastern Bering Sea Continental Shelf Trawl Survey: Results for Commercial Crab Species. NOAA Technical Memorandum NMFS-AFSC.	https://www.fisheries.noaa.gov/resource/document/draft-technical-memorandum-2019-eastern-bering-sea-continental-shelf-trawl-survey

11 Appendices

11.1 Appendix 1 – Assessment Team Bios

11.1.1 Assessment Team Bios

Based on the technical expertise required to carry out this assessment, an Audit Team was selected as follows.

Dr. Ivan Mateo, Lead Assessor
Dr. Ivan Mateo has over 25 years' experience working with natural resources population dynamic modelling. 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 Centre Ecosystem Based Fishery Management on bio-energetic modelling 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 Defence Fund developing population dynamics models for data poor stocks in the Gulf of California. Dr. Mateo also worked as National Research Council post-doc research associate at the NOAA National Marine Fisheries Services Ted Stevens Marine Research Institute on population dynamic modelling of Alaska sablefish.

Dr. Wes Toller
Dr. Toller has an extensive background in fisheries management and habitat conservation. As owner and operator of his own consulting business since 2010, 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 MSC Program. Dr. Toller 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. Dr. Toller 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. Dr. Toller received his doctorate in biological sciences from the University of Southern California. He currently resides in Seattle.