



**FAO-BASED RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION  
SURVEILLANCE REPORT (NO.3)**

*For The*

**U.S. Alaska King and Snow Crab Bering Sea Commercial Fisheries  
(200 mile EEZ)**

*Facilitated By the*  
**Alaska Seafood Marketing Institute (ASMI)**

**Assessors:**

**Vito Ciccia Romito, Lead Assessor**  
**Geraldine Criquet, Assessor**  
**Ivan Mateo, Assessor**  
**Jerry P. Ennis, Assessor**

**Report Code:** **AK/CRA/001.3/2015**

**Published in June 2015**

**SAI Global/Global Trust Certification Ltd.**

Head Office, 3rd Floor, Block 3,  
Quayside Business Park,  
Mill Street, Dundalk, Co. Louth.

**T: +353 42 9320912**

**F: +353 42 9386864**

**web: [www.GTCert.com](http://www.GTCert.com)**



**GlobalTRUST**  
DELIVERING CERTAINTY





**Table of Contents**

**I. Summary and Recommendations .....4**

**II. Assessment Team Details.....5**

**III. Acronyms.....6**

**1. Introduction.....8**

**1.1. Recommendation of the Assessment Team .....9**

**2. Fishery Applicant Details.....10**

**3. Unit of Certification .....11**

**4. Surveillance Meetings .....12**

**5. Surveillance Assessment Outcome Summary .....16**

**6. Conformity Statement .....21**

**7. FAO-Based Conformance Criteria Fundamental Clauses for Surveillance Reporting .....22**

A. The Fisheries Management System..... 22

B. Science and Stock Assessment Activities ..... 30

C. The Precautionary Approach ..... 61

D. Management Measures ..... 72

E. Implementation, Monitoring and Control ..... 81

F. Serious Impacts of the Fishery on the Ecosystem ..... 90

**8. Performance specific to agreed corrective action plans .....102**

**9. Unclosed, new non-conformances and new corrective action plans .....102**

**10. Future Surveillance Actions.....102**

**11. Client signed acceptance of the action plan .....102**

**12. Recommendation and Determination.....102**

**References.....103**

**Appendix 1 .....108**

## I. Summary and Recommendations

The Alaska Seafood Marketing Institute (ASMI) requested an assessment of the U.S. Alaska King and Snow Crab Bering Sea commercial fisheries according to the FAO Based Responsible Fisheries Management (RFM) Certification Program. The application was made in April 2010. Assessment commenced and assessment validation was completed in December 2011, proceeding to full assessment and final certification determination on 16<sup>th</sup> April 2012.

This report is the **3<sup>rd</sup> Surveillance Report (ref: AK/CRA/001.3/2015)** for the U.S. Alaska King and Snow Crab Bering Sea commercial fisheries following Certification awarded against the FAO-Based RFM Program, awarded on the 16<sup>th</sup> April 2012. The objective of the Surveillance Report is to monitor for any changes/updates (after 12 months) in the management regime, regulations and their implementation since the previous assessment (2<sup>nd</sup> surveillance) and to determine whether these changes (if any) and current practices remain consistent with the overall confidence rating scorings of the fishery allocated during initial certification.

In addition to this, any areas reported as “items for surveillance” or corrective action plans in the previous assessment are reassessed and a new conclusion on consistency of these items with the Conformance Criteria is given accordingly. No non-conformances were identified during either the full assessment, surveillance assessment. Consequently, no corrective action plans were requested.

The certification covers the the U.S. Alaska King and Snow Crab Bering Sea Commercial Fisheries [Bristol Bay Red King Crab (*Paralithodes camtschaticus*), Eastern Bering Sea Snow Crab (*Chionoecetes opilio*) and St. Matthew Island Blue King Crab (*Paralithodes platypus*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subject to a federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] joint management regime.

The surveillance assessment was conducted according to the Global Trust Certification procedures for FAO – Based Responsible Fisheries Management Certification using the FAO – Based RFM Conformance Criteria Version 1.2 fundamental clauses as the assessment framework.

The assessment was conducted by a team of Global Trust appointed Assessors comprising of externally contracted fishery experts and Global Trust internal staff. Details of the assessment team are provided in Appendix 1.

The main Key outcomes have been summarized in Section 5 “Assessment Outcome Summary”.

## II. Assessment Team Details

**Vito Ciccio Romito, Lead Assessor**

SAI Global/Global Trust Certification Ltd.  
Quayside Business Centre,  
Dundalk, Co. Louth, Ireland.  
T: +353 (0)42 9320912  
F: +353 (0)42 9386864

**Dr. Gerald P. Ennis, Assessor**

Independent fishery expert,  
Newfoundland,  
Canada.

**Dr. Ivan Mateo, Assessor**

SAI Global/Global Trust Certification Ltd.  
Rhode Island, United States of America  
T: 401-486-4592.

**Dr. Géraldine Criquet, Assessor**

SAI Global/Global Trust Certification Ltd.  
Quayside Business Centre,  
Dundalk, Co. Louth, Ireland.  
T: +353 (0)42 9320912  
F: +353 (0)42 9386864

### III. Acronyms

ABC	Allowable Biological Catch
ACL	Annual Catch Limits
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
ASMI	Alaska Seafood Marketing Institute
AWT	Alaska Wildlife Troopers
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
CPUE	Catch per Unit Effort
CPT	Crab Plan Team
EIS	Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FAO	Food and Agriculture Organization of the United Nations
FMP	Fishery Management Plan
GOA	Gulf of Alaska
GHL	Guideline Harvest Level
IFQ	Individual Fishing Quota
LLP	License Limitation Program
MSA	Magnuson-Stevens Act
mt	Metric tons
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act
nm	Nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
OFL	Overfishing Level
OLE	Office for Law Enforcement
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
TAC	Total Allowable Catch
USCG	U.S. Coast Guard

## Stock Status Definitions

**Acceptable biological catch (ABC)** is a level of annual catch of a stock that accounts for the scientific uncertainty in the estimate of OFL and any other specified scientific uncertainty and is set to prevent, with a greater than 50 percent probability, the OFL from being exceeded. The ABC is set below the OFL.

**ABC Control Rule** is the specified approach in the five-tier system for setting the maximum permissible ABC for each stock as a function of the scientific uncertainty in the estimate of OFL and any other specified scientific uncertainty.

**Annual catch limit (ACL)** is the level of annual catch of a stock that serves as the basis for invoking accountability measures. For crab stocks, the ACL will be set at the ABC.

**Total allowable catch (TAC)** is the annual catch target for the directed fishery for a stock, set to prevent exceeding the ACL for that stock and in accordance with section 8.2.2 of the BSAI crab FMP.

**Maximum sustainable yield (MSY)** is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. MSY is estimated from the best information available.

**F<sub>MSY</sub> control rule** means a harvest strategy which, if implemented, would be expected to result in a long term average catch approximating MSY.

**B<sub>MSY</sub> stock size** is the biomass that results from fishing at constant F<sub>MSY</sub> and is the minimum standard for a rebuilding target when a rebuilding plan is required.

**Maximum fishing mortality threshold (MFMT)** is defined by the F<sub>OFL</sub> control rule, and is expressed as the fishing mortality rate.

**Minimum stock size threshold (MSST)** is one half the B<sub>MSY</sub> stock size.

**Overfished** is determined by comparing annual biomass estimates to the established MSST. For stocks where MSST (or proxies) are defined, if the biomass drops below the MSST (or proxy thereof) then the stock is considered to be overfished.

**Overfishing** is defined as any amount of catch in excess of the overfishing level (OFL). The OFL is calculated by applying the F<sub>OFL</sub> control rule annually estimated using the tier system in Chapter 6.0 of the BSAI crab FMP to abundance estimates.

## 1. Introduction

This Surveillance Report documents the 3<sup>rd</sup> Surveillance Assessment (2015) the U.S. Alaska King and Snow Crab Bering Sea commercial fisheries (3 species) originally certified on April 16<sup>th</sup> 2012, and presents the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

### Unit of Certification

The U.S. Alaska King and Snow Crab Bering Sea Commercial Fisheries [Bristol Bay Red King Crab (*Paralithodes camtschaticus*), Eastern Bering Sea Snow Crab (*Chionoecetes opilio*) and St. Matthew Island Blue King Crab (*Paralithodes platypus*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ), are subjected to a federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] joint management regime.

This 3<sup>rd</sup> Surveillance Report documents the assessment result for the continued certification of commercially exploited U.S. Alaska King and Snow Crab Bering Sea fisheries to the FAO-Based RFM Certification Program. This is a voluntary program that has been supported by ASMI who wishes to provide an independent, third-party certification that can be used to verify that these fisheries are responsibly managed according to the FAO-Based RFM Program.

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

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

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

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

A summary of the site meetings is presented in Section 5. Assessors included both externally contracted fishery experts and Global Trust internal staff (Appendix 1).

## 1.1. Recommendation of the Assessment Team

Following this 3<sup>rd</sup> Surveillance Assessment, in 2015, the Assessment Team recommended that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fisheries, the U.S. Alaska King and Snow Crab Bering Sea Commercial Fisheries [Bristol Bay Red King Crab (*Paralithodes camtschaticus*), Eastern Bering Sea Snow Crab (*Chionoecetes opilio*) and St. Matthew Island Blue King Crab (*Paralithodes platypus*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subjected to a federal [National Marine Fisheries Service (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) & Board of Fisheries (BOF)] joint management regime.

## 2. Fishery Applicant Details

<b>Applicant Contact Information</b>			
Organization/ Company Name:	<b>Bering Sea Crab Client Group LLC</b>	Date:	<b>April 2015</b>
Correspondence Address:	Bering Sea Crab Client Group LLC		
Street :	<b>23929 22<sup>nd</sup> Drive SE</b>		
City :	<b>Bothell</b>		
State:	<b>Washington 98021</b>		
Country:	<b>USA</b>		
Phone:	<b>(425) 4868173</b>	E-mail Address:	<a href="mailto:sgoodman@nrccorp.com">sgoodman@nrccorp.com</a>
<b>Key Management Contact Information</b>			
Full Name:	<i>(Last)</i> <b>Scott</b>	<i>(First)</i> <b>Goodman</b>	
Position:	<b>Fisheries Biologist</b>		
Correspondence Address:	<b>As above</b>		
Phone:	<b>(425) 2325986</b>	E-mail Address:	<a href="mailto:sgoodman@nrccorp.com">sgoodman@nrccorp.com</a>

### 3. Unit of Certification

<b>UNIT OF CERTIFICATION</b>			
<b>U.S. ALASKA KING AND SNOW CRAB BERING SEA COMMERCIAL FISHERIES</b>			
<b><i>Fish Species (Common &amp; Scientific Name)</i></b>	<b><i>Geographical Location of Fishery</i></b>	<b><i>Gear Type</i></b>	<b><i>Principal Management Authority</i></b>
Red King crab <i>(Paralithodes camtschaticus)</i>	Bristol Bay	Pot gear	National Marine Fisheries Service (NMFS) and North Pacific Fishery Management Council (NPFMC)
Eastern Bering Sea Snow crab <i>(Chionocetes opilio)</i>	Eastern Bering Sea		
Blue King crab <i>(Paralithodes platypus)</i>	St. Matthew Island		Alaska Department of Fish and Game (ADFG) and Alaska Board of Fisheries (BOF)

#### 4. Surveillance Meetings

Date & Time	Organization	Representative	Items Discussed
Monday 27 <sup>th</sup> April 2015; 09.30 am.	Bering Sea Fisheries Research Foundation and Alaska Bering Sea Crabber Association	Scott Goodman and Gary Stauffer (BSFRF)  Ruth Christiansen and Mark Gleason (ABSCA)  Vito Romito (GTC), Ivan Mateo (GTC)	<ul style="list-style-type: none"> <li>- Ongoing projects of the Alaska Bering Sea Crabbers association and Bering Sea Fisheries Research Foundation.</li> <li>- Changes or significant updates in law, regulations or commercial fisheries operations affecting the BSAI crab fisheries in 2014/15.</li> <li>- 2014/15 catches for the 3 fisheries.</li> <li>- Other notable updates regarding these fisheries over the past 12 months.</li> <li>- Illegal catches in the BSAI or on the Russian side?</li> <li>- Bycatch avoidance mechanisms, technical (e.g. escape rings, large mesh size, cod fingers) and operational methods.</li> <li>- Management measures relative to legal size, minimum mesh size, protection of juveniles and females.</li> <li>- General trends in stock status for these stocks.</li> <li>- Issues concerning potential damage of Southern Bristol Bay spawning grounds from overlapping groundfish fisheries.</li> <li>- Handling of sublegal and female crabs. Return at sea of females and juvenile crab, handling and methods.</li> <li>- Gear loss and ghost fishing, extent.</li> <li>- Gear conflicts with other users, overlapping fishing areas with other crab or groundfish fisheries.</li> <li>- Area closures, existing and new proposals.</li> <li>- Fishing threats to Essential Fish Habitats from other fleets. Relation to recent modification of trawl sweeps for the flatfish fleet.</li> <li>- New research programs to elucidate biology or ecology of these species (e.g. NPRB).</li> <li>- Industry collaboration in research activities.</li> <li>- Provenience of bait for these fisheries.</li> <li>- Crab economic data collection and use. 2014 updates.</li> </ul>

<p>Monday 27<sup>th</sup> April 2015; 02.00 pm.</p>	<p>Alaska Fisheries Science Centre (AFSC), Seattle, WA, USA.</p>	<p>Benjamin J. Turnock, EBS snow crab stock assessment scientist  Vito Romito (GTC), Ivan Mateo (GTC)</p>	<ul style="list-style-type: none"> <li>- Changes or significant updates in law, regulations or commercial fisheries operations over the past 12 months affecting the management of this fishery and stock.</li> <li>- Updates, if any, on the stocks structure and/or genetics studies in the Eastern/Western Bering Sea (e.g. to elucidate whether the stock is independent from that of Russia in the Western Bering Sea).</li> <li>- Survey activities for the stock.</li> <li>- Plans for the Bering Sea Fisheries Research Foundation (BSFRF) to carry out additional surveys of Bristol Bay.</li> <li>- Most recent recruitment trends for this species.</li> <li>- Planned or ongoing research to improve shell aging for crab species. Other research for the species (e.g. natural mortality estimation, ontogenic migration, males and females mating efficiency and dynamics, female biennial spawning, etc...).</li> <li>- ADFG crab observer coverage and data collected; observed pot lift rate in 2013/2014.</li> <li>- Groundfish Restructured Observer Program, data on groundfish bycatch of crab.</li> <li>- Bycatch dynamics in the fishery, any interactions with endangered species?</li> <li>- Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods. Changes or updates over the past 12 months.</li> <li>- Gear loss and ghost fishing, extent.</li> <li>- Changes in spatial or seasonal closures over the past 12 months for the BBRKC fishery.</li> <li>- Fishing threats to EBS habitats from other fleets. Relation to recent trawl sweep modification of the BSAI bottom trawl fisheries.</li> <li>- New research programs to elucidate biology or ecology of this species (e.g. NPRB).</li> </ul>
<p>Tuesday 28<sup>th</sup> of April 2015; 10.00</p>	<p>Alaska Department of Fish and Game</p>	<p>Doug Pengilly and Wayne Donaldson.</p>	<ul style="list-style-type: none"> <li>- 2014 changes or significant updates in law, regulations or commercial fisheries operations affecting this or other crab fisheries.</li> </ul>

<p>am.</p>	<p>(ADFG), Kodiak, AK, USA.  (Via Conference Call)</p>	<p>Vito Romito (GTC), Ivan Mateo (GTC)</p>	<ul style="list-style-type: none"> <li>- Information to shed light on the large decrease in mature male biomass and recruitment in 2013 and the rise back to 2012 levels in 2014.</li> <li>- SMBKC annual molting frequency (and growth increment) as a function of pre-molt size.</li> <li>- Updates on crab aging research.</li> <li>- Assessment model utilized in 2014, key differences from 2013.</li> <li>- Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods, legal size.</li> <li>- Gear loss and ghost fishing, extent, issues with this fishery.</li> <li>- Ecosystem effects on the fishery. Oceanic and climatic effects, predation, migration etc... and their potential effects on the SMBKC stock</li> <li>- Endangered species interactions from this fishery.</li> </ul>
<p>Wednesday 29<sup>th</sup> of April 2015; 10.45 am.</p>	<p>Alaska Wildlife Troopers Kodiak, AK, USA.</p>	<p>Lt Streifel (Southeast Region)  Vito Romito (GTC), Ivan Mateo (GTC)</p>	<ul style="list-style-type: none"> <li>- Enforcement legislation, rules or proposals. Significant changes and updates over 2014 affecting the 3 species in question.</li> <li>- Enforcement of management measures that support reduction of bycatch and discards.</li> <li>- Number of boardings, number of violations detected, types of violations in the past 12 months. Overall levels of compliance.</li> <li>- Gear marking regulations, checking and concern relating the loss of gear (pot).</li> <li>- Relationships with USCG for federal waters enforcement.</li> </ul>
<p>Thursday 30<sup>th</sup> of April 2015; 09.00 am.</p>	<p>Alaska Department of Fish and Game (ADFG), Juneau, AK, USA.</p>	<p>Jie Zheng, Bristol Bay Red King crab stock assessment scientist  Vito Romito (GTC), Ivan Mateo (GTC)</p>	<ul style="list-style-type: none"> <li>- Changes or significant updates in law, regulations or commercial fisheries operations affecting this species over the past 12 months.</li> <li>- Survey activities for the stock, NMFS trawl survey and BSFRF trawl survey, data generated and use of such data. Additional survey sample for Bristol Bay Red King Crab stock. Updates for the past 12 months.</li> <li>- Plans to conduct tagging studies to characterize the ontogenetic or annual migration patterns of the stock.</li> <li>- Recent recruitment trends for this species. Estimation of natural</li> </ul>

			<p>mortality and survey catchability parameters. Changes in age structure.</p> <ul style="list-style-type: none"> <li>- ADFG crab observer coverage and data collected; observed pot lift rate in 2013/2014.</li> <li>- Ongoing efforts to address the 2010 CIE comments of incorporating early life history parameters on Bristol Bay red king crab stock assessment such as life history characteristics (primiparous and multiparous mating locations and timing, hatching, larval period and movement, settlement period and location, growth at each stage, molt frequency and timing, time and size at maturity, and adult migration patterns).</li> <li>- Plans to improve estimates of natural mortality, crab availability to the trawl surveys, and juvenile crab abundance as identified in the 2013 BBRKC SAFE report.</li> <li>- Concern about potential consequences, in terms of reduced genetic diversity, associated with the fishery targeting large males and allowing too much mating by males that mature at small sizes.</li> <li>- Bycatch avoidance mechanisms, technical (e.g. escape rings, pot fingers) and operational methods.</li> <li>- Legal size. Changes over the past 12 months.</li> <li>- Gear loss and ghost fishing, extent, issues.</li> <li>- Measures to spatially and temporally protect breeding populations. Updates for 2013.</li> <li>- Specific to the BBRKC fishery, it appears that mature female crab has moved to the historical important spawning ground in the southern Bristol Bay, given the current overlap between fisheries, trawling intensity in the southern Bristol Bay, and the importance of the spawning ground there, it appears that trawling fisheries have adversely affected the EFH of red king crab. Updates on research or developments on this subject.</li> </ul>
--	--	--	--

## 5. Surveillance Assessment Outcome Summary

- 1. Alaska's BSAI crab stocks are managed under the Fishery Management Plan for Bering Sea/ Aleutian Islands King and Tanner Crabs (FMP). The crab FMP was developed under a negotiated agreement between the State of Alaska and the federal government. The result was a state/federal fishery management plan (FMP) which incorporated concerns of the NPFMC, NMFS and MSA requirements on the federal side and ADFG, the BOF and Alaska statutes on the state side. This balance resulted in true Joint Management where the needs of both Alaska residents and those from other states were met. The crab FMP has three categories of regulations which reflect the state and federal emphasis. Once the state and federal agencies and the BOF and NPFMC arrived at consensus and put the Joint management document to public review, it was submitted to the Secretary of Commerce who accepted joint management for the BSAI crab fisheries.*
- 2. The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. This occurs whenever resources under their management may be affected by other developments and each time they create, renew or amend regulations. The fishery management agencies have processes, committees and groups that allow potential coastal zone developments and issues to be brought to formal review and engagement such as the NPFMC meetings or the BOF meetings. From witnessing the processes, interviews with representatives of these organizations, The Council and the BOF actively encourage stakeholder participation, and all their deliberations are conducted in open, public sessions. Decisions are transparently documented on the various websites of these organizations in a timely manner. With a Congressionally approved approach creating Processor Quota Shares and Individual Fishing Quotas for rationalized crab fisheries in the BSAI in 2005, the numbers of buyers and sellers were capped, seasons were protracted and vessels were able to join cooperatives that resulted in fewer vessels deploying less gear on the grounds. The economic conditions under which fishing industries operate promote responsible fisheries, and these circumstances are actively reviewed and demonstrated in various analysis by NMFS. ADFG also track ex-vessel value of the fisheries they manage, and produce Annual Management Reports that support the analysis. Decisions are based on both biological and socio-economic information collected and analyzed by NPFMC, NMFS and ADFG staff economists that participate in the economic, social and cultural evaluation and review process of fishery management proposals. Allocation also considers subsistence and community development initiatives.*
- 3. Long-term fisheries management objectives are outlined in the BSAI Crab FMP. State regulations for the king and snow (& Tanner crab) fisheries are listed under the Alaska Administrative Code, Title 5, Chapter 34 and 35. The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851) to which all fishery management plans must be consistent. Conservation of aquatic habitats and biodiversity are*

*integral parts of the NPFMC's management process. These concerns and decisions are summarized annually in the AFSC Ecosystems Considerations report and the ecosystem sections of each annual Stock Assessment and Fishery Evaluation (SAFE) report. Furthermore, Essential Fish Habitat (EFH) identification and protection constitute a key objective for the management system as outlined in the BSAI crab FMP.*

- 4. The collection, aggregation and use of data in stock assessments for the BSAI crab fisheries are undertaken through collaboration between the NPFMC, the NMFS and ADFG. Data collection, analysis and stock assessment of the BSAI crab fisheries respect the NPFMC's BSAI crab FMP requirements. NMFS and ADFG collect fishery dependent data and undertake fishery-independent surveys for all BSAI crab fisheries providing the basis for the assessment of the crab stocks and their impact on the ecosystem. The NMFS annual trawl surveys of the eastern Bering Sea provide indices of relative abundance and biomass for all three fisheries. Full details of the datasets for the three fisheries and their time series can be found in the annual Stock Assessment and Fishery Evaluation (SAFE) reports.*
- 5. The NMFS undertakes shellfish stock assessments through the annual Eastern Bering Sea trawl survey which provides the primary input to the shellfish assessments. Information derived from both regular surveys and associated research are analyzed by AFSC stock assessment scientists and supplied to fishery management agencies and to the commercial fishing industry. In addition, economic and ecosystem assessments are provided to the Council on an annual basis. For the BBRKC fishery, a length-based analysis (LBA) model combines multiple sources of survey, catch and bycatch data using a maximum likelihood approach to estimate abundance, recruitment and catchabilities, catches and bycatch of the commercial pot fisheries and groundfish trawl fisheries. For the SMBKC fishery a three-stage catch-survey analysis (CSA) assesses the male component of the stock incorporating data from commercial catches from the directed fishery and its observer program, the annual EBS trawl survey, triennial pot surveys and bycatch data from the groundfish trawl fishery. For the EBSSC fishery the stock assessment uses a size and sex-structured model which is fitted to time series of total catch data from the directed fishery and bycatch data from the trawl fishery, size frequency data from the catch in the pot fishery and the bycatch in both the pot and trawl fisheries, and abundance data from the NMFS trawl survey and two recent BSFRF surveys. An ongoing goal is to produce an ecosystem assessment utilizing a blend of data analysis and modelling to clearly communicate the current status and possible future directions of ecosystems.*
- 6. The status determination criteria for crab stocks are calculated on an annual basis using a five-tier system that accommodates varying levels of uncertainty of information, and incorporates new scientific information providing a mechanism for continually improving the status determination criteria as more information becomes available. For tier 3 stocks, the target reference point is  $B_{35\%}$  (when spawning biomass is reduced to 35% of the unfished condition), a proxy for  $B_{MSY}$ , or biomass at Maximum Sustainable Yield (MSY). Stock status of*

*BSAI crabs are determined by two metrics. Firstly, the stock is considered to be overfished if the stock size is estimated to be below the minimum stock size threshold (MSST) or limit reference point (1/2 MSY). Secondly, overfishing is considered to have occurred if the exploitation level, or fishing mortality, exceeds the fishing mortality at the overfishing level ( $F_{OFL}$ ), or more intuitively if the total catch exceeds the OFL level (equivalent to MSY).*

<b>Stock</b>	<b>Tier</b>	<b>Target Reference Point (TRP)</b>	<b>Biomass at TRP</b>	<b>Biomass at present</b>	<b>Percentage of TRP</b>
<b>BBRKC</b>	3b	B35%	25,700 t	24,700 t	96%
<b>SMBKC</b>	4b	Bmsy proxy	3,284 t	3,040 t	93%
<b>EBSSC</b>	3b	B35%	142,909 t	126,500 t	89%

*There is strong evidence from the assessments that since rationalization, the level of fishing permitted for all three crab stocks has been commensurate with the current state of the fishery resources and never exceeded the overfishing level.*

7. *The overall management for the BBRKC, EBSSC and SMBKC comprises all the elements as specified in the FAO guidelines for the precautionary approach. FAO Guidelines for the Precautionary Approach (PA) (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review. Absence of adequate scientific information is not used as a reason for postponing or failing to take conservation and management measures. The three crab stocks part of this assessment are managed under a tier system rule based on stock knowledge. Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. The five-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. The lower the tier, the less conservative the determination of OFL/ABC and ACL are, due to a greater level of information being known about the stock. Higher tier stocks are managed more conservatively due to gaps in the information about the stock. This system is intrinsically precautionary in nature and the results involve catches always lower than the overfishing level. The annual assessments and subsequent SAFE reports for the BSAI crab fisheries allow for the identification of areas where there are gaps in the knowledge of the stock which require further research and/or improvements.*
8. *The NPFMC's FMP for BSAI crab stocks outlines the harvest strategy and harvest control rule, the stock status definitions, the criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The BSAI Crab FMP Plan authorizes only the use of pot gear to harvest the crab resources. The Crab Rationalization program allocates BSAI crab resources among harvesters, processors, and coastal communities who have been involved with and/or were dependent upon these fisheries. Share allocations to harvesters*

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

- 9. There is clearly defined harvest strategy that consists of a set of defined management measures designed to maintain the crab stocks at levels capable of producing maximum sustainable levels. These include harvest control rule, stock status definitions, criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). Using this strategy and clearly laid out rebuilding plans, two of these stocks were rebuilt from being declared overfished. The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH are necessary to maintain stocks capable of producing maximum sustainable yields. At present, there is an area of overlap between current female red king crab distribution and areas where trawling occurs in the southern Bristol Bay. The NPFMC is currently researching this issue and discussing the best way to proceed with the management of this area.*
- 10. Alaska enhances through education and training programs the education and skills of fishers and, where appropriate, their professional qualifications. Records of fishermen are maintained up to date by the fishery management organizations.*
- 11. There is a division of effort and emphasis in the at-sea enforcement between the USCG and the AWT. Under joint management there are both state and federal laws to enforce, and both state and federal agents actively conduct at-sea enforcement. The USCG is responsible for enforcing the main federal vessel regulations: this includes safety at sea, drug enforcement, vessel compliance with ESA and EFH requirements and assuring compliance of federal permits, observer coverage, licenses and VMS in the crab fisheries. AWT have vessels that conduct at-sea compliance with gear regulations, capable of hauling and confiscating crab pots, sample crab harvests at sea, assure sex and size requirements are met and assure*

*that the vessels have all required state and federal licenses. Additionally AWT, along with ADFG area biologists and technicians, conduct vessel inspections dockside, conducting hold inspections and observing offloads of harvested crab for compliance. The entire crab harvests are conducted in Alaskan waters by American vessels. No foreign fleet is allowed to fish in the Alaska's EEZ. Because the fishery was rationalized in 2005, most enforcement of IFQ/IPQ violations, as well as size, sex and season violations occur at offloading.*

- 12. In Alaska waters, enforcement policy section 50CFR600.740 states: (a) The MSA provides four basic enforcement remedies for violations, in ascending order of severity, as follows: (1) Issuance of a citation (a type of warning), usually at the scene of the offense (see 15 CFR part 904, subpart E). (2) Assessment by the Administrator of a civil money penalty. (3) For certain violations, judicial forfeiture action against the vessel and its catch. (4) Criminal prosecution of the owner or operator for some offenses. The MSA treats sanctions against the fishing vessel permit to be the carried out of a purpose separate from that accomplished by civil and criminal penalties against the vessel or its owner or operator. The 2011 Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions issued by NOAA Office of the General Counsel – Enforcement and Litigation, provides guidance for the assessment of civil administrative penalties and permit sanctions under the statutes and regulations enforced by NOAA. The Marine Division of AWT and the State of Alaska Department of Law pursue a very aggressive enforcement policy. They attend the BOF and are integral into the process for regulation formulation and legislation, analogous to the USCG attendance and input in the Council process. AWT has Statutory / Regulatory legislation pertaining to their Authority.*
- 13. The purpose of the Crab Ecosystem Considerations and Indicators (CECI) report is to consolidate ecosystem information specific to the crab stocks in the BSAI FMP. The last EFH review (2010) identified impacts of groundfish trawling on EFH habitat of red king Crab in Southern Bristol Bay as a potential problem area. The NPFMC is addressing the issue. In the BSAI crab fisheries Final Environmental Impact Statement (EIS), the impact of pot gear on benthic Eastern Bering Sea species is discussed. The total portion of the EBS impacted by commercial pot fishing may be less than 1% of the shelf area and the report concludes that BSAI crab fisheries have an insignificant effect on benthic habitat. Habitat protection areas, prohibited species caps (PSC) and crab bycatch limits are in place to protect important benthic habitat for crab and other resources and to reduce crab bycatch in the trawl and fixed gear groundfish fisheries. If PSC limits are reached in bottom trawl fisheries executed in specific areas, those fisheries are closed. The EBS crab fisheries catch a small amount of other species as bycatch. A limited number of groundfish, such as Pacific cod, Pacific halibut, yellowfin sole, and sculpin are caught in the directed pot fishery. The invertebrate component of bycatch includes echinoderms, snails, non-FMP crab, and other invertebrates. As noted in the Endangered Species Act EIS report, crab fisheries do not adversely affect ESA listed species, destroy or modify their habitat, or comprise a measurable portion of their diet. Based on food habits data collected in the summer months during the annual EBS bottom trawl survey, Pacific cod, Pacific halibut and skates are the primary predators of large or*

*legal size crab although legal-sized crab are a minimal component of these predators diets. The short and long term effects of removing large male crab from a population are not well understood and may vary by species and population as outlined in various scientific studies.*

## 6. Conformity Statement

**The Assessment Team recommends that continued certification under the FAO Based Responsible Fisheries Management Program is granted to the Alaska Bering Sea and Aleutian Islands king and snow crab commercial fishery employing pot gear within Alaska's jurisdiction (200 nautical miles EEZ), under federal [National Marine Fisheries Services (NMFS)/North Pacific Fishery Management Council (NPFMC)] and state [Alaska Department of Fish and Game (ADFG) and Board of Fisheries (BOF)] joint management regime.**

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

### A. The Fisheries Management System

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

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

*FAO Eco 28*

**Evidence adequacy rating:**

**High**
                         
  **Medium**
                         
  **Low**

**Rating determination**

**Summary**

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

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

The NPFMC is one of eight regional councils established by the Magnuson-Stevens Fishery Management and Conservation Act (MSFMCA or MSA) to oversee management of the nation's fisheries. The MSA is the primary layer of governance for Bering Sea crab fisheries. The MSA sets out

ten national standards for fishery conservation and management (16 U.S.C. § 1851), with which all FMPs must be consistent. Under the MSA, the NPFMC is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a FMP and any necessary amendments that regulate conservation and management for each fishery under its authority. The management goal in the FMP is to maximize the overall long-term benefit to the nation of Bering Sea Aleutian Islands (BSAI) king and Tanner crab stocks by coordinated federal and state management, consistent with responsible stewardship for conservation of the crab resources and their habitats (<http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>).

### **Stock Assessment and Harvest Rates**

The NMFS Alaska Fisheries Science Center in Seattle and the Kodiak Fisheries Research Center (KFRC) generate the scientific information and analysis necessary for the conservation, management, and utilization of the region's crab resources. ADFG is a strong participant in crab research, at headquarters (HQ), Dutch Harbor and Kodiak, their research and analysis is also integrated into the conservation and management of Alaskan crab stocks. The NPFMC and NMFS set overfishing levels (OFL), determine all sources of mortality, and make numerous management decisions via consultation with the NMFS Restricted Access Management Division (RAM) on Individual Fishing Quotas/Individual Processor Quotas.

<http://www.afsc.noaa.gov/> and <http://www.afsc.noaa.gov/Kodiak/default.htm>

During 2014, new Stock Assessment and Fishery Evaluation (SAFE) reports were completed for each of the major crab species and fisheries. Annual stock assessments show changes in the biomass of a stock, fishing effects on the stocks, summarize biological data taken on the species and incorporate multiple parameters including the ecosystem, temperature regime, and data from other fisheries. Data are updated annually with the most current information. The SAFE reports provide information for better stock management via mortality estimates, biomass reference points and suggested allowable catches. SAFE documents are reviewed by the Crab Plan Team and the Scientific and Statistical Committee of the NPFMC.

For BSAI King and Tanner crab SAFE 2014 see: <http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (see [2014 Crab SAFE](#))

### **Stock Identification and Management Units**

Each of the Bering Sea crab fisheries are considered discrete stocks and treated as single stocks for management purposes. There have been no changes in the stock units since certification. The ADFG defines a succinct area under their regulation 5 AAC34.800 Description of Registration Area T, for the single stock red king crab fishery. The St. Matthew Island blue king crab fishery is defined by specific district boundaries encompassing the fishable population's location, under 5 AAC 34.905 (C)(2) Description of Registration Area Q districts, Saint Matthew Island Section with studies showing little to no genetic exchange with the Pribilof or Western Bering Sea populations. The *C. opilio* (snow) crab fishable population is much more broadly distributed, with the district area boundaries defined under 5 AAC 35.505 (e)(1) and (B)(2) Description of Registration Area J districts.

<http://www.afsc.noaa.gov/Kodiak/shellfish/crabebs/2014EBSSurveyTechMemoDraft.pdf>

**Enforcement**

There is a division of effort and emphasis in the at-sea enforcement between the USCG and the AWT. Under joint management there are both state and federal laws to enforce, and both state and federal agents actively conduct at-sea enforcement. The USCG is responsible for enforcing the main federal vessel regulations: this includes safety at sea, drug enforcement, vessel compliance with ESA and EFH requirements and assuring compliance of federal permits, observer coverage, licenses and VMS in the crab fisheries. While the AWT have vessels that conduct at-sea compliance with gear regulations, are capable of hauling and confiscating crab pots, sample crab harvests at sea to assure sex and size requirements are met and assure that the vessels have all required state and federal licenses. Additionally AWT, along with ADFG area biologists and technicians, conduct vessel inspections dockside, conducting hold inspections and observing offloads of harvested crab for compliance. Because the fishery was rationalized in 2005, most enforcement of IFQ/IPQ violations, as well as size, sex and season violations occur at offloading.

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

[www.uscg.mil/d17/](http://www.uscg.mil/d17/)

No significant changes to management or other measures/regulation have been implemented in the past 12 months.

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

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

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

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

**NEPA**

The NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes, a socio-economic and biological/ environmental impact assessment of various proposed scenarios, before the path of action is decided. This occurs whenever resources under their management may be affected by other developments and each time they create, renew or amend regulations. The NEPA processes provide public information and opportunity for public involvement that are robust and inclusive at both the state and federal levels. Fisheries are relevant to the NEPA process in two ways. First, each significant NPFMC fisheries package must go through the NEPA review process. Second, any project that could impact fisheries (i.e., oil and gas, mining, coastal construction projects, etc...) that is either on federal lands, in federal waters, receives federal funds or requires a federal permit, must go through the NEPA process. In this manner, both fisheries and non-fisheries projects that have a potential to impact fisheries have a built in process by which concerns of the NPFMC, NMFS, state

agencies, industry, other stakeholders or the public can be and are accounted for.

The state is a cooperating agency in the NEPA process for federal actions, so that gives the State of Alaska a seat at the table for federal actions. This includes decision-making processes and activities relevant to the fishery resource and its users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users.

Overall, the NEPA process, existing agencies and processes (e.g. ADFG, the Alaska Department of Environmental Conservation), the Department of Natural Resources (DNR), US Fish and Wildlife Service, the Alaska National Interest Lands Conservation Act, the DNR's Office of Project Management and Permitting and Bureau of Ocean Energy Management), and the existing intimate and routine cooperation between federal and state agencies managing Alaska's coastal resources (living and non-living) is capable of planning and managing coastal developments in a transparent, organized and sustainable way, that minimizes environmental issues while taking into account the socio-economic aspects, needs and interests of the various stakeholders of the coastal zone.

Virtually every development affecting the natural environment, by regulation, has to go through the NEPA environmental impact assessment process, which identifies its potential environmental, social, and economic impacts and/or benefits. The NEPA processes provide public information and opportunity for public and agencies involvement that are robust and inclusive at both the state and federal levels ([https://ceq.doe.gov/nepa/Citizens\\_Guide\\_Dec07.pdf](https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf)).

#### **DEC**

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

#### **ADFG**

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

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

#### **DNR**

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

#### **USFWS**

The U.S. Fish and Wildlife Service (USFWS) is a bureau within the Department of the Interior. Its objectives include 1) Assisting in the development and application of an environmental stewardship ethic based on ecological principles, scientific knowledge of fish and wildlife, and a sense of moral

responsibility; 2) Guide the conservation, development, and management of the US's fish and wildlife resources; 3) Administer a national program to provide the public opportunities to understand, appreciate, and wisely use fish and wildlife resources. The USFWS functions include enforcement of federal wildlife laws, protection of endangered species, management of migratory birds, restoration of nationally significant fisheries, conservation and restoration of wildlife habitat such as wetlands, and help of foreign governments with their international conservation efforts. Additionally, the USFWS distributes of hundreds of millions of dollars, collected through the Sport Fish and Restoration Program. These funds are derived from an excise taxes on fishing equipment, motorboat and small engine fuels and import duties. Funds are distributed to State fish and wildlife agencies for fishery projects, boating access and aquatic education

([http://www.fws.gov/help/about\\_us.html](http://www.fws.gov/help/about_us.html)).

### **ANILCA**

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

### **OPMP**

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

### **BOEM**

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

[http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis\\_Flowchart\\_CookInletOffshore\\_Draft.pdf](http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis_Flowchart_CookInletOffshore_Draft.pdf)

[http://www.boem.gov/uploadedFiles/Proposed\\_OCS\\_Oil\\_Gas\\_Lease\\_Program\\_2012-2017.pdf](http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf)

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

#### **The NPFMC process**

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

#### **The BOF process**

The BOF main role is to conserve and develop the fishery resources of the state. The board is also charged with making allocative decisions, and ADFG is responsible for management based on those decisions. The BOF meets four to six times per year in communities around the state to consider proposed changes to fisheries regulations around the state. The board uses the biological and socioeconomic information provided by the Alaska Department of Fish and Game, public comment received from people inside and outside of the state, and guidance from the Alaska Department of Public Safety and Alaska Department of Law when creating regulations that are sound and enforceable. Advisory committees are the local "grass roots" groups that meet to discuss fish and wildlife issues and to provide recommendations to the boards. There are 82 committees throughout the state each with expertise in a particular local area. This process ensures that the local communities' customary uses and practices are considered.

Advisory Committees (AC) are local "grass roots" citizen groups intended to provide a local voice for the collection and expression of public opinions and recommendations on matters relating to the management of fish and wildlife resources in Alaska. ADFG staff regularly attends the AC meetings in their respective geographic areas to provide information to the public and hear local opinions on fishery related activities. Currently, there are 82 advisory committees in the state. Of these, approximately 80% to 85% are "active," meaning they regularly meet, write proposals, comment, and attend BOF meetings. The enabling statute for the AC system is AS 16.05.260. Regulations governing the ACs are found in the Alaska Administrative Code (AAC) Title 5, Chapters 96 – 97 <http://www.boards.adfg.state.ak.us/bbs/what/prps.php>.

#### **CDQs**

The Community Development Quota (CDQ) Program began in December of 1992 with the goal of promoting fisheries related economic development in western Alaska. The program is a federal fisheries program that involves eligible communities who have formed six regional organizations,

referred to as CDQ groups. There are 65 communities within a fifty-mile radius of the Bering Sea coastline who participate in the program. The CDQ program allocated a portion of the Bering Sea and Aleutian Island harvest amounts to CDQ groups, including halibut, groundfish (Pollock, Pacific cod, flatfish and rockfish), crab and bycatch species. The CDQ program was granted perpetuity status during the 1996 reauthorization of the Magnuson-Stevens Act. The Economic status of the fisheries off the BSAI area can be found in the Economic SAFE. These reports are published yearly along with the Ecosystem SAFEs and the various fishery Stock Assessment and Resource Evaluation (SAFE) reports.

<http://www.afsc.noaa.gov/refm/docs/2014/economic.pdf>

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

**FAO CCRF 7.3.3/7.2.2**

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

*Long-term fisheries management objectives are outlined in the BSAI Crab FMP. State regulations for the king and snow (& Tanner crab) fisheries are listed under the Alaska Administrative Code, Title 5, Chapter 34 and 35. The MSA, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851) to which all fishery management plans must be consistent. Conservation of aquatic habitats and biodiversity are integral parts of the NPFMC's management process. These concerns and decisions are summarized annually in the AFSC Ecosystems Considerations report and the ecosystem sections of each annual Stock Assessment and Fishery Evaluation (SAFE) report. Furthermore, Essential Fish Habitat (EFH) identification and protection constitute a key objective for the management system as outlined in the BSAI crab FMP.*

In 2005, the NPFMC instituted an approved rationalization approach creating Processor Quota Shares as well as Individual Fishing Quotas for rationalized crab fisheries in the BSAI. By capping the numbers of buyers and sellers, and providing greatly protracted seasons, vessels were able to join cooperatives that resulted in fewer vessels deploying less gear on the grounds and it removed excess fishing capacity to improve the economic viability of the fishing industry. The pot gear deployed is selective, with ADFG mandated escape rings to allow small crab to escape, and biodegradable twine to reduce ghost fishing from lost pots. With the race for fishing no longer hanging over the fleet, this resulted in reduced pot losses, reduced damage from on-deck sorting, reduced deadloss, and a higher quality product.

Because a large, efficient fleet operating in a race for fish scenario can quickly surpass a harvest target when they locate high concentrations of crab, fishery rationalization was an important NPFMC objective. Prior to rationalization, more than 300 vessels would participate in the larger fisheries. When the fisheries were rationalized, a lesser number qualified to receive quota shares of the rationalization program (245 Bristol Bay red king crab quota holders, 231 Bering Sea *C. opilio* (snow crab) holders, and 136 St. Matthew Island blue king crab holders). A quota shareholder may hold quota in several (or all) fisheries, as allocation was derived from the historical volume of pounds legally landed by an individual entity, as compared to the total pounds landed by the entire fleet. Today, because of the use of cooperatives, many fewer vessels are needed to take the TAC; and because the vessel owners fish within fishery cooperatives, they can stack permits on fewer vessels and reduce operational costs.

<http://www.adfg.alaska.gov/FedAidPDFs/FMR12-22.pdf>

**FMP Management Objectives**

The BSAI king and Tanner crab FMP lists the following objectives:

- Biological Conservation Objective: Ensure the long-term reproductive viability of king and Tanner crab populations.
- Economic and Social Objective: Maximize economic and social benefits to the nation over time.
- Gear Conflict Objective: Minimize gear conflict among fisheries.
- Habitat Objective: To protect, conserve, and enhance adequate quantities of essential fish habitat (EFH) to support king and Tanner crab populations and maintain a healthy ecosystem.
- Vessel Safety Objective: Provide public access to the regulatory process for vessel safety considerations.
- Due Process Objective: Ensure that access to the regulatory process and opportunities for redress are available to all interested parties.
- Research and Management Objective: Provide fisheries research, data collection, and analysis to ensure a sound information base for management decisions.

The national standards and management objectives defined in BSAI FMP provide adequate evidence to demonstrate the existence of long-term objectives clearly stated in management plans.

NMFS conducts biological research that is used by the NPFMC’s Crab Plan Team to recommend a TAC in each fishery. ADFG uses their recommendations along with the best scientific data available at the time to establish catch limits for each of its crab fisheries in the Bering Sea.

The BOF and the department also maintain long-term objectives for these fisheries established in regulation and in Annual Management Reports. State regulations for the king and Tanner crab fisheries are listed under the Alaska Administrative Code, Title 5, Chapter 34 and 35. Long term objectives for State regulations are listed under 5 AAC 34.816 Bristol Bay red king crab harvest strategy, 5 AAC 34.917 St. Matthew Island Section blue king crab harvest strategy, and 5 AAC 35.517 Bering Sea *C. opilio* Tanner crab harvest strategy. Annual Management Reports may be found on the department’s web site. (*C. opilio* is also known as “snow” crab).

**Recently Fishery Management Plan (FMP) Amendments**

Amendments	Notice of Availability and/or Proposed Rule	Analysis	Decision Information
<a href="#">Amendment 46</a>	<a href="#">80 FR 7816, February 12, 2015</a> . Notice of availability of Amendment 108 to the FMP for Groundfish of the BSAI, Amendment 100 to the FMP for Groundfish of the GOA, and Amendment 46 to the FMP for BSAI King and Tanner Crabs. These amendments would correct the text in the FMPs that establish vessel length limits for small vessels exempted from the License Limitation Program (LLP) consistent with the original intent of the LLP, current fisheries operations, and Federal regulations. Comment period through April 13, 2015.	<a href="#">Analysis</a>	<a href="#">Approved:</a> 04/07/15
<a href="#">Amendment</a>	<a href="#">80 FR 7817, February 12, 2015</a> . Proposed rule to implement Amendment 45 to the Fishery Management Plan for BSAI King and Tanner Crabs. Comment	<a href="#">Final</a>	<a href="#">Approved:</a>

<p><a href="#">45</a></p>	<p>period through March 16, 2015.</p> <p><a href="#">80 FR 5499, February 02, 2015</a>. Notice of availability of Amendment 45 to the FMP for king and tanner crab of the BSAI to establish, for a limited period of time, a process to remove Pacific cod catch limits, known as sideboard limits, for certain hook-and-line catcher/processors. Comment period through April 3, 2015.</p>	<p><a href="#">RIR/IRFA</a></p>	<p>04/29/15</p>
<p><a href="#">Amendment 43</a></p>	<p><a href="#">79 FR 49487, August 21, 2014</a>. Notice of availability of Amendment 103 to the FMP for Groundfish of the BSAI and Amendment 43 to the FMP for BSAI King and Tanner Crabs. If approved, Amendment 103 would prohibit directed fishing for Pacific cod in the Pribilof Islands Habitat Conservation Zone. Amendment 43 would revise the rebuilding plan for Pribilof Islands blue king crab. Comment period through October 20, 2014.</p>	<p><a href="#">Draft RIR/IRFA</a></p> <p><a href="#">Final EA</a></p> <p><a href="#">FONSI</a></p>	

<https://alaskafisheries.noaa.gov/sustainablefisheries/amds/>

## B. Science and Stock Assessment Activities

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

FAO CCRF 7.1.9/7.4.4/7.4.5/7.4.6/8.4.3/12.4

ECO 29.1-29.3

### Evidence adequacy rating:

High

Medium

Low

### Rating determination

#### Summary

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

#### Observations from the survey, commercial and other fisheries

ADFG and NMFS collect yearly data from a variety of sources to characterize the fishery, status and population trends in all regulatory areas. ADFG and NMFS collect fishery data and undertake fishery-independent surveys for all Bering Sea and Aleutian Islands (BSAI) crab fisheries providing the basis for the assessment of the crab stocks and their impact on the ecosystem. The NMFS annual trawl surveys of the eastern Bering Sea provide indices of relative abundance and biomass for all three Unit of Certification fisheries. Landing data in the form of retained catch numbers and biomass, and fishing effort in terms of pot lifts are recorded on the ADFG eLandings system (previously reported on paper 'fish tickets'). Pot bycatch data are obtained from crab fisheries bycatch data recorded on the ADFG observer database, and trawl and fixed gear bycatch data from the groundfish fishery are obtained from the NMFS observer database. Estimates of bycatch mortality biomass assume handling mortality rates of 20% for the directed pot bycatch, 25% for the Tanner crab fishery bycatch, and 80% and 50% for trawl and fixed gear bycatch, respectively.

#### Crab removals

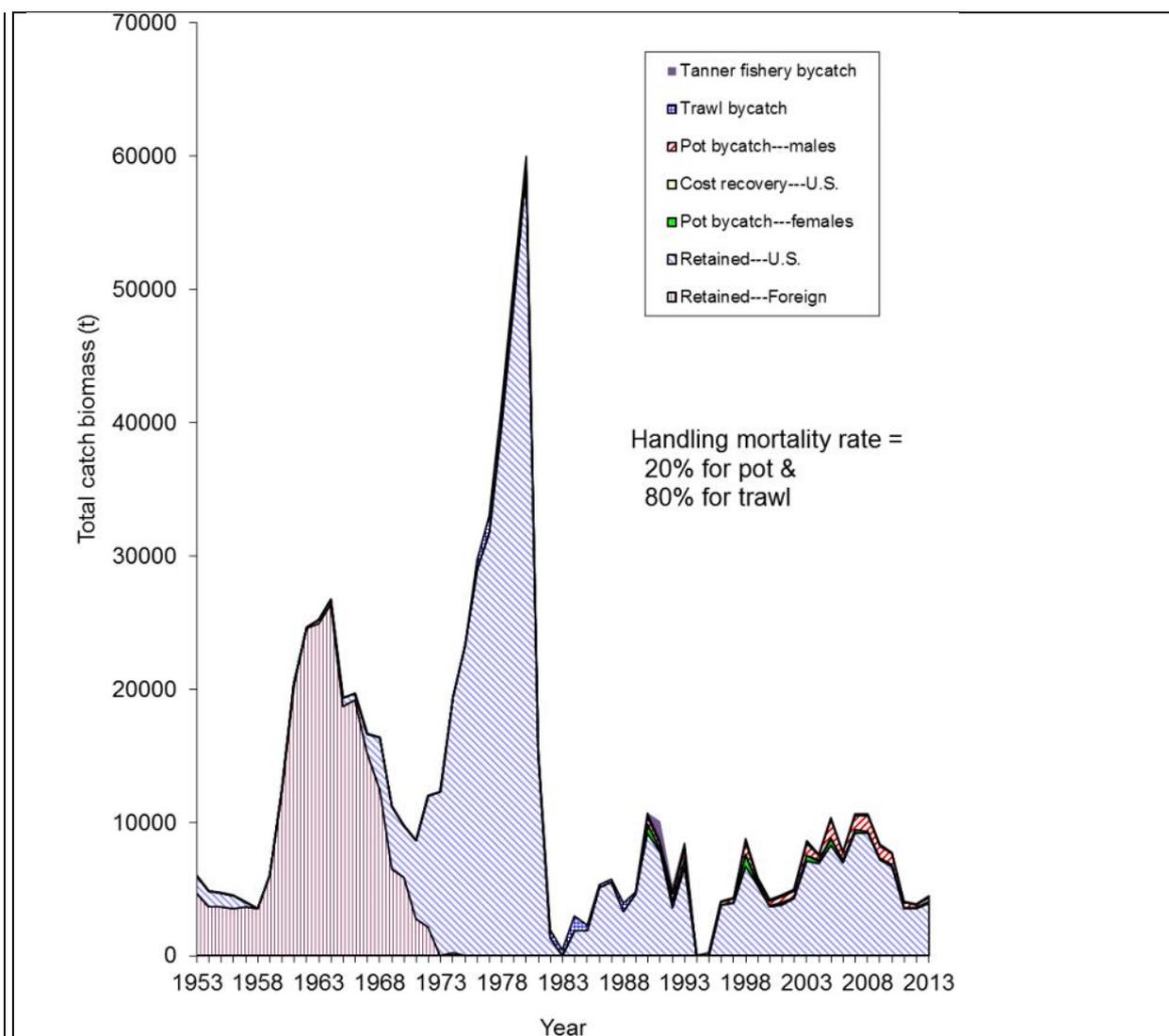
Total removals from the crab populations come from multiple sources including the directed fishery, bycatch in other fisheries, and surveys.

**Bristol Bay red king crab (BBRKC)**

New data for the September 2014 assessment include commercial catch and bycatch in 2013/2014, the 2014 summer trawl survey, and updated summer trawl survey data from 1975 to 2014. The revised (2013) NMFS length-weight relationships are used. Trawl bycatch length frequency data during 1986-2012 and trawl bycatch abundance data during 2009-2012 were revised based on the new data provided by NMFS in 2014. Catch data and size frequencies of retained crab from the directed BBRKC pot fishery from 1960 to the 2013/14 season were used in the most recent SAFE analysis. Observers were placed on directed crab fishery vessels starting in 1990. Size frequency data on the total catch (retained plus discarded) in the directed crab fishery were available from 1992 to 2009/10. BSFRF conducted trawl surveys in 2007 and 2008 with a small-mesh trawl net and 5-minute tows in inshore areas adjacent to historic NMFS Bristol Bay survey sites.

**Table 1.** Data included in the Bristol Bay red king crab 2014 SAFE report.

<b>Data</b>	<b>Years</b>
<b>Commercial fishery data</b>	
INPFC landings (length, year, CPUE)	1960-73
ADFG	1974-2014
Bycatch data (ADFG, NMFS)	1990-2014
<b>Fishery Independent data</b>	
NMFS EBS trawl survey	1975-2014
Late EBS trawl survey stations	1999, 2000,
BSFRF (small mesh tows)	2006-2012 2007-2008



**Figure 1.** Retained catch biomass and bycatch mortality biomass (t) for Bristol Bay red king crab from 1960 to 2013. Handling mortality rates were assumed to be 0.2 for the directed pot fishery, 0.25 for the tanner crab fishery and 0.8 for the trawl fisheries.

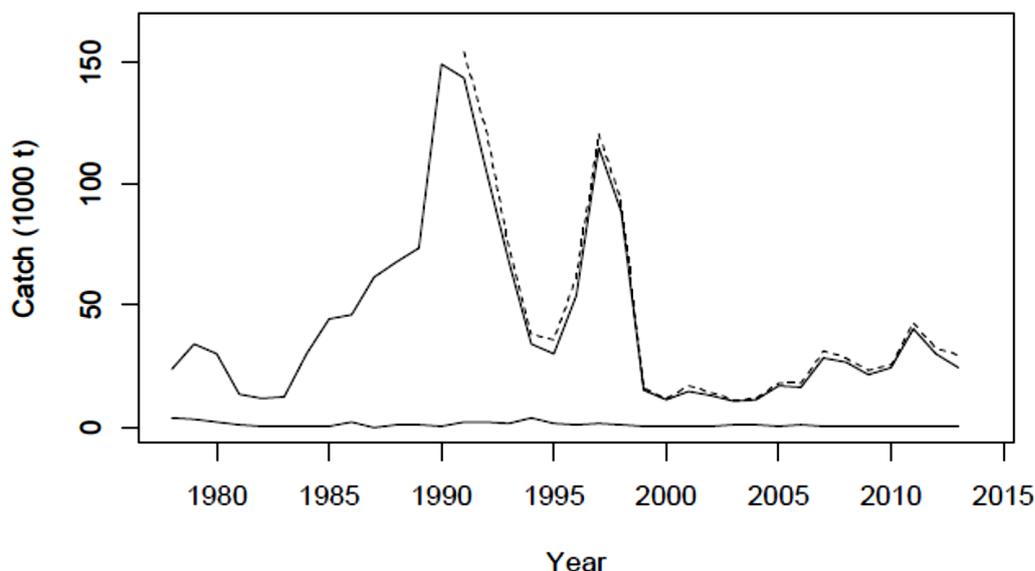
**EBS snow crab**

Catch data and size frequencies of retained crab from the directed snow crab pot fishery from 1978 to the 2013/14 season were used in this analysis. Observers were placed on directed crab fishery vessels starting in 1990. Size frequency data on the total catch (retained plus discarded) in the directed crab fishery were available from 1992 to 2013/14. Total discarded catch was estimated from observer data from 1992 to 2013/14 (Table 2). The discarded male catch was estimated for 1978 to 1991 in the model using the estimated fishery selectivities based on the observer data for the period 1992 to 2013/14. The discard catch estimate was multiplied by the assumed mortality of discards from the pot fishery. The mortality of discarded crab was 30% in the Base model. The estimate of discard mortality rate for bycatch in the directed fishery was updated to 30% from 50% during 2013 based on data collected from the fishery and experimental results. This estimate differs

from the current rebuilding harvest strategy used since 2001 to the present by ADFG to set the TAC, which assumes a discard mortality of 25%. The discards prior to 1992 may be underestimated due to the lack of escape mechanisms for undersize crab in the pots before 1997. The base model in the current assessment differs from the September 2013 base model in fitting a two part linear function with a smooth transition to the 2011 growth data, recommended in the 2014 CIE review and by the CPT and SSC.

**Table 2.** Data sources and updates used in the 2014 EBSSC SAFE report.

Data component	Years
Retained male crab pot fishery size frequency by shell condition	1978/79-2013/14
Discarded male and female crab pot fishery size frequency	1992/3-2013/14
Trawl fishery bycatch size frequencies by sex	1991-2013/2014
Survey size frequencies by sex and shell condition	1978-2014
Retained catch estimates	1978/79-2013/14
Discard catch estimates from snow crab pot fishery	1992/93-2013/14 from observer data
Trawl bycatch estimates	1973-2013/14
Total survey biomass estimates and coefficients of variation	1978-2014
2009 study area biomass estimates and coefficients of variation and length frequencies for BSFRF and NMFS tows	2009
2010 study area biomass estimates and coefficients of variation and length frequencies for BSFRF and NMFS tows	2010

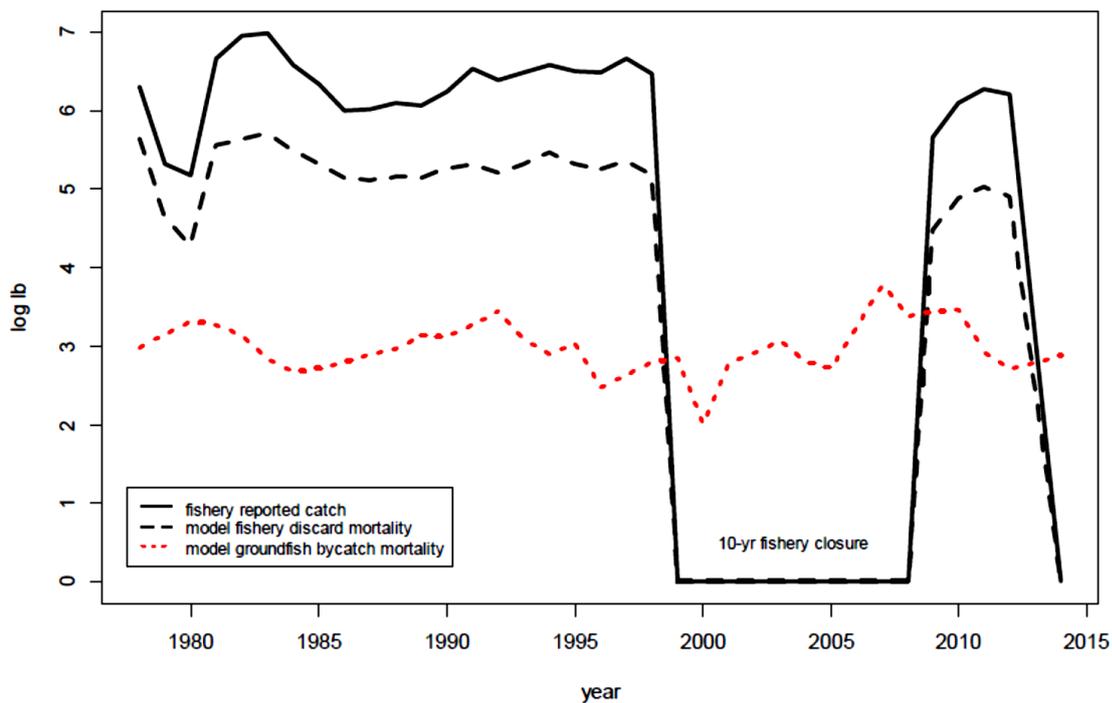


**Figure 2.** Catch (1000 t) from the directed snow crab pot fishery and groundfish trawl bycatch. Total catch (dashed line) is retained catch (solid line) plus discarded catch after 30% discard mortality was applied. Trawl bycatch (lower solid line) is male and female bycatch from groundfish trawl fisheries with 80% mortality applied.

**Saint Matthew blue king crab**

Major data sources used in this assessment include annual directed-fishery retained-catch statistics from fish tickets (1978/79 - 1998/99, 2009/10 - 2012/13); the annual NMFS eastern Bering Sea trawl survey (1978-2014); the triennial ADFG SMBKC pot survey (every third year 1995-2013); size frequency information from ADFG crab-observer pot-lift sampling (1990/91-1998/99, 2009/10-2012/13); and NMFS groundfish-observer bycatch biomass data (1992/93- 2013/14).

It is especially noteworthy that the two surveys cover different geographic regions and that each has in some years encountered proportionally large numbers of male blue king crab in areas where the other is not represented. Groundfish SMBKC bycatch data come from NMFS Bering Sea reporting areas 521 and 524.



**Figure 3.** Components of SMBKC fishing mortality biomass for the years 1978/79 – 2013/14. Note logarithmic scale.

BSAI King and Tanner crab SAFE 2014:

<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (see 2014 Crab SAFE)

### **Fishery-independent data**

#### **NMFS, ADFG and BSFRF surveys**

##### ***Eastern Bering Sea***

NMFS conducts an annual trawl survey in the EBS to determine the distribution and abundance of crab and groundfish fishery resources and hence provides fishery-independent estimates of abundance and biological data. Since 1972 the survey has covered the full stock distribution except for inshore waters. The assessment uses tow-by-tow survey data from 1975-2014. Abundance estimates by sex, size and shell condition are derived from the survey data using an area-swept approach. Starting in 2010 the NMFS expanded the EBS trawl survey north to 65.5 °N, covering the remainder of the EBS shelf. The ADFG also conducts a triennial pot survey in the Saint Matthew region (last survey in 2010 and was conducted for summer of 2013), which surveys areas of important habitat for blue king crab that are not accessible to the NMFS EBS trawl survey. The 2014 standard EBS trawl survey was conducted onboard two chartered commercial fishing vessels and began on 8 June in the northeast corner of Bristol Bay. The survey moved westward, sampling 376 stations and finishing on August 2<sup>nd</sup>.

The SAFE assessment teams for the three crab stocks are aware of sources of potential bias in stock biomass estimates and have collected additional information where necessary to revise their estimates of stock biomass. For example, additional survey stations have been sampled for the Bristol Bay red king crab stock after the standard summer survey to ensure realistic assessment of mature female crabs which may not have molted prior to the main summer survey, and the Bering Sea Fisheries Research Foundation (BSFRF) also conducted small-meshed surveys in 2007 and 2008 to ensure that the trawl net captured nearly all crabs within the swept area. For the St. Matthew blue king crab stock there is an additional high density sampling area, and triennial pot surveys also potentially provide alternative indices of stock abundance. For the Eastern Bering Sea snow crab stock, additional trawl surveys were undertaken by BSFRF in 2009 and 2010.

#### **Biological Data Collection**

All crab were removed from the catch, sorted by species and sex, and a total catch weight was obtained for each species. Individual crab carapaces were measured ( $\pm 1$  mm) to provide a size-frequency distribution of each sample. Crab sizes are reported as carapace width (CW) excluding spines for Tanner and snow crab, and carapace length (CL) for all king crab and hair crab. Individual weights were collected on a subsample of each species to add to the existing length-weight data. Carapace shell condition was assessed for each crab sampled and assigned to one of six classes according to specific criteria. All female crab abdomens were evaluated to determine reproductive condition based on the size of the egg clutch, the condition of the eggs and color of the eggs. Starting in 2012, mature female red king crab samples were collected (even years only) throughout their distribution to monitor fecundity changes over time. In addition, mature female *Chionoecetes* spp. With shell conditions 1-3 were collected in collaboration with ADFG.

**Bristol Bay red king crab**

During the 2014 NMFS EBS trawl survey, red king crab were caught at 67 of the 136 stations. Bottom temperatures were significantly higher in June 2014 (4.5° C) compared to the same period in 2013 and 2012 (2.9 and 0.9° C, respectively). Standard survey data were used to estimate male and female abundance. No resurveys were required for the assessment.

<http://www.afsc.noaa.gov/Kodiak/shellfish/crabEBS/2014EBSSurveyTechMemoDraft.pdf>

The Bering Sea Fisheries Research Foundation (BSFRF) has been conducting research in cooperation with ADFG and NMFS. All projects funded by BSFRF undergo review and approval by its Board and have specific scientific objectives that fit with annual research priorities as determined by cooperative research partners. BSFRF research has focused primarily on improving scientific understanding of Bering Sea crab resources but is also interested in other Alaska and West Coast fishery resources. The projects listed below are the most recent and provide a brief overview annual or ongoing research.

**2013-2014 Bristol Bay RKC Net Efficiency Survey**

This research builds on prior survey trawl selectivity work and conducted sampling at 60 NMFS survey stations with two separate chartered vessels working in parallel to the NMFS charters across two field seasons to expand sample size of BBRKC captured. The goal of this project is to cover all of the BBRKC survey distribution (over 2013 and 2014 survey seasons) with the two survey trawls (Nephrops trawl and NMFS trawl) operating side-by-side and to compare BBRKC CPUE results to directly inform the NMFS 83-112 trawl selectivity in the length-based stock assessment model currently used by ADFG/NMFS for management of the BBRKC stock.

**2013-2017 Bristol Bay RKC Pre-Recruit Survey**

The research is a planned multi-year survey project to collect BBRKC pre-recruit information with improved accuracy and precision to detect size-sex modes and potentially to estimate mortality of BBRKC per year. Objectives of this work are to complete a higher sampling density across areas of expected pre-recruit BBRKC, to estimate mean and variance of abundance estimates, and to complete model analysis for each year and across years. Results are expected to inform some assessment model parameters and/or further pre-recruit BBRCK survey research. Early results from these surveys are being reviewed by cooperative research partners to determine their utility – and to plan for continuing the basis of this research.

**2013-2014 Generic Crab Model (GCM) Update**

The generic crab model research (GCM) has been supported by BSFRF from its inception in 2009 to develop and refine a GCM methodology that can be used for any commercially important crab stock in Alaska. The development of the model architecture is complete and the testing of model runs and model stability is underway. A review of the first outcome of the GCM effort is expected to be seen late in 2014 (for BBRKC). Further review and refinement of GCM application to multiple stocks will be completed on a stock by stock basis in the immediate future.

Summaries of other research projects can be found at:

[http://www.bsfrf.org/crab\\_research.php](http://www.bsfrf.org/crab_research.php)

#### **EBS snow crab**

The legal minimum size limit for male snow crab is 3.1 inches CW (78mm), but processors currently prefer a minimum size of 4.0 inches CW (102 mm). The density of male snow crab is reported for both the legal ( $\geq 3.1$  in. CW) and preferred ( $\geq 4.0$  in. CW) size categories. In 2014, snow crabs were caught at 260 of the 376 stations in the combined areas of the Bristol Bay District, Pribilof District and St. Matthew Island Section sampling strata.

<http://www.afsc.noaa.gov/Kodiak/shellfish/crabEBS/2014EBSSurveyTechMemoDraft.pdf>

The Bering Sea Fisheries Research Foundation (BSFRF) has been conducting research in cooperation with ADFG and NMFS. Current research projects include studies into the handling mortality of snow crab to answer the questions regarding the 50% mortality used in the stock assessment.

#### Handling Mortality

The Crab Plan Team (CPT) has been evaluating handling mortality as the result of two years of at sea assessment using reflex action mortality predictor (RAMP) assessment. The status quo 50% mortality factor was a conservative mortality estimate, which served as a safe surrogate that provided protection for the stocks until at-sea studies that estimate short-term handling mortality of snow, Tanner, and king crab could be determined for the eastern Bering Sea. The issue of handling mortality is of particular concern for the snow crab fishery in which one crab is discarded for every three retained. The RAMP predicted that mean short-term handling mortalities for the 2010/11 and 2011/12 fisheries were 4.6% and 4.5%, respectively. Vessel-specific handling mortality was found to be negatively correlated with back-deck temperatures; for example, short-term mortality rates increase to 35% at -14 degrees C. However, most vessels do not fish in those conditions over the season's length. Using St. Paul airport temperature as a proxy for back-deck conditions, the estimated mean mortality rate for the 1990/91-2010/11 fishing seasons was 4.0%; the highest seasonal estimate was 8.0% during one season in the early 1990s. However, these mortality rates do not address additional long-term handling mortality, so additional precautionary factors are needed.

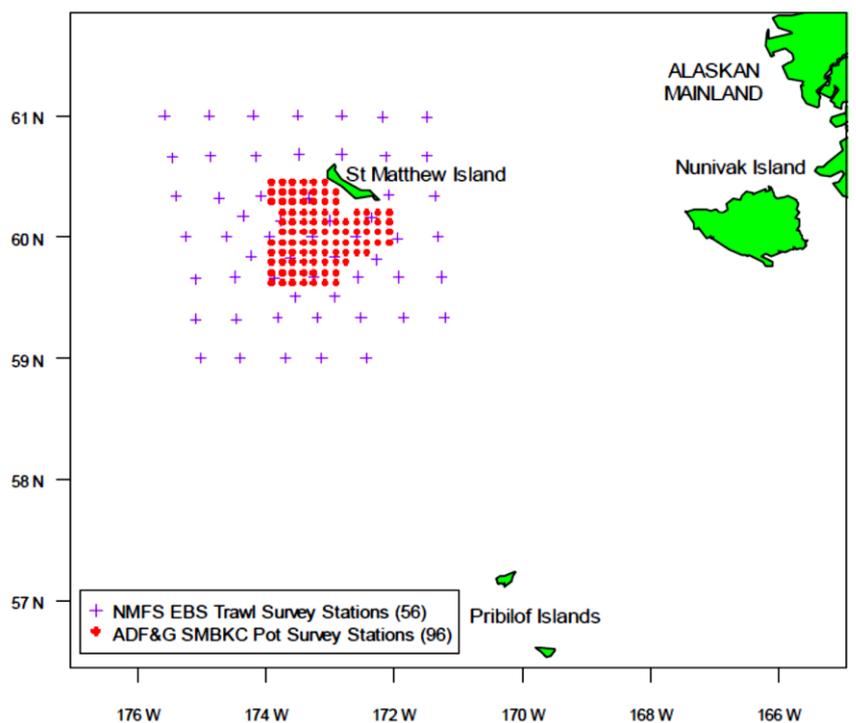
Based on these results and subsequent discussions, the CPT recommended reducing the current value used in calculations involving total handling mortality from 0.5 to 0.3, derived by adding the highest annual short-term estimate (0.08) to the highest injury rate (0.12), and multiplying this sum by 1.5 under the assumption that long-term mortality contributes an additional mortality equal to 50% of the short-term mortality rate. The CPT did not recommend any changes to the handling mortality estimates used for Tanner and king crabs because no new information was provided on Tanner crab and the RAMP approach does not appear to be useful for golden and red king crab. In September 2013, the CPT presented model options with 0.5, 0.3 and a third option that incorporated other precautionary factors. The consensus of the CPT was that the best current estimate of handling mortality of snow crab was 0.3. The CPT requested that the next snow crab assessment use 0.3 as handling mortality for all pot fisheries (crab and fish) in the base run and 0.5 as an alternative scenario (there was some discussion as to whether 0.3 or 0.5 should be the base, but if 0.3 is chosen it should be the base run so that the new handling mortality is included in the remaining alternative runs).

[http://www.bsfrf.org/crab\\_research.php](http://www.bsfrf.org/crab_research.php)

<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (see [2014 Crab SAFE](#))

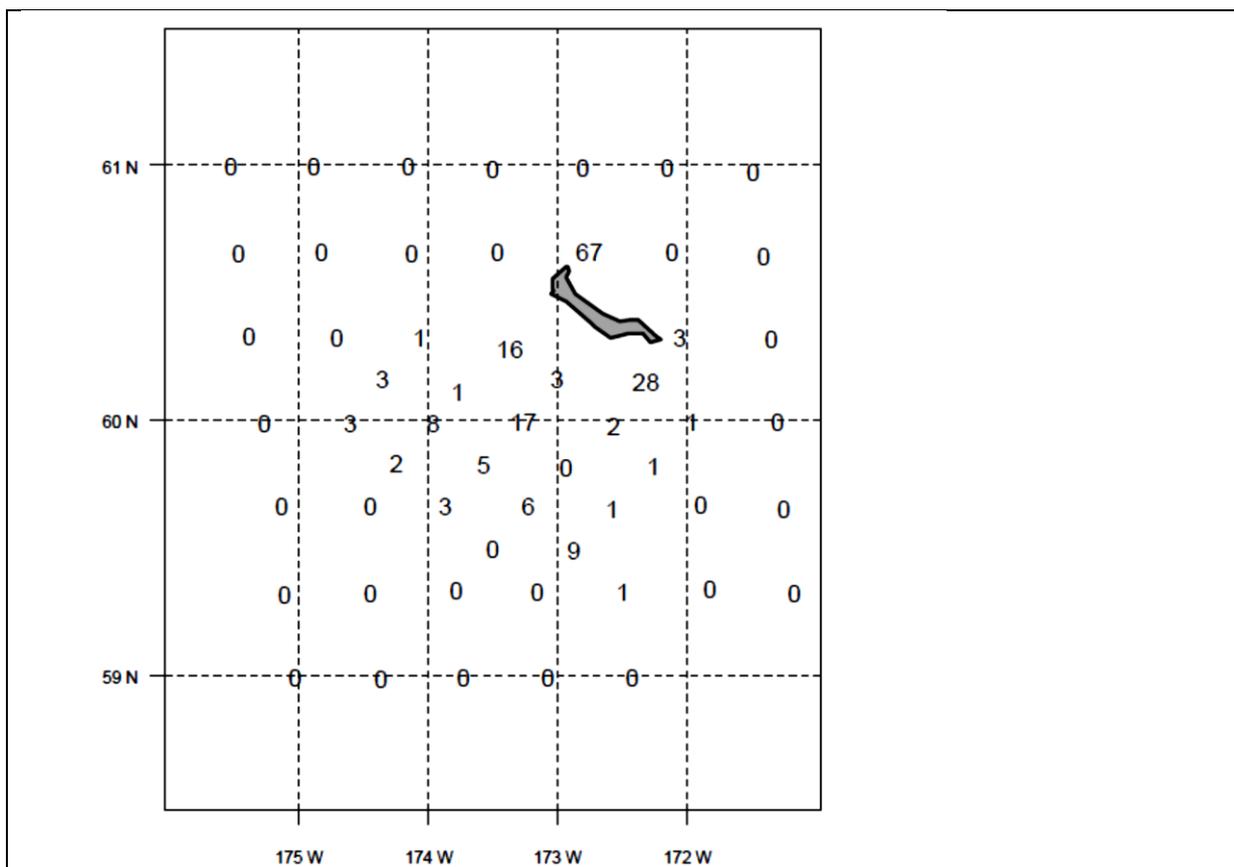
**Saint Matthew blue king crab**

Blue king crab were caught at 21 of the 57 stations surveyed in the St. Matthew section sampling strata in the 2014 survey. The figure below shows the overlap between the NMFS EBS trawl survey stations and the ADFG triennial pot survey stations. Coverage with both gear types ensures that areas that may be unavailable to one of the sampling gear types will be sampled by the other.



**Figure 4.** Trawl and pot-survey stations used in the SMBKC stock assessment.

The figure below shows the blue king crab catches from the 2014 NMFS trawl survey. The ADFG pot survey only covers the area to the south and west of St. Matthew Island, and therefore may be missing areas of large blue king crab biomass to the north and east of the island.



**Figure 5.** Catches of male blue king crab measuring at least 90 mm CL from the 2014 NMFS trawl-survey at the 57 stations used to assess the SMBKC stock. Note that the area north of St. Matthew Island is not represented in the ADFG pot-survey data used in the assessment.

**Fishery-dependent data**

**Commercial catch**

The second major component of the annual BSAI crab population analysis data collection is sampling the commercial catch. Landings data for BSAI crabs in the form of retained catch numbers and biomass, and fishing effort in terms of pot lifts are recorded on the ADFG eLandings system (previously reported on paper ‘fish tickets’), which permits the calculation of catch per unit effort in the various crab fisheries. All eLandings report information is stored on one server and data are available to NMFS, ADFG, NPFMC and the International Pacific Halibut Commission for their scientific, management and enforcement purposes. The data are entered once by one person thus creating fewer data entry errors and the data are verified in real time. The data is clearly timely, since it is used to close or modify a fishery in season.

Sampling of catches and discards in the directed crab fisheries by on-board observers and sampling of retained catches by shore-based observers through the ADFG observer program, in conjunction with bycatch estimates from the NMFS groundfish observer program, provides data on pot, trawl and fixed gear bycatch to enable an estimate of total removals. Catch and effort data are available from 1960-2014 for the Bristol Bay red king crab fishery, for 1978/79 to 1998/99 and 2009/10 to 2012/13 for the St Matthew blue king crab fishery and for 1978/79 to 2013/14 for the Eastern Bering Sea snow crab fishery. These significant time series of catch and effort are used in the assessments

for the three crab species, although problems with accurate recording of soak time for the gear and estimating catchability precludes the use of some CPUE data. The datasets for catch and effort are updated each year as part of the assessment process described in the SAFE reports.

At-sea sampling in the directed fishery by observers on the ADFG observer program record total catch, bycatch, effort and size frequency and other biological characteristics, and so the data collected from this observer program can be used in both stock assessment of the fishery and in-season projections of fishery performance. ADFG deploys observers on vessels participating in the BSAI crab fisheries as an important component of data collection and fishery management. Observers are deployed on all catcher-processor vessels in the crab fisheries, on randomly selected catcher vessels in the BBRKC (minimum 20% of participating vessels carry observers) and EBSSC (minimum 30% of participating vessels carry observers) fisheries, and on all vessels fishing for SMBKC. Observers are required to sample a specific number of pots per day of vessel coverage. Estimates of CPUE for the retained component of the catch from the observer program can therefore provide an independent estimate of fishery CPUE for comparison with estimates given in annual management reports based on eLandings, daily fishing logs and interviews with vessel captains.

Summary of ADFG BSAI crab observer data (<http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS14-49.pdf>)

#### **BRISTOL BAY RED KING CRAB**

The 2012/13 Bristol Bay red king crab season commenced October 15 and closed January 15. Most fishing occurred early in the season. Total allowable catch (TAC) was set at 7.85 million pounds, with legal male crab at least 6.5 in LM. Two catcher-processors and 63 catcher vessels participated. Onboard observers sampled 437 (1.1%) of the ATF reported total of 38,144 pot lifts.

Onboard observers collected CL measurements of 20,217 male red king crabs from sampled pot lifts. Average CL was 142.9 mm, and 91.1% of the crabs were classified as new shell. CL measurements of 562 female red king crabs from sampled pot lifts averaged 115.3 mm. Approximately 98.8% of the females were new shell. CL measurements were also recorded for 8,957 male red king crab by onboard observers and dockside samplers in size-frequency sampling of retained catch. Average CL was 154.3 mm, and 86.8% of the sampled crabs were new shell.

Estimated fishery CPUE of legal-retained red king crab was 31.0 crabs per pot lift, with 95% confidence interval (25.85, 36.05). This value, which compares to an ATF reported value of 30.3, is roughly double the 2010/11 estimate of 17.2 and the highest since 2006/07). Estimated bycatch of discarded sublegal males was nearly as high at 16.9.8 crab per pot lift; and estimated female bycatch was 1.6 crabs per pot lift. Some incidental bycatch of discarded Tanner and snow crab, mostly males, was also observed in this fishery. Legal tallies conducted during the 2012/13 season by onboard observers and dockside samplers totaled 11,320 crabs, accounting for 1% of the fishery reported harvest. Approximately 0.27% of all sampled crabs were illegal, all of them sublegal male red king crab.

#### **BERING SEA SNOW CRAB**

The 2012/13 Bering Sea snow crab fishery opened October 15 with a TAC of 66.350 million pounds. Legal harvest was restricted to male crab at least 3.1 in LM. (Note that although the

minimum legal size for snow crab in this fishery is 3.1 in LM, processing plants generally do not accept crab smaller than 4 in LM). Whereas the regulatory fishery closure is May 31 in the Western subdistrict (west of 173° W long.) and May 15 in the Eastern subdistrict (east of 173° W long.), the season was extended by emergency order to June 15 west of 171° W long. as a result of unusual sea ice conditions that disrupted fishing activity during much of the season. Two catcher-processor vessels and 68 catcher vessels participated. Onboard observers sampled 2,532 (1.1%) of the ATF reported 225,489 pot lifts.

Onboard observers collected CW measurements of 234,420 male snow crabs during pot lift sampling. Average CW was 108.2 mm and 87.6% of the crabs were categorized as new shell. Average female snow crab CW was 70.7 mm, based on 1,607 measured females, with 83.2% of them judged new shell. CW measurements were additionally recorded on 46,330 male snow crab in size-frequency sampling of retained catch. Average CW was 113.1 mm and 90.8% of the crabs were new shell.

Estimated CPUE of legal-retained snow crab was 213.1 crabs per pot lift in 2012/13, with 95% confidence interval (187.50, 238.57). Like the 2012/2013 ATF reported value of 210.3, it suggests a continuing decline over the last few years. Average catch per pot for discarded legal-size males, mostly animals smaller than 4 in (~102 mm) CW, also decreased further in 2012/13.

Legal tallies conducted on catcher-processor vessels and on catcher vessels delivering snow crab to processors totaled 102,434 crabs, which accounted for 0.2% of the reported total catch. Of those, 0.15% were illegal, most of them non-target Tanner *C. bairdi*. By contrast, most of the illegal crabs encountered in other 2012/13 BSAI crab fisheries were undersized males of the target species.

#### **SAINT MATTHEW ISLAND BLUE KING CRAB**

The St. Matthew Island blue king crab fishery opened for the third consecutive time since 1998 on October 15, 2011 with a TAC of 1.630 million pounds and closed by regulation February 1, 2013, though fishing was completed by the end of 2012. Legal harvest was limited to male crab at least 5.5 in LM. All 17 participating catcher vessels were required to carry an observer. Of the ATF reported 37,065 pot lifts in this fishery, observers sampled 2,841 (7.79%).

Observers took CL measurements from 61,975 male and 12,130 female blue king crabs in pot lift sampling. Respective average CL values were 116.8 mm and 89.1.0 mm. Observers recorded 92% of the males and 65% of the females as new shell. Size-frequency sampling of 4,278 fishery-retained male blue king crab yielded an average CL of 129.8 mm, with 92.7% of the sampled animals judged new shell.

Estimated 2012/13 CPUE of legal-retained crab was 10.1 crab per pot lift with approximate 95% confidence interval (9.94, 10.36). The ATF reported value was 10.29 crabs per pot lift. Catch rates in this fishery since its resumption in 2009/10 have been low by comparison to values prior to the 1999 closure). Estimated 2012/13 bycatch of discarded sublegal males slightly exceeded the legal catch, as was true in each of the two previous seasons, whereas estimated female discard CPUE was down from 5.5 crab per pot lift. Some incidental bycatch of subsequently discarded snow crab occurred in the 2012/13 St. Matthew Island blue king crab fishery, most of it consisting of legal-size males.

Legal tallies conducted on catcher vessels delivering blue king crab to processors totaled 19,597 crabs, or 5.2% of the reported harvest. Approximately 0.37% of the sampled animals were illegal due to size, sex, or species restrictions.

This fishery was closed in 2013/2014 and no observer data are available for this season.

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

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

Port sampling by ADFG observers is conducted on landings from vessels without onboard observers. Sampling occurs at the shore-based facilities that process the catch. Biological data collected on landed red king crab consist of carapace length measurement, shell condition, and average weight.

Confidential interviews, supplemented by daily fishing log (DFL) records, were conducted with vessel captains to acquire detailed information regarding statistical areas fished, effort, and fishery performance. In the 2010/11 BBRKC fishery, 135 of the 236 total landings were sampled. Data was collected from 131 of the 348 landings during the 2010/11 snow crab fishery. There was no port sampling of SMBKC landings due to 100% observer coverage.

The assessment process involves rigorous peer review of the assessments by the whole Crab Plan Team, by the Scientific and Statistical Committee (SSC) of NPFMC, and through specially organized workshops with independent scientists and periodic reviews by the Center for Independent Experts (CIE) review panels. As a result the SAFE reports will note ways in which the use of research results in the assessments could be improved, and identifies gaps in the evidence base which need to be filled by new research. These data are ultimately used for setting management objectives, reference points and performance criteria as well as ensuring adequate linkages between applied research and fisheries management.

#### **Incidental mortality of crab in the commercial crab fishery**

Mortality rates of 20-50% are estimated for non-legal and female crab in the directed fisheries. Mortality can vary depending on the weather conditions (extreme cold causes the animals to freeze from exposure), depth of the fishery, handling aboard the vessel and size of the catch.

Estimates of bycatch mortality biomass assume handling mortality rates of 20% for the directed pot bycatch, 25% for the Tanner crab fishery bycatch, and 80% and 50% for trawl and fixed gear bycatch, respectively.

#### **Incidental catch (bycatch) and mortality in non-directed fisheries**

Size frequency data on crab bycatch in trawls is provided also for the BBRKC and EBSSC fisheries and in trawls and fixed gear for the SMBKC fishery from the NMFS Groundfish Observer Program. The new restructured NMFS groundfish observer program came into effect 1 January 2013 with objectives to increase observer coverage on smaller vessels, reduce bias in the selection for coverage process and better respond to management needs within individual fisheries.

<https://alaskafisheries.noaa.gov/sustainablefisheries/observers/draft2015adp.pdf>

Following approval of Amendments 24 and 38 to the BSAI Crab FMP, these ten stocks now have annually-specified overfishing limits (OFLs) and Acceptable Biological Catch (ABC) levels. Total allowable catch (TAC) levels are established exclusively by the State. All catch accrues towards the ABC (or ACL). Additional bycatch outside of the directed crab fisheries occurs in the BSAI groundfish fisheries and Bering Sea scallop fishery. Total catch from all sources may not exceed the ACL thus currently the State must assume anticipated levels of bycatch for each stock in order to set TAC or GHl at a level where the total catch from directed and non-directed sources will not exceed the ACL.

As noted in the accountability measures for the ACL requirements under Amendment 38, if an ACL is exceeded, the TAC or GHL in the following year will be reduced in order to prevent against exceeding the ACL concurrently. Thus, all accountability measures come out of the directed crab fishery. In deference to this, in 2010 the Council initiated an analysis of PSC limits in the BSAI groundfish fisheries for BSAI crab stocks in order to potentially limit the overall bycatch for each stock and provide the State with a hard limit for each stock in order to facilitate TAC-setting.

In February 2014 the Council requested that staff prepare a discussion paper on crab PSC in groundfish fisheries and existing closure areas and management measures for 4 specific stocks: Bristol Bay red king crab, Bering Sea snow crab, Bering Sea Tanner crab and Saint Matthew blue king crab.

Specifically the Council requested information on recent stock distribution, and the distribution and amount of PSC in the trawl and fixed gear groundfish fisheries. Specific elements to include were the proportion of PSC by trawl and fixed gear fisheries inside of existing closure area boundaries and a detailed history of the closures to help identify the fraction of historical fisheries that occurred in these areas as well as their crab PSC. This paper briefly described the stock distribution for the 4 stocks, existing closures and their rationale historically as well as current trends by gear type in PSC in groundfish fisheries. BSAI crab stocks are susceptible to three principal sources of fishery mortality: retained catch and bycatch during the directed fishery, bycatch mortality during other state-managed crab fisheries, and bycatch mortality during federally-managed groundfish fisheries. For purposes of calculating the bycatch mortality, which accrues towards crab ACLs annually, handling mortality rates of 80% for trawl gear and 50% for fixed gear are applied.

**Table 3.** Summary of information availability by crab stock, current management measures and bycatch by gear type between 2003/04 – 2011/12 as a proportion of the 2012/13 ABC.

Stock	Abundance estimate	Current fishery	Existing Bycatch controls	Trawl bycatch mortality as % of ABC	Fixed gear mortality as % of ABC	Assumption in TAC-setting
Bristol Bay red king crab	√	√	Trawl PSC limits and closure area	0.72%-2.10%	0.19%-0.35%	Maximum mortality in last 20 years (0.84 million pounds)
EBS Tanner crab	√		Trawl PSC limits	1.25%-2.15%	0.55%-2.93%	Varies based upon estimates of needs in the snow crab fishery
EBS snow crab	√	√	Trawl PSC limits	0.20%-1.14%	0.04%	Depends on stock status and buffer below ABC
St. Matthew blue king crab	√	√	Bottom Trawl closure area	0.02%-0.05%	0.08%-7.09%	Maximum mortality in last 20 years (0.077 million pounds)

<https://alaskafisheries.noaa.gov/npfmc/PDFdocuments/bycatch/CrabBycatchBSAI213.pdf>

### Economic considerations

The BSAI crab FMP has an economic and social objective which is defined as maximizing economic and social benefits to the nation over time. Economic benefits are broadly defined to include, but are not limited to: profits, income, employment, benefits to consumers, and less tangible or less

quantifiable social benefits such as the economic stability of coastal communities. Following the FMP:

“To ensure that economic and social benefits derived for fisheries covered by this FMP are maximized over time, the following will be examined in the selection of management measures:”

1. The value of crab harvested (adjusted for the amount of crab dying prior to processing and discarded, which is known as deadloss) during the season for which management measures are considered,
2. The future value of crab, based on the value of a crab as a member of both the parent and harvestable stock,
3. Subsistence harvests within the registration area, and
4. Economic impacts on coastal communities.

This examination will be accomplished by considering, to the extent that data allow, the impact of management alternatives on the size of the catch during the current and future seasons and their associated prices, harvesting costs, processing costs, employment, the distribution of benefits among members of the harvesting, processing and consumer communities, management costs, and other factors affecting the ability to maximize the economic and social benefits as defined in this section. Economic data collection is a component of the Crab Rationalization Program instituted in 2005.

The Economic Data Report (EDR) program is focused on collecting production, cost, earnings, and employment information from harvesting and processing sectors of crab fisheries to evaluate effects of the CR Program over time. Congress required that an independent third-party data collection agent (DCA) administer the collection and dissemination of the crab EDR data. NMFS selected the Pacific States Marine Fisheries Commission (PSMFC) to be the DCA. [Amendment 42](#) to the Fishery Management Plan (FMP) for BSAI King and Tanner Crabs, which published on June 17, 2013, revises and simplifies the annual EDR forms. A new report on the economic status of the BSAI crab fisheries was produced in 2014. It presents information on economic activity in commercial crab fisheries currently managed under the Federal Fishery Management Plan (FMP) for Bering Sea and Aleutian and Islands King and Tanner Crab (BSAI crab), with attention to the subset of fisheries included in the Crab Rationalization (CR) Program. In this report statistics on harvesting and processing activity; effort; revenue; labor employment and compensation; operational costs; and quota ownership, usage and disposition among participants in the fisheries are provided. Additionally, this report provides a summary of BSAI crab-related research being undertaken by the Economic and Social Sciences Research Program (ESSRP) at the Alaska Fisheries Science Center (AFSC).

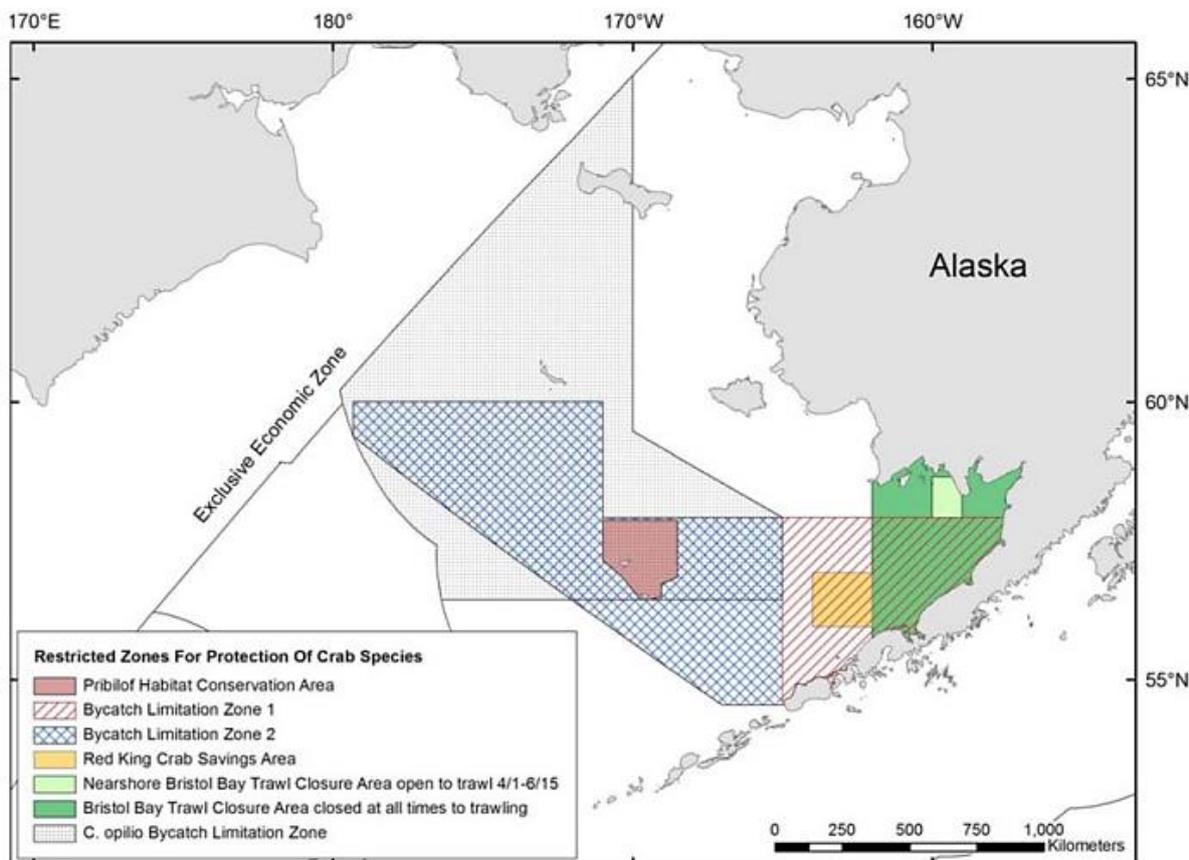
<http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/> (see [2014 Crab SAFE](#))

<http://alaskafisheries.noaa.gov/sustainablefisheries/crab/rat/edr/>

### **Ecosystem considerations**

Annual SAFE documents contain an ecosystem section, taking into account the fishery's effect on the target species, other species, and habitat. These sections are updated as new information is gathered.

Of mention, southwestern Bristol Bay red king crab populations are very important, particularly an area southwest of Amak Island, and recent questions have arisen to establish whether and how trawl fisheries in that area may be impacting the crab habitat. Given the potential redistribution of crab in the area southwest of Amak Island due to temperature changes, the Council also requested that discussion paper look at the efficacy of existing red king crab protection areas, such as the Red King Crab Savings Area and the Nearshore Bristol Bay Trawl Closure, to see whether these closed areas are still providing both habitat and bycatch protection to red king crab. These studies are now in progress at the Council level. No other new information is available from these documents on ecosystem dynamics.



**Figure 6.** Restricted Zones for protection of crab in the eastern Bering Sea.

[http://www.npfmc.org/wp-content/PDFdocuments/conservation\\_issues/EFH/BBRKC\\_EFH213.pdf](http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf)

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

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

**FAO Eco 29-29.3**

**Evidence adequacy rating:**

**High**

**Medium**

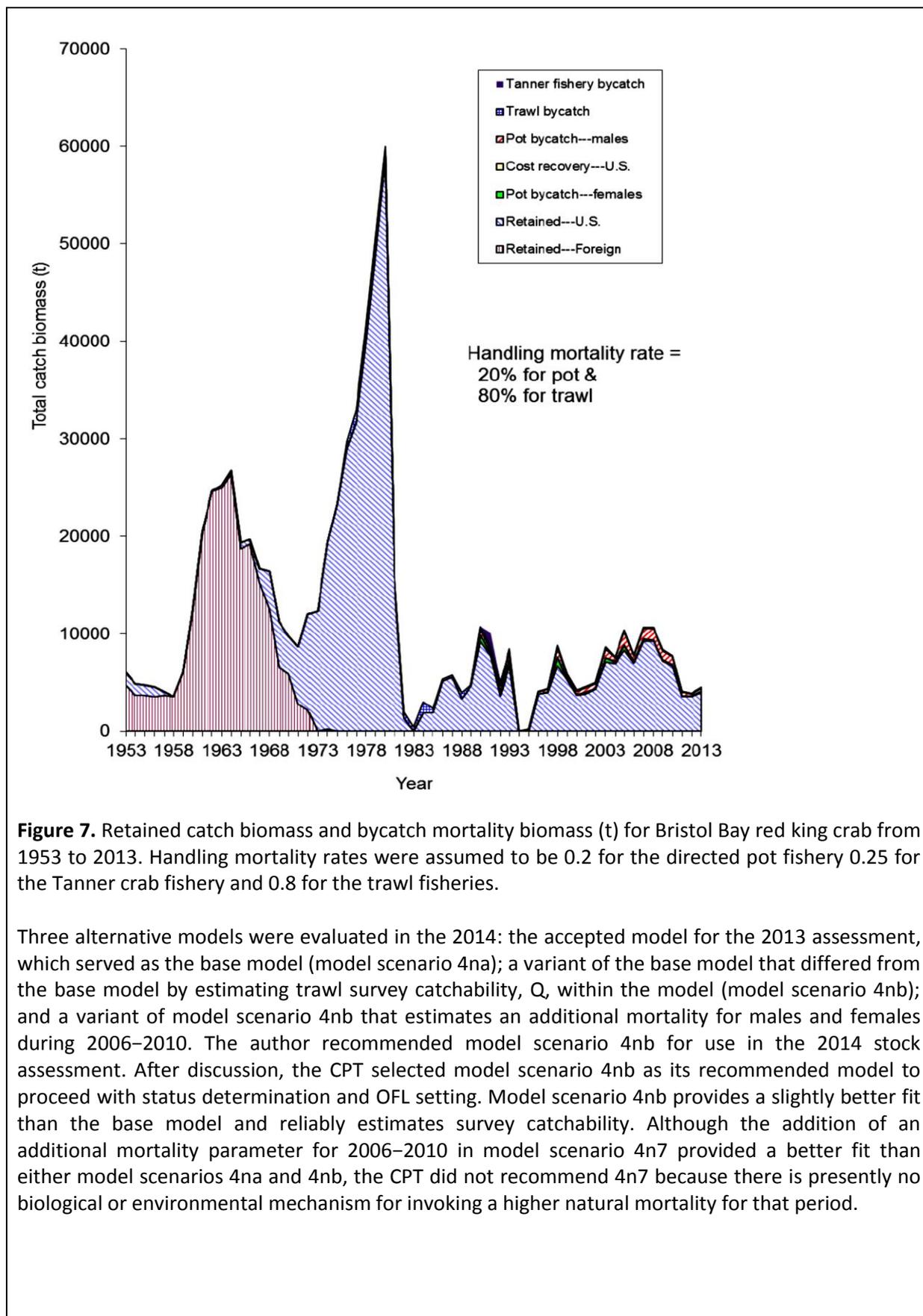
**Low**

**Rating determination**

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

**2014 BBRKC Stock Assessment**

The stock assessment model is based on a sex- and size-structured population dynamics model incorporating data from the NMFS eastern Bering Sea trawl survey, the Bering Sea Fisheries Research Foundation (BSFRF) trawl survey, landings of commercial catch, at-sea observers, and dockside samplers. In the model recommended by the CPT, annual stock abundance was estimated for male and female crabs  $\geq 65$ -mm carapace length from 1975 to the time of the 2014 survey and mature male (males  $\geq 120$  mm CL) biomass was projected to 15 February 2015. Catch data (retained catch numbers, retained catch weight, and pot lifts by statistical area and landing date) from the directed fishery, which targets males  $\geq 135$  mm (6.5 in carapace length), were obtained from ADFG fish tickets and reports, red king crab and Tanner crab fisheries bycatch data from the ADFG observer database, and groundfish trawl bycatch data from the NMFS trawl observer database. NMFS trawl survey data was updated with the newly re-estimated time series provided by NMFS in 2014, catch and bycatch data were updated with data from the 2013/14 crab fishery year; data on bycatch during groundfish fisheries during 2009/10–2012/13 were revised with data provided by NMFS in 2014 and data on bycatch during the Tanner crab fishery were revised with data provided by ADFG in 2014.



**Figure 7.** Retained catch biomass and bycatch mortality biomass (t) for Bristol Bay red king crab from 1953 to 2013. Handling mortality rates were assumed to be 0.2 for the directed pot fishery 0.25 for the Tanner crab fishery and 0.8 for the trawl fisheries.

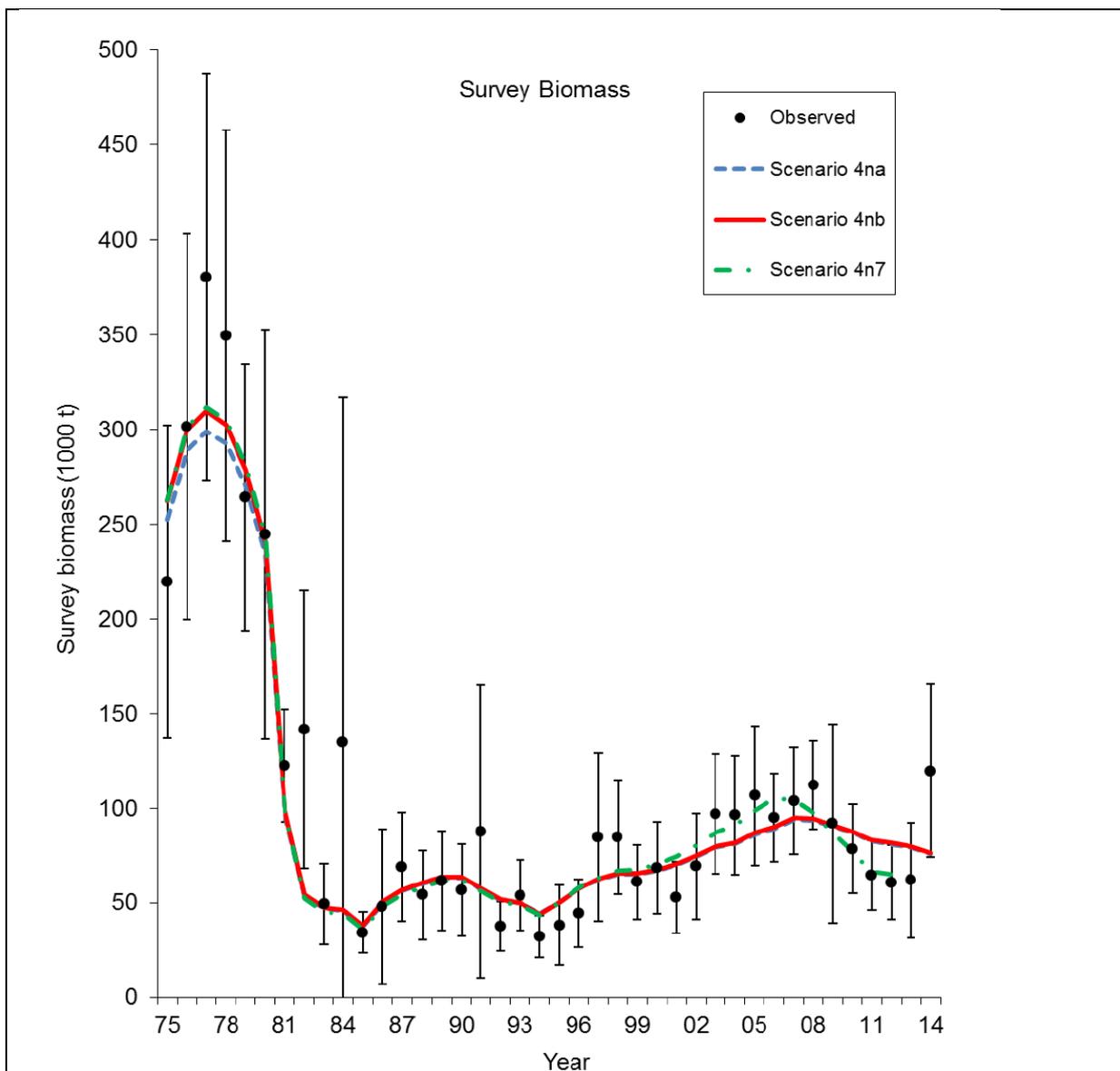
Three alternative models were evaluated in the 2014: the accepted model for the 2013 assessment, which served as the base model (model scenario 4na); a variant of the base model that differed from the base model by estimating trawl survey catchability,  $Q$ , within the model (model scenario 4nb); and a variant of model scenario 4nb that estimates an additional mortality for males and females during 2006–2010. The author recommended model scenario 4nb for use in the 2014 stock assessment. After discussion, the CPT selected model scenario 4nb as its recommended model to proceed with status determination and OFL setting. Model scenario 4nb provides a slightly better fit than the base model and reliably estimates survey catchability. Although the addition of an additional mortality parameter for 2006–2010 in model scenario 4n7 provided a better fit than either model scenarios 4na and 4nb, the CPT did not recommend 4n7 because there is presently no biological or environmental mechanism for invoking a higher natural mortality for that period.

**Table 4.** Data included in BBRKC 2014 SAFE report

<b>Data</b>	<b>Years</b>
<b>Commercial fishery data</b>	
INPFC landings (length, year, CPUE)	1960-73
ADFG	1974-2014
Bycatch data (ADFG, NMFS)	1990-2014
<b>Fishery Independent data</b>	
NMFS EBS trawl survey	1975-2011
Late EBS trawl survey stations	1999, 2000,
BSFRF (small mesh tows)	2006-2014 2007-2008

**Stock biomass and recruitment trends**

Model (scenario 4nb) estimates of total survey biomass increased from 262.1 thousand t in 1975 to 310.0 thousand t in 1978, fell to 38.1 thousand t in 1985, generally increased to 94.9 thousand t in 2007, and subsequently declined to 76.3 thousand t in 2014. Estimated recruitment was high during the 1970s and early 1980s and has been generally low since 1985. The near-term outlook for this stock is a continued declining trend. Recruitment has been poor (less than the mean from 1984-2014) since 2006. The 2011 survey produced a high catch of juvenile males and females <65 mm CL in one survey tow but that catch did not track into the 2012–2014 surveys. The survey area-swept estimates for abundance and biomass in 2014 were surprisingly high, given the poor recruitment and the size distributions and area-swept estimates from recent previous surveys.



**Figure 8.** Comparisons of area-swept estimates of total survey biomass and model prediction for model estimates in 2014 under scenarios 4na, 4nb and 4n7, for Bristol Bay red king crab. Pot and trawl handling mortality rates were assumed to be 0.2 and 0.8, respectively. The error bars are plus and minus 2 standard deviations.

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

Bristol Bay red king crab is in Tier 3. The proxy of *BMSY* (*B35%*) for a Tier 3 stock is based on mature male biomass at mating (MMB) and is computed as the average recruitment over some time period multiplied by the mature male biomass-per-recruit corresponding to *F35%* less the mature male catch under an *F35%* harvest strategy. Based on the author’s discussion regarding an apparent reduction in stock productivity associated with the well-known 1976/77 climate regime shift in the EBS, the CPT continues to recommend computing average recruitment based on model recruitment using the time period 1984 (corresponding to fertilization in 1977) to the last year of the assessment. The estimated *B35%* is 25.7 thousand t). MMB projected for 2014/15 is, at 24.7 thousand t, 96% of *B35%*. Consequently, the Tier 3 status level for the BBRKC stock in 2014/15 is b.

The team recommends that the OFL for 2014/15 be set according to model scenario 4nb, for which the calculated OFL is 6.82 thousand t (15.04 million lb). The team recommended that the ABC for 2014/15 be set below the maximum permissible ABC. The team recommended that a 10% buffer from the OFL be used to set the ABC at 6.14 thousand t (13.53 million lb).

MMB for 2013/14 is estimated to be above MSST (12.85 thousand t) 27.1 thousand t; hence the stock was not overfished in 2013/14. The total catch in 2013/14 (4.56 thousand t) was less than the 2013/14 OFL (7.96 thousand t); hence overfishing did not occur in 2013/14. The stock at 2014/15 time of mating is projected to be above the MSST and 96% of B35% (see above); hence the stock is not projected to be in overfished condition in 2014/15.

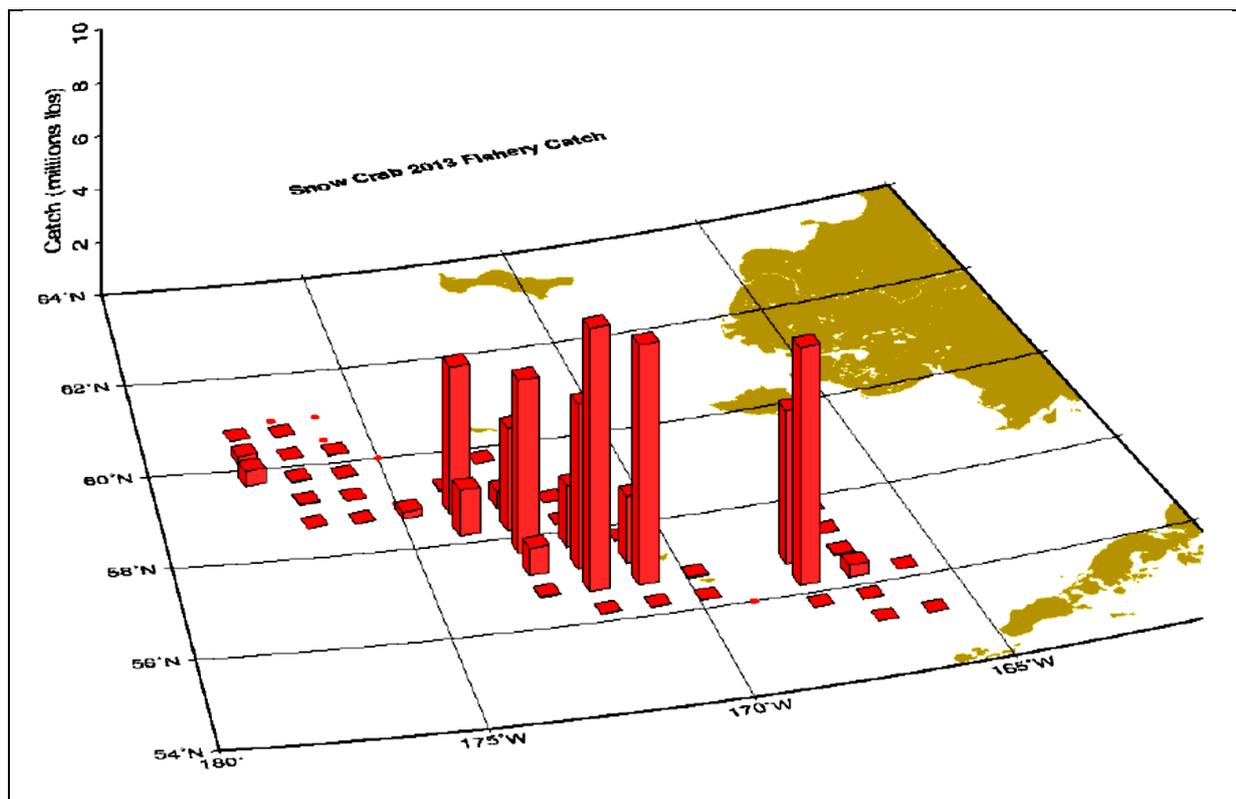
Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	13.63	32.64 <sup>A</sup>	6.73	6.76	7.71	10.66	
2011/12	13.77	30.88 <sup>A</sup>	3.55	3.61	4.09	8.80	7.92
2012/13	13.19	29.05 <sup>A</sup>	3.56	3.62	3.90	7.96	7.17
2013/14	12.85	27.12 <sup>A</sup>	3.90	3.99	4.56	7.07	6.36
2014/15		24.69 <sup>B</sup>				6.82	6.14

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.

**2014 EBSSC Stock Assessment**

The stock assessment for Eastern Bering Sea snow crab is based on a size- and sex-structured model in which crabs are categorized into immature, mature, new and old shell. The model is fitted to abundance and size frequency data from the NMFS trawl survey, total catch data from the directed fishery, bycatch data from the trawl fishery, and size frequency data for male retained catch in the directed fishery, and male and female bycatch in the directed fishery and trawl fishery. The model is also fitted to biomass estimates and size frequency data from the 2009 and 2010 BSFRF surveys and to growth increment data from Somerton. New data used in the model include biomass and length frequency data from the 2014 NMFS Eastern Bering Sea trawl survey, retained and discard catch and length size frequencies from the 2013/14 directed fishery, and discard catch and length frequency data from the groundfish fisheries.



**Figure 9.** 2012/13 snow crab pot fishery retained catch (million lbs) by statistical area. Statistical areas are 1 degree longitude by 0.5 degree latitude.

Three growth models were considered in this assessment. The first growth model considered was the one used in the 2013 assessment, which modeled growth increment as a function of crab size using a single linear segment. A second model was based on a suggestion during the 2014 CIE review of the snow crab assessment that fits two linear segments to growth increment data using a smooth transition between the segments—with the result that the resulting function is differentiable at all points. The final model described growth increments using two linear segments and a fixed transition point; this model is not differentiable at the transition point from one segment to the other.

The assessment author presented nine model scenarios in this assessment. These scenarios included the 2013 assessment model with the old growth model, the two-segment “hockey stick”-type growth model, three models based on the smooth, 2-segment growth model but with different weights (1, 2 and 3) in the likelihood placed on fitting the growth data, and four other models (based on the smooth growth model with growth likelihood weight 2) that also incorporated different weights on likelihood penalties placed on fishing mortality rates in the final model estimation phase. Model estimates of biomass were relatively insensitive to these changes, as were the associated F35%’s and B35%’s (except for the model with the smallest penalty on fishing mortality rates). OFLs for the 2014/15 fishery were somewhat sensitive to individual model scenarios. The author’s selected model (Model 2b) incorporated the CIE-suggested 2- segment growth model with the smooth transition with the moderate (2x) weighting in the likelihood to fit the growth data as his preferred model, and the CPT concurred with this recommendation. This model was selected because it used the smooth, 2-segment growth model and it fit the growth data much better than the similar model with the 1x weighting factor, while the fit was not substantially improved using model with the 3x factor on fitting the growth data.

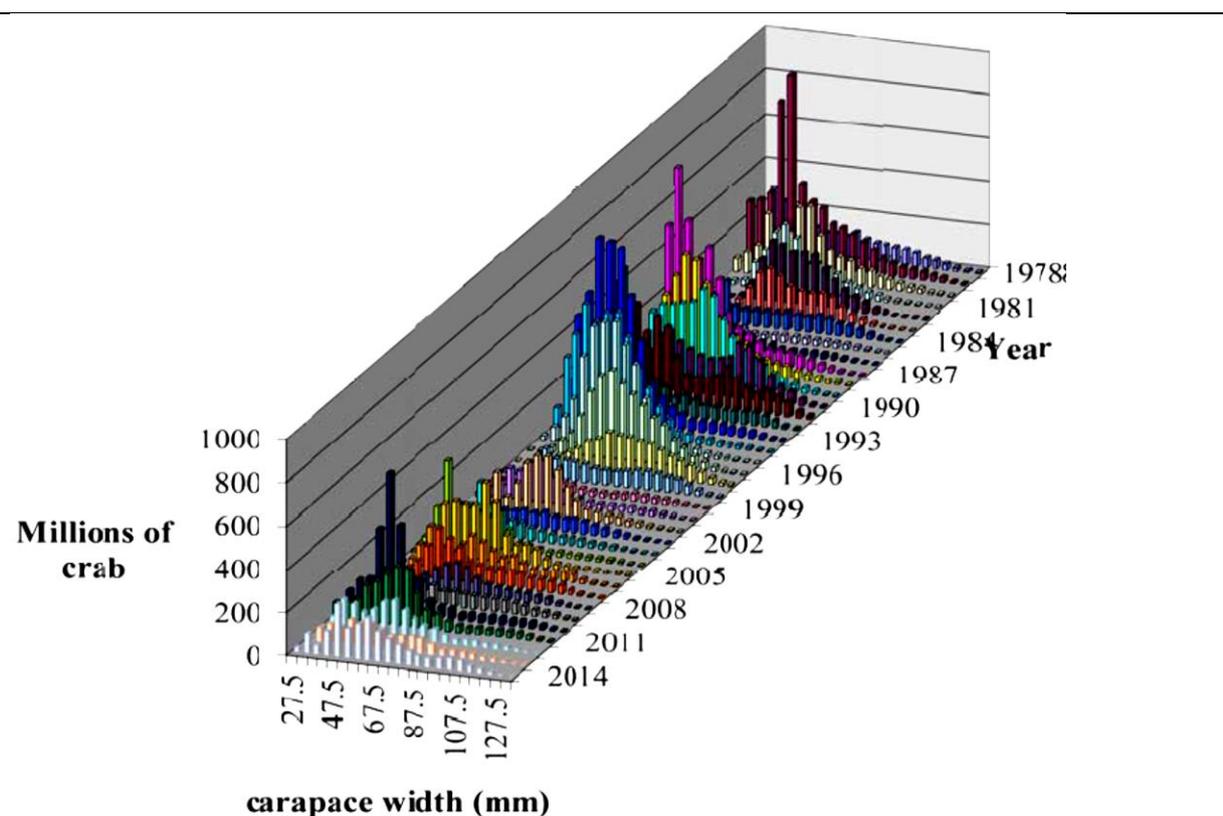
**Table 5.** The various data components used in the model.

Data component	Years
Retained male crab pot fishery size frequency by shell condition	1978/79-2013/14
Discarded male and female crab pot fishery size frequency	1992/3-2013/14
Trawl fishery bycatch size frequencies by sex	1991-2013/2014
Survey size frequencies by sex and shell condition	1978-2014
Retained catch estimates	1978/79-2013/14
Discard catch estimates from snow crab pot fishery	1992/93-2013/14 from observer data
Trawl bycatch estimates	1973-2013/14
Total survey biomass estimates and coefficients of variation	1978-2014
2009 study area biomass estimates and coefficients of variation and length frequencies for BSFRF and NMFS tows	2009
2010 study area biomass estimates and coefficients of variation and length frequencies for BSFRF and NMFS tows	2010

#### Stock biomass and recruitment trends

Observed survey mature male biomass decreased from 167,400 t in 2011 to 120,800 t in 2012 and to 96,100 t in 2013. It increased to 156,900 t in 2014. Similarly, the observed survey mature female biomass also decreased from 2011 to 2013 (from 280,000 t in 2011, 220,600 t in 2012, and to 195,100 t in 2013) but increased in 2014 to 212,500 t. In contrast to the survey observations available at the time, the 2013 model had estimated that mature male biomass increased between 2012 and 2013, almost returning to the 2011 level. This was partly driven by a peak in 2009 in estimated recruitment that was not evident in the surveys for 2012 and 2013.

The 2014 model also estimated a similar peak in recruitment, but delayed by a year (2010 rather than 2009), as well as an increasing trend in biomass (now supported by the survey results). The 2013 model-predicted mature male biomass at the time of the survey for 2013 was 1.5 times higher than the observed value. The 2014 model under-predicts mature male biomass at the time of the survey for 2014. Fits by the 2014 model to the size frequency data from the 2012 and 2013 surveys were poor; fitted size frequencies were lower than observed for females and higher than observed for males. The 2013 survey exhibited similar behavior. Fits to the 2014 data are somewhat improved, as the predicted recruitment event in 2010, apparently influenced a relatively high abundance of small (~50 mm CW) males observed in the 2010 survey propagates into the more fully-selected size classes in the survey.



**Figure 10.** Observed survey numbers (millions of crab) by carapace width and year for male snow crab.

Tier determination/Plan Team discussion and resulting OFL/ABC determination Status and catch Specifications The CPT recommended that the EBS snow crab is a Tier 3 stock so the OFL will be determined by the F35% control rule. The proxy for *BMSY* (*B35%*) is the mature male biomass at mating (142.9 thousand t) based on average recruitment over 1978 to 2014 present (1,351 million crab). Consequently, the minimum stock size threshold (MSST) is 71.5 thousand t. The CPT recommended that the ABC be less than maximum permissible ABC, and concurs with the authors' recommendation to use a default 10% buffer for setting the ABC.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	73.7	196.6 <sup>A</sup>	24.6	24.7	26.7	44.4	
2011/12	77.3	165.2 <sup>A</sup>	40.3	40.5	44.7	73.5	66.2
2012/13	77.1	170.1 <sup>A</sup>	30.1	30.1	32.4	67.8	61.0
2013/14	71.5	126.5 <sup>A</sup>	24.5	24.5	28.1	78.1	70.3
2014/15		137.6 <sup>B</sup>				69.0	62.1

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

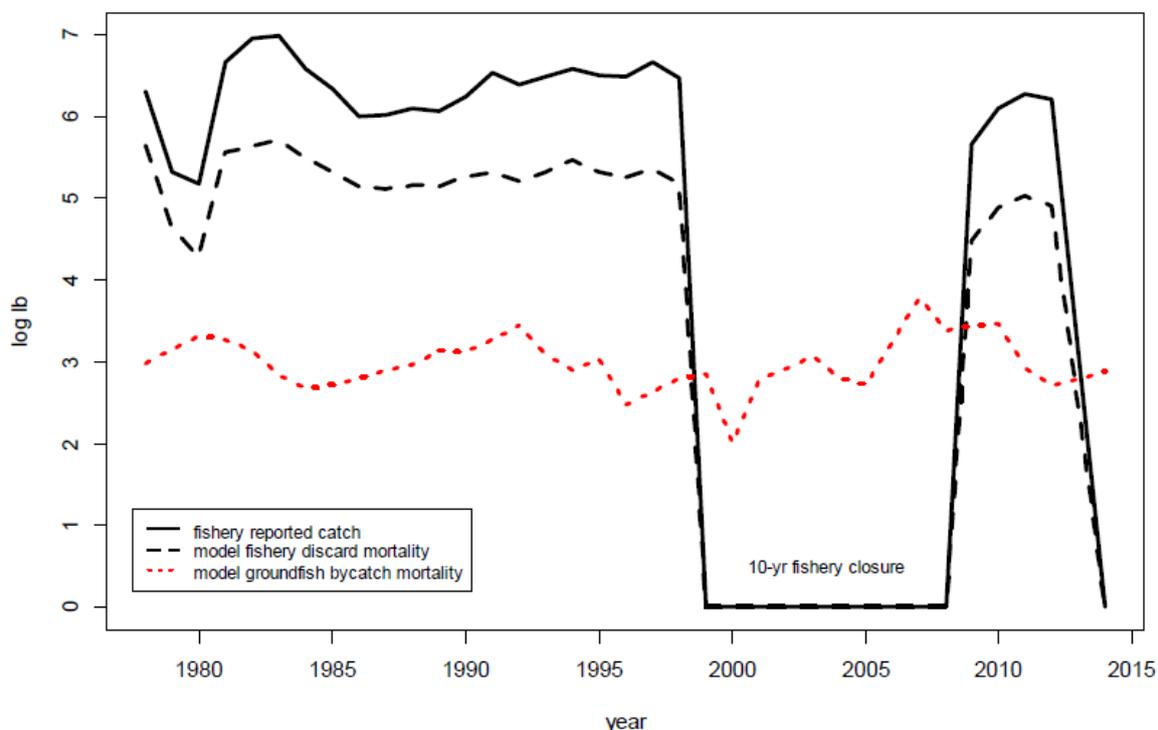
B - Projected biomass from the current stock assessment. This value will be updated next year.

**2014 SMBKC Stock Assessment**

The St Matthew Blue king crab fishery was prosecuted as a directed fishery from 1977 to 1998. Harvests peaked in 1983/84 when 9.454 million lb were landed by 164 vessels. Harvest was fairly stable from 1986/87 to 1990/91, averaging 1.252 million lb annually. Harvest increased to a mean

catch of 3.297 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 of 2000, Amendment 15 to the FMP was approved to implement a rebuilding plan for the St. Matthew Island blue king crab stock. The rebuilding plan included a harvest strategy established in regulation by the Alaska Board of Fisheries, an area closure to control bycatch, and gear modifications. In 2008/09 and 2009/10, the MMB was estimated to be above *BMSY* for two years and the stock declared rebuilt in 2009.

The fishery re-opened in 2009/10 with a TAC of 1.167 million lb and 0.461 million lb of retained catch were harvested. The 2010/11 TAC was 1.600 million lb and the fishery reported a retained catch of 1.264 million lb. The 2011/12 harvest of 1.881 million lb represented 80% of 2.539 million lb TAC. In 2012/13, by contrast, harvesters landed 99% (1.616 million lb) of a reduced TAC of 1.630 million lb, though fishery efficiency, at about 10 crab per pot, was little changed from what it had been in each of the previous three years. The directed fishery was closed in 2013/14 due to declining trawl survey estimates of abundance and concerns about the health of the stock. Bycatch of non-retained blue king crab has been observed in the St. Matthew blue king crab fishery, the eastern Bering Sea snow crab fishery, and trawl and fixed-gear groundfish fisheries. Based on limited observer data, bycatch of sublegal male and female crabs in the directed blue king crab fishery off St. Matthew Island was relatively high when the fishery was prosecuted in the 1990s, and total bycatch (in terms of number of crabs captured) was often twice as high or higher than total catch of legal crabs. The fishery was re-opened for the 2014-15 season.



**Figure 11.** Model ST SMBKC fishing mortality.

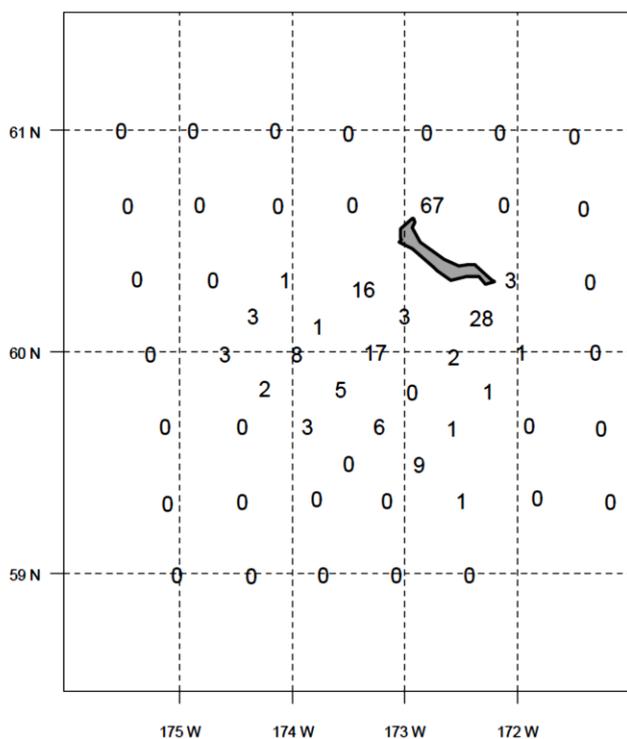
A three-stage catch-survey analysis (CSA) is used to assess the male crab  $\geq 90$  mm CL. The three size categories are: 90–104 mm CL; 105–119 mm CL; and  $\geq 120$  mm CL. Males  $\geq 105$  are used as a proxy to identify mature males, and males  $\geq 120$  mm CL are used as a proxy to identify legal males. The CSA incorporates the following data: (1) commercial catch data from 1978/79 -1998/99, 2009/10-

2012/13; (2) annual trawl survey data from 1978 to 2014; (3) triennial pot survey data from 1995 to 2013; (4) bycatch data in the groundfish trawl and groundfish fixed-gear fisheries from 1991 to 2014; and (5) ADFG crab observer composition data for the years 1990/91–1998/99, 2009/10–2012/13. Trawl survey data are from summer trawl survey for stations within the St. Matthew Section. Trawl survey data provided estimates of density (number/nm<sup>2</sup>) at each station for males in the three size categories. The pot survey data originate from the ADFG triennial pot surveys that occurred during July and August in 1995, 1998, 2001, 2004, 2007, 2010 and 2013. The pot survey samples areas of high-relief habitat important to blue king crab (particularly females) that the NMFS trawl survey cannot sample. Data used are from only the 96 stations fished in common during each of the five pot survey years. The CPUE (catch per pot lift) indices from those 96 stations for the male categories listed above were used in the assessment.

Groundfish discard information for trawl and fixed gear is estimated from NMFS observer data. Bycatch composition data were not available so total biomass caught as bycatch was estimated by summing blue king crab biomass from federal reporting areas 524 and 521 according to gear type.

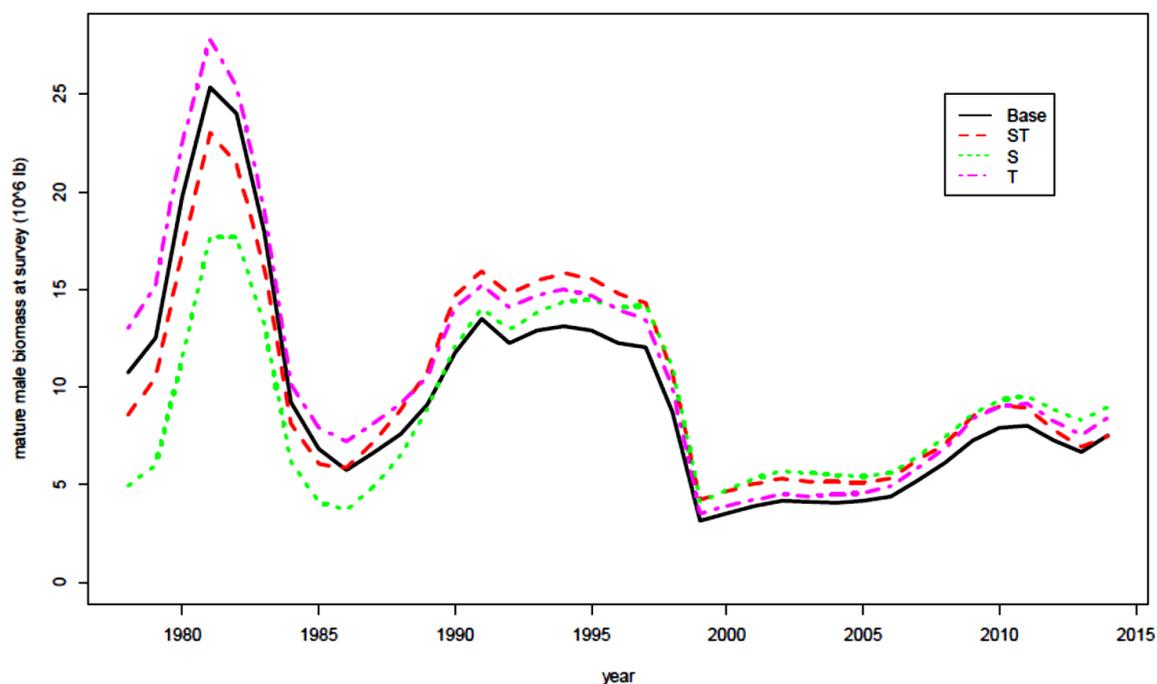
**Stock biomass and recruitment trends**

The 2014 assessment estimates that the stock is currently below the proxy for *BMSY*, as it was in the previous year. The MMB has fluctuated substantially over three periods, increasing during 1978 to 1981 of the first period from 7.6 million lb to 17.6 million lb, followed by a steady decrease to 2.9 million lb in 1985. The second period had a steady increase from 1986 to 13.3 million lb in 1997 followed by a rapid decline to 2.8 million lb in 1999. The third period starting in 2000 had a steady increase in all size classes and peaked at 14.77 million lb in 2010/2011 before declining to 6.29 million lb in 2012/2013.



**Figure 12.** Catches of 181 male blue king crab measuring at least 90 mm CL from the 2014 NMFS trawl survey at the 56 stations used to assess the SMBKC stock. Note that the area north of St.

Matthew Island, which includes the large catch of 67 crab at station R-24, is not represented in the ADFG pot-survey data used in the assessment.



**Figure 13.** Plots of base and alternative model estimated mature male biomass at time of survey.

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

The stock assessment examines four model configurations: 1) the base model used previously; 2) the base model with time-varying trawl-survey selectivity (Model S); 3) the base model with alternative stage-transition matrix (Model T); and 4) the base model with both modifications above (Model ST). These modifications were added to address concerns previously raised by the CPT and SSC. The author recommended use of the fourth model. Model comparisons suggest that the modified models fit the trawl-survey-index better than the base model and that the author-recommended model fits the trawl survey composition data better than the base model and two other formulations. The CPT expressed concerns with time varying selectivity, as no mechanism was identified to explain this variability and concerns were raised that it was fitting sampling error. Some plan team members regarded the selectivity patterns to be implausible, especially selectivities > 1 for the stage-2 crab. However, others commented that it could be possible given crab movement and the mismatch between survey-station location and crab distribution. As a result, the CPT selected the base model with an alternative stage-transition matrix (Model T) because the selectivities were reasonable (i.e. < 1 for stage-2 crab) unlike the previous base model. However, the CPT noted that this model still has poor fits to stage composition data and a retrospective pattern.

The CPT-recommended model uses the full assessment period (1978/79-2013/14) to define the proxy for *BMSY* in terms of average estimated *MMB<sub>mating</sub>* with  $\gamma = 1$  and an instantaneous natural mortality  $0.18^{-1}$  year. The *MMB* estimated for 2013/14 under the recommended model is 6.71 million lb (3,040 t) and the *FMSY* proxy is taken equal to the assumed instantaneous natural mortality rate ( $0.18^{-1}$  year), resulting in a mature male biomass OFL of 0.940 million lb (426 t). The author recommended and the CPT concurred with a 20% buffer on the OFL for the ABC because of

additional uncertainty in the model. This same approach was used last year. The ABC based on 20% buffer is 0.752 million lb (341 t).

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL*	ABC
2010/11	1.5	6.70 <sup>A</sup>	0.73	0.57	0.64	1.04	
2011/12	1.5	5.03 <sup>A</sup>	1.15	0.85	0.95	1.70	1.50
2012/13	1.8	2.85 <sup>A</sup>	0.74	0.73	0.82	1.02	0.92
2013/14	1.5	3.04 <sup>A</sup>	0	0	0.00027	0.56	0.45
2014/15	1.8	3.04 <sup>B</sup>				0.43	0.34

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.\*Total male catch only

**Reference:** BSAI King and Tanner crab SAFE 2014.

<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (click on [2014 Crab SAFE](#))

### C. The Precautionary Approach

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

FAO CCRF 7.5.2/7.5.3

Eco 29.2/29.2bis/30-30.2

**Evidence adequacy rating:**

High

Medium

Low

**Rating determination**

**Summary**

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

Stock	Tier	Target Reference Point (TRP)	Biomass at TRP	Biomass at present	Percentage of TRP
BBRKC	3b	B35%	25,700 t	24,700 t	96%
SMBKC	4b	Bmsy proxy	3,284 t	3,040 t	93%
EBSSC	3b	B35%	142,909 t	126,500 t	89%

There is strong evidence from the assessments that since rationalization, the level of fishing permitted for all three crab stocks has been commensurate with the current state of the fishery resources and never exceeded the overfishing level.

The biomass that is associated with MSY,  $B_{msy}$ , is effectively treated as the target reference point since it is the desired stock condition (but effective harvest is always lower, consistent with ABC, ACL and TAC formulations as explained below), although MSY itself is treated as a upper limit rather than a target reference point because the overfishing limit (OFL) is based upon MSY. The (lower) limit reference point corresponds to  $1/2$  MSY. The harvest rate is decreased when stock biomass is moving from upper to limit reference point and is reduced to zero when the stock reaches the limit reference point. At that point, a rebuilding plan is implemented.

For tier 3 stocks, the target reference point is  $B_{35\%}$  (when spawning biomass is reduced to 35% of

the unfished condition), a proxy for  $B_{msy}$ . Under the Magnuson-Stevens Act (MSA) new statutory requirements were established in 2006 to end and prevent overfishing by the use of annual catch limits (ACLs) and appropriate accountability measures if those ACLs should be exceeded. The measures were required to be implemented by 2010 for all stocks subject to overfishing and by 2011 for all remaining stocks that were not currently subject to overfishing.

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

The NPFMC’s fishery management plan (FMP) for BSAI crab stocks outlines the stock status definitions, the criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). The MSA requires that the Science and Statistical Committee (SSC) of the NPFMC determine the scientific benchmarks while the Council itself recommends quotas based on these benchmarks. This separation of responsibilities is a key step forward in the goal of eliminating overfishing and enhancing recovery of overfished stocks.

The status determination criteria for crab stocks are calculated on an annual basis using a five-tier system that accommodates varying levels of uncertainty of information, and incorporates new scientific information providing a mechanism for continually improving the status determination criteria as more information becomes available. Under the system overfishing and overfished criteria and ABC (= ACL) levels are formulated. For crab stocks, the overfishing level equals MSY and is derived through the annual assessment process. Each crab stock is assessed annually to determine its status and if catch estimates exceed the OFL, then overfishing is occurring. If annual biomass estimates are below MSST (defined as 0.5  $B_{msy}$ ) then the stock is overfished. If overfishing has occurred or the stock is overfished, the Magnuson-Stevens Act (MSA) requires NPFMC to immediately end overfishing and rebuild stocks. The MSA also requires that the FMP include accountability measures to prevent ACLs from being exceeded and to correct overages if they do occur.

BBRKC and EBSSC are managed as tier 3 stocks. Tier 3 is for stocks where reliable estimates of the spawner-recruit relationship are not available, but proxies for  $F_{msy}$  and  $B_{msy}$  are estimated. For tier 3 stocks, the term  $F_{35\%}$  refers to a fishing mortality associated with an equilibrium level of spawning per recruit equal to 35% of the equilibrium level of spawning per recruit in a virgin, unfished stock. Similarly,  $B_{35\%}$  refers to the long term average biomass that would be expected under average recruitment and  $F=F_{35\%}$ .

SMBKC is managed as a tier 4 stock. Tier 4 is for stocks where there is insufficient population data to estimate the spawner-recruit relationship, but simulation modelling is used to derive OFLs which capture the historical performance of the fisheries and borrow information from other stocks. Estimation of  $F_{OFL}$  requires estimates of current survey biomass, natural mortality rate ( $M$ ) or proxy, and a scalar,  $\gamma$ , which allows adjustments in the overfishing definitions to account for differences in

biomass measures.

**Table 6.** Reference points are considered appropriate and precautionary for stock harvest practices for 2014.

Stock	Tier	Reference Point (RP)	Biomass at RP	Biomass at present	Percentage of Reference Point
BBRKC	3b	B35%	25,700 t	24,700 t	96%
SMBKC	4b	Bmsy proxy	3,284 t	3,040 t	93%
EBSSC	3b	B35%	142,909 t	126,500 t	89%

**BBRKC**

Bristol Bay red king crab is in Tier 3. The proxy of *BMSY* (*B35%*) for a Tier 3 stock is based on mature male biomass at mating (MMB) and is computed as the average recruitment over some time period multiplied by the mature male biomass-per-recruit corresponding to *F35%* less the mature male catch under an *F35%* harvest strategy. Based on the author’s discussion regarding an apparent reduction in stock productivity associated with the well-known 1976/77 climate regime shift in the EBS, the CPT continues to recommend computing average recruitment based on model recruitment using the time period 1984 (corresponding to fertilization in 1977) to the last year of the assessment. The estimated *B35%* is 25.7 thousand t). MMB projected for 2014/15 is at 24.7 thousand t, 96% of *B35%*. Consequently, the Tier 3 status level for the BBRKC stock in 2014/15 is b. The team recommended that the OFL for 2014/15 be set according to model scenario 4nb, for which the calculated OFL is 6.82 thousand t (15.04 million lb).

The team recommended that the ABC for 2014/15 be set below the maximum permissible ABC. The team recommends that a 10% buffer from the OFL be used to set the ABC at 6.14 thousand t (13.53 million lb). MMB for 2013/14 is estimated to be above MSST (12.85 thousand t) at 27.1 thousand t; hence the stock was not overfished in 2013/14. The total catch in 2013/14 (4.56 thousand t) was less than the 2013/14 OFL (7.96 thousand t); hence overfishing did not occur in 2013/14. The stock at 2014/15 time of mating is projected to be above the MSST and 96% of *B35%* (see above); hence the stock is not projected to be in overfished condition in 2014/15.

**Table 7.** Status and catch specifications (thousand t) for Bristol Bay red king crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	13.63	32.64 <sup>A</sup>	6.73	6.76	7.71	10.66	
2011/12	13.77	30.88 <sup>A</sup>	3.55	3.61	4.09	8.80	7.92
2012/13	13.19	29.05 <sup>A</sup>	3.56	3.62	3.90	7.96	7.17
2013/14	12.85	27.12 <sup>A</sup>	3.90	3.99	4.56	7.07	6.36
2014/15		24.69 <sup>B</sup>				6.82	6.14

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.  
 B - Projected biomass from the current stock assessment. This value will be updated next year.

**EBSSC**

The CPT recommended that the EBS snow crab is a Tier 3 stock so the OFL could be determined by the *F35%* control rule. The proxy for *BMSY* (*B35%*) is the mature male biomass at mating (142.9 thousand t) based on average recruitment over 1978 to 2014 present (1,351 million crab).

Consequently, the minimum stock size threshold (MSST) is 71.5 thousand t. The CPT recommended that the ABC be less than maximum permissible ABC, and concurred with the SAFE authors' recommendation to use a default 10% buffer for setting the ABC.

**Table 8.** Historical status and catch specifications for snow crab (thousand t).

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	73.7	196.6 <sup>A</sup>	24.6	24.7	26.7	44.4	
2011/12	77.3	165.2 <sup>A</sup>	40.3	40.5	44.7	73.5	66.2
2012/13	77.1	170.1 <sup>A</sup>	30.1	30.1	32.4	67.8	61.0
2013/14	71.5	126.5 <sup>A</sup>	24.5	24.5	28.1	78.1	70.3
2014/15		137.6 <sup>B</sup>				69.0	62.1

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.

### SMBKC

The 2014 stock assessment examines four model configurations: 1) the base model used previously; 2) the base model with time-varying trawl-survey selectivity (Model S); 3) the base model with alternative stage-transition matrix (Model T); and 4) the base model with both modifications above (Model ST). These modifications were added to address concerns previously raised by the CPT and SSC. The author recommended use of the fourth model. Model comparisons suggest that the modified models fit the trawl-survey-index better than the base model and that the author-recommended model fits the trawl survey composition data better than the base model and two other formulations. The CPT expressed concerns with time varying selectivity, as no mechanism was identified to explain this variability and concerns were raised that it was fitting sampling error. Some plan team members regarded the selectivity patterns to be implausible, especially selectivities > 1 for the stage-2 crab. However, others commented that it could be possible given crab movement and the mismatch between survey-station location and crab distribution. As a result, the CPT selected the base model with an alternative stage-transition matrix (Model T) because the selectivities were reasonable (i.e. < 1 for stage-2 crab) unlike the previous base model.

However, the CPT noted that this model still has poor fits to stage composition data and a retrospective pattern. The CPT recommended model uses the full assessment period (1978/79-2013/14) to define the proxy for *BMSY* in terms of average estimated *MMB<sub>mating</sub>* with  $\gamma = 1$  and an instantaneous natural mortality  $0.18^{-1}$  year. The MMB estimated for 2013/14 under the recommended model is 6.71 million lb (3,040 t) and the *FMSY* proxy is taken equal to the assumed instantaneous natural mortality rate ( $0.18^{-1}$  year), resulting in a mature male biomass OFL of 0.940 million lb (426 t). The author recommended and the CPT concurred with a 20% buffer on the OFL for the ABC because of additional uncertainty in the model. This same approach was used last year. The ABC based on 20% buffer is 0.752 million lb (341t).

**Table 9.** Historical status and catch specifications (thousand t) of St Matthew blue king crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL *	ABC
2010/11	1.5	6.70 <sup>A</sup>	0.73	0.57	0.64	1.04	
2011/12	1.5	5.03 <sup>A</sup>	1.15	0.85	0.95	1.70	1.50
2012/13	1.8	2.85 <sup>A</sup>	0.74	0.73	0.82	1.02	0.92
2013/14	1.5	3.04 <sup>A</sup>	0	0	0.00027	0.56	0.45
2014/15	1.8	3.04 <sup>B</sup>				0.43	0.34

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.  
 B - Projected biomass from the current stock assessment. This value will be updated next year.\*Total male catch only

The total male catch for 2013/14 (0.00 million lb) was less than the 2013/14 OFL (1.24 million lb) so overfishing did not occur during 2013/14. Likewise, the 2013/14 MMB (6.71 million lb) is above the MSST (3.9 million lb) so the stock is not in an overfished condition.

Fishery Management Plan for BSAI crab:  
<http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/fmp/CrabFMPOct11.pdf>

BSAI King and Tanner crab SAFE 2014:  
<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (click on [2014 Crab SAFE](#))

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

FAO CCRF 7.5.1/7.5.4/7.5.5

FAO ECO 29.6/32

**Evidence adequacy rating:**

High

Medium

Low

**Rating Determination**

**Summary**

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

The FAO Guidelines for the Precautionary Approach (PA) (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review. Prior identification of desirable (target) and undesirable (limit) outcomes must be carried out and measures are required that will avoid undesirable outcomes with high probability and correct them promptly should they occur. The Guidelines suggest that this be achieved through decision rules that specify in advance what action should be taken when specified deviations from operational targets are observed (i.e. harvest control rules). Furthermore, the Guidelines suggest that a management plan should not be accepted until it has been shown to perform effectively in terms of its ability to avoid undesirable outcomes (for example through simulation trials). Lastly, the absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species as well as non-target species and their environment.

King and snow crab stocks in the Bering Sea and Aleutian Islands are managed by the State of Alaska through a federal king and Tanner crab fishery management plan (FMP). Under the FMP, management measures are divided into three categories: (1) fixed in the FMP, (2) frame-worked in the FMP, and (3) discretion of the State of Alaska. The State of Alaska is responsible for developing harvest strategies to determine GHL/TAC under the framework in the FMP.

The BBRKC and EBSSC stocks are both managed under the tier 3 management scheme, SMBKC falls into the tier 4 management level, making management more conservative. The NPFMC treats OFL (MSY) as an upper limit rather than a target. This system is intrinsically precautionary in nature and the practical results can be seen by comparing catches against OFL determinations for 3 crab stocks under assessment.

### BBRKC

**Table 10.** Status and catch specifications (thousand t) for Bristol Bay red king crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	13.63	32.64 <sup>A</sup>	6.73	6.76	7.71	10.66	
2011/12	13.77	30.88 <sup>A</sup>	3.55	3.61	4.09	8.80	7.92
2012/13	13.19	29.05 <sup>A</sup>	3.56	3.62	3.90	7.96	7.17
2013/14	12.85	27.12 <sup>A</sup>	3.90	3.99	4.56	7.07	6.36
2014/15		24.69 <sup>B</sup>				6.82	6.14

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.

### Additional Plan Team comments

The model scenario 4nb that the CPT selected as its preferred model for status determination and OFL setting, was the result of a previous CPT request to the author to evaluate a model that estimates catchability for the NMFS trawl surveys as an alternative model to the 2013 model (i.e., the base model scenario 4na that was reviewed for this assessment).

The CPT noted that, at its May 2014 meeting, it asked that a model allowing for higher natural mortality during 2006–2010 not be brought for consideration as a 2014 stock assessment model. The SSC in June 2014, however, requested that such a model be investigated further for presentation in September 2014, if time permits. The author obliged with a presentation of model scenario 4n7. The CPT noted that model scenario 4n7 appears to result in improved model fits, but feels that this model scenario should not be used for stock assessment until a plausible mechanism for the estimated higher natural mortality during 2006–2010 has been identified.

### Data Gaps and Research Priorities

The following data gaps exist for this stock:

- Information about changes in natural mortality in the early 1980s;
- Un-observed trawl bycatch in the early 1980s;
- Natural mortality;
- Crab availability to the trawl surveys;
- Juvenile crab abundance;

- f. Female growth per molt as a function of size and maturity;  
g. Changes in male molting probability over time.

Research priorities:

- a. Estimating natural mortality;  
b. Estimating crab availability to the trawl surveys;  
c. Surveying juvenile crab abundance in nearshore;  
d. Studying environmental factors that affect the survival rates from larvae to recruitment.

## EBSSC

**Table 11.** Status and catch specifications (thousand t) for snow crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	73.7	196.6 <sup>A</sup>	24.6	24.7	26.7	44.4	
2011/12	77.3	165.2 <sup>A</sup>	40.3	40.5	44.7	73.5	66.2
2012/13	77.1	170.1 <sup>A</sup>	30.1	30.1	32.4	67.8	61.0
2013/14	71.5	126.5 <sup>A</sup>	24.5	24.5	28.1	78.1	70.3
2014/15		137.6 <sup>B</sup>				69.0	62.1

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.

## Additional Plan Team recommendations

The Plan Team recommended that the author explore the use of applying different penalty weights by time period to quantities related to fishing mortality. One specific suggestion was to eliminate the weights on average F and to put penalties on F deviations only in the “early” time period when data on discards is unavailable. The Plan Team also recommended the author consider whether the smallest crabs used to estimate growth increments could be molting more than once per year (contrary to the assumption used to incorporate the data in the model) and to explore the ramifications of this, if true, on the model.

## Data Gaps and Research Needs

Research is needed to improve knowledge of snow crab life history and population dynamics to reduce uncertainty in the estimation of current stock size, stock status and optimum harvest rates.

Tagging programs need to be initiated to estimate longevity and migrations. Studies and analyses are needed to estimate natural mortality.

A method of verifying shell age is needed for all crab species. A study was conducted using lipofuscin to age crabs, however verification of the method is needed. Radiometric aging of shells of mature crabs is costly and time consuming. Aging methods will provide information to assess the accuracy of assumed ages from assigned shell conditions (i.e. new, old, very old, etc), which have not been verified, except with the 21 radiometric ages reported here from Orensanz (unpub. data).

Techniques for determining which males are effective at mating and how many females they can successfully mate with in a mating season are needed to estimate population dynamics and

optimum harvest rates. At present time it is assumed that when males reach morphometric maturity they stop growing and they are effective at mating. Field studies are needed to determine how morphometric maturity corresponds to male effectiveness in mating. In addition the uncertainty associated with the determination of morphometric maturity (the measurement of chelae height and the discriminate analysis to separate crabs into mature and immature) needs to be analyzed and incorporated into the determination of the maturity by length for male snow crab.

Female opilio in waters less than 1.5 degrees Celsius and colder have been determined to be biennial spawners in the Bering Sea. Future recruitment may be affected by the fraction of biennial spawning females in the population as well as the estimated fecundity of females, which may depend on water temperature.

A female reproductive index needs to be developed that incorporates males, mating ratios, fecundity, sperm reserves, biennial spawning and spatial aspects.

Analysis needs to be conducted to determine a method of accounting for the spatial distribution of the catch and abundance in computing quotas.

**SMBKC**

**Table 12.** Status and catch specifications (thousand t) for St Mathew Blue King crab.

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL*	ABC
2010/11	1.5	6.70 <sup>A</sup>	0.73	0.57	0.64	1.04	
2011/12	1.5	5.03 <sup>A</sup>	1.15	0.85	0.95	1.70	1.50
2012/13	1.8	2.85 <sup>A</sup>	0.74	0.73	0.82	1.02	0.92
2013/14	1.5	3.04 <sup>A</sup>	0	0	0.00027	0.56	0.45
2014/15	1.8	3.04 <sup>B</sup>				0.43	0.34

A - Estimated biomass at the time of mating for the year concerned. Note this represents a revised estimate from the projection the previous year.

B - Projected biomass from the current stock assessment. This value will be updated next year.\*Total male catch only

*Additional Plan Team recommendations*

The CPT requested further investigation of the time-varying selectivity, including further explanation/investigation of plausible explanations. Research needs include better molting probability information for the two smaller stages (of the three used in the model).

**Data Gaps and Research Priorities**

The CPT and SSC have identified as an important research need to investigate SMBKC annual molting frequency (and growth increment) as a function of pre-molt size. As the currently specified base-model transition matrix, requiring all stage-1 and 2 crab to transition in each year to stages 2 and 3, respectively, is likely unrealistic, the author concurs with this recommendation. For this assessment he has explored the use of a more biologically plausible transition matrix based on his review of Otto and Cumiskey's 1990 work on molting frequency and growth increment of Pribilof and St. Matthew Island blue king crab. Currently available ADFG SMBKC tagging data are limited to larger crab, making them mostly uninformative in this regard. Additional SMBKC tagging data covering a broader range of sizes would be useful.

## Current Research

**Small-Mesh Nearshore Gulf of Alaska Trawl Survey:** This survey has been conducted with standard methods since 1972 and is the longest continuous annual survey of its type in the North Pacific. This time series has been instrumental in describing ecological change in the Gulf of Alaska following the 1976 climate regime shift in the North Pacific and in describing ecological response to more recent climate change.

**Culture of Red King Crab Larvae as a Means to Facilitate the Release of Juveniles into the Ocean Environment:** The goal of this multi-year project is to initiate mass rearing of larval red and blue king crabs in the Alutiiq Pride Hatchery in Seward, AK. The first year of this project would be devoted to mass or optimal culture of king crab larvae under hatchery conditions. This initial step is critical toward determining feasibility of the project. In addition, optimal release densities will be determined and larval collection devices in Chigniak Bay and possibly Alitak Bay will be deployed to determine where larval king crab are being transported after release.

**Developing Biological Reference Points for Crustacean Fisheries: Reproductive Potential of Bristol Bay Red King Crab and Eastern Bering Sea Snow Crab:** Concurrent laboratory experiments and field collections are being conducted of Bristol Bay red king crab (BBRKC) and eastern Bering Sea snow crab (EBSSC) to achieve three project objectives which are important for improving assessment of reproductive potential and understanding population dynamics for these two stocks. The objectives are to: (1) assess reductions in fecundity during brooding and occurrence of unfertilized or non-viable eggs (2) assess egg quality by female size and reproductive history and (3) assess larval fitness by female size, reproductive history, and egg quality. The incorporation of reproductive potential in the development of biological reference points is a pressing fishery management need for Bering Sea crab stocks. A review by the Center for Independent Experts (CIE) determined that a quantitative understanding of the contribution of female crabs of differing life histories are needed to replace the current, crude measure of reproductive output based on total female biomass.

**Predicting Snow Crab Growth and Size with Climate Warming in the Northern Bering Sea:** A project is underway to explore the relationship of water temperature with the distributions, growth, and reproduction of snow crab in the northern Bering Sea. In the Bering Sea, the main concentration of snow crabs of marketable size has shifted northward from Bristol Bay to northwest of St. Matthew Island, with further expansion likely. To test the hypothesis that crab size structure and viable fisheries in the northern Bering Sea are controlled by temperature effects, they will compare model predictions of growth and size structure to data from the study area, and to historical data from the Chukchi Sea and north of St. Matthew Island.

**Ocean Acidification Effects on Larval Crab:** Carbon dioxide from the atmosphere is taken up by the world's oceans, making them more acidic and changing the availability of dissolved calcium for animals, like crabs, that use calcium to harden their exoskeletons. Larval king crab are being raised under different acidity conditions in order to better understand the effects of ocean acidification on commercially important crab stocks.

**Dive Program:** Year-round underwater research near Kodiak studies in situ the growth of red king and Tanner crabs, their behavior and habitat relationships, and the timing of molting and grasping.

**Crab Cultivation and Embryonic Development:** Larval crab cultivation plays a very important role in

supporting early life history research on such species as red king crab, blue king crab, snow crab, Tanner crab, and Hairy crab. In addition to studies on improving methods for cultivating crab larvae, studies on hatch timing and survival of larvae under different conditions are conducted. Future research aims to improve the cultivation methods and technology for crab larvae, look at the settlement behavior by crab larvae and the use of critical habitats, and cannibalism/predation levels of settling crab.

**Primiparous and Multiparous Tanner Crab Egg Development:** Studies suggest that females carrying a clutch of eggs for the first time (primiparous) brood their eggs for many months longer than females that have previously brooded egg clutches (multiparous). A current study is examining egg development monthly between primiparous and multiparous females from extrusion to hatching. This will allow confirmation of when primiparous and multiparous females extrude egg clutches and when their eggs hatch.

BSAI King and Tanner crab SAFE 2014:

<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (click on [2014 Crab SAFE](#))  
[http://www.afsc.noaa.gov/RACE/shellfish/default\\_sf.php](http://www.afsc.noaa.gov/RACE/shellfish/default_sf.php)

## D. Management Measures

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

**FAO CCRF 7.1.1/7.1.2/7.1.6/7.4.1/7.6.1/7.6.9/12.3**

**FAO Eco 29.2/29.4/30**

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

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

**Alaska Board of Fisheries**

It is the goal of the BOF and ADFG to manage king and Tanner crab stocks in a manner that will protect, maintain, improve and extend these resources for the greatest overall benefit to Alaska and the nation.

Achievement of this goal is necessarily constrained by the requirement to minimize: 1) risks of

irreversible adverse effects on reproductive potential; 2.) harvest during biologically sensitive periods of the life cycle; 3.) adverse interactions with other fish and shellfish stocks and fisheries.

Management of these fisheries for the purpose of achieving this goal will result in a variety of benefits which include, but are not limited to, the following:

- 1) Maintaining healthy stocks of king and Tanner crabs of sufficient abundance to insure their continued reproductive viability and the maintenance of their role in the ecosystem;
- 2) Providing a sustained and reliable supply of high quality product to the industry and consumers which will provide substantial and stable employment in all sectors of the economy relating to these fisheries; and
- 3) Providing opportunities for subsistence and personal use fisheries on these stocks.

#### Policies

To achieve the management goal and provide the benefits available from these resources, it is necessary to set policies which will protect stocks and provide for optimum utilization of these resources. It is the policy of the BOF to:

- 1) Maintain crab stocks comprised of various size and age classes of mature animals in order to maintain the long term reproductive viability of the stock and reduce industrial dependency on annual recruitment, which is extremely variable. Benefits of this policy are most apparent when weak recruitment occurs. As population abundance and structure change with declining recruitment, harvests should be reduced.
- 2) Routinely monitor crab resources to provide information on abundance of females as well as pre recruit, recruit and post recruit males. This is necessary to detect any changes in the population which may require adjustments in management to prevent irreversible damage to the reproductive potential of each stock. Harvest must be conducted in a conservative manner in the absence of adequate information on stocks.
- 3) Protect king and Tanner crab stocks during biologically sensitive periods of their life cycle. Closure of the fishing season is necessary at times surrounding the annual mating, molting and egg hatching periods in order to reduce unnecessary mortality of soft animals, disturbance during mating and damage to egg clutches.
- 4) Minimize handling and unnecessary mortality of non-legal crabs and other non-target animals. Capture and handling of females, sublegal males and animals of other species results in a loss of reproductive ability and biomass that may be detrimental to a stock.
- 5) Maintain an adequate brood stock to rebuild king or Tanner crab populations when they are depressed. Maintenance of an adequate brood stock takes precedence over short term economic considerations. When populations are at or below threshold, the minimum stock size that allows sufficient recruitment so that stock can rebuild itself, fisheries must be closed and must remain closed until there is adequate brood stock.
- 6) Establish regulations which will help improve the socioeconomic aspects of management by harvesting crab when their meat yield is highest; providing for fair starts and closures to seasons; insuring enforceability of regulations; and other measures providing for an orderly fishery.

#### Management Measures:

- 1.) **Harvest Rates.** Exact harvest rates in each situation are chosen based on abundance of pre-recruit males and females as well as legal males, the established minimum size or the actual size of crab landed, percentage of females bearing eggs, and the ratio of recruit to post-recruit males.

- 2.) **Size Limits.** Size limits provide some protection against overharvest and also provide for improved product quality.
- 3.) **Sex Restrictions.** Harvest of king and Tanner crabs is limited to males only in an attempt to provide full fertilization of females and increase the chances of reproductive success.
- 4.) **Fishing Seasons.** Biological seasons should be set to minimize the harvest of king and Tanner crabs during times surrounding the annual mating, molting and egg hatching periods.
- 5.) **Guideline Harvest Levels (GHLs).** A preseason estimate of the level of allowable king and Tanner crab harvest is established for each fishery.
- 6.) **Closed Areas.** To minimize the handling and unnecessary mortality of non-legal and or molting crabs, or to prevent conflicts with other fisheries or stocks, it may be necessary to close portions of management areas.
- 7.) **Gear Types.** Fishing for king and Tanner crabs is limited to pots. Biodegradable panels are required on pots to minimize adverse effects of lost gear. Escape rings, large mesh panels, or other measures may be required to gear to meet BOF policies.
- 8.) **Inseason Adjustments.** Inseason adjustments may be made to the guideline harvest level and length of the fishing season. When information shows the continued fishing effort would jeopardize the reproductive viability of king or Tanner crab stocks, closures may occur by Emergency Order.
- 9.) **Other Measures.** Additional regulations or management measures may be adopted to control disease, reduce handling and trapping mortality due to weather, require tank inspections, specify registration procedures, gear storage, gear limitations or any other regulations needed to meet the BOF goals for managing these fisheries.

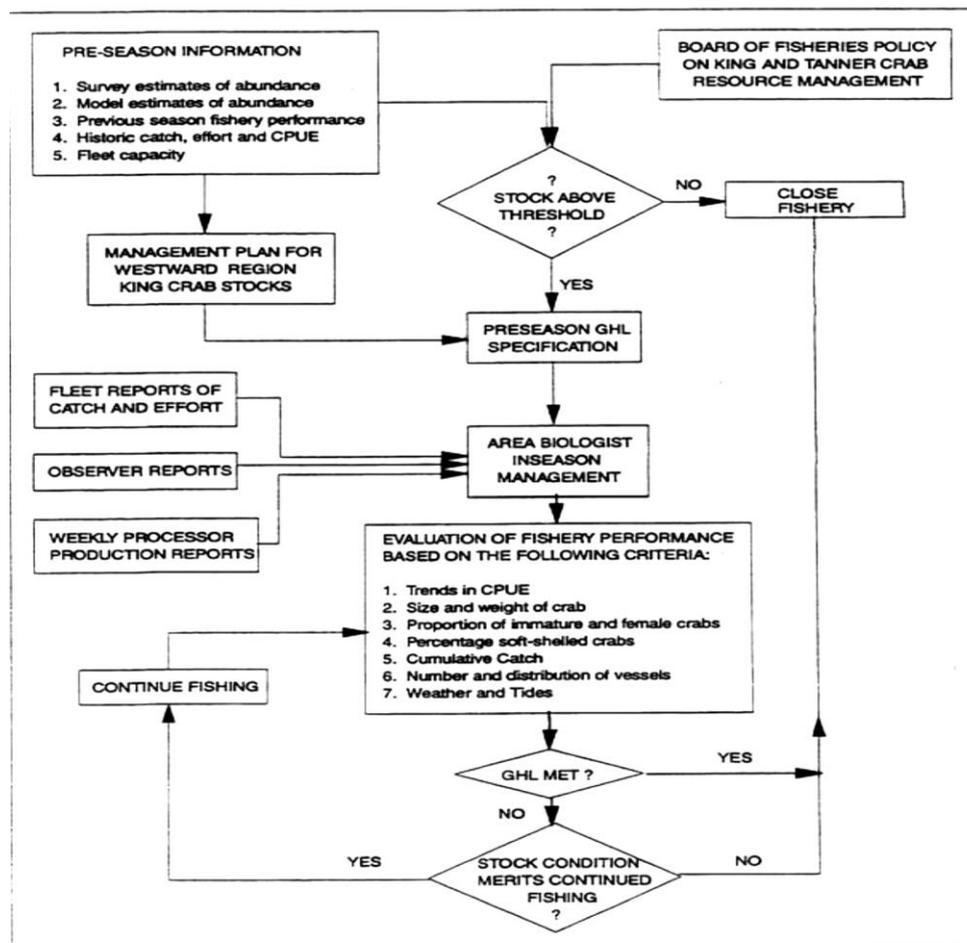
<http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/KingTannerCrab-2012-2014.pdf>

#### **Harvest rate policy and catch limits management**

The OFL is the catch level above which overfishing is occurring, and the harvest control rules aim to prevent overfishing by establishing a maximum fishing mortality threshold and using this threshold value to determine annual catch limits. The ABC is the level of annual catch that accounts for scientific uncertainty in the estimate of OFL and other uncertainties. The ABC is set below the OFL. The ACL is the level of catch that serves as the basis for invoking accountability measures, and for crab stocks the ACL is set at the ABC.

The TAC is the annual catch target for the fishery which is set at or below the ACL and may take into account uncertainty in the management process and socio-economic factors, or other biological concerns that may affect the reproductive potential of the stock but that are not reflected in the OFL itself. The status determination criteria for crab stocks are calculated on an annual basis using a five-tier system that accommodates varying levels of uncertainty of information, and incorporates new scientific information providing a mechanism for continually improving the status determination criteria as more information becomes available. Under the system overfishing and overfished criteria and ABC (= ACL) levels are formulated. For crab stocks, the overfishing level equals MSY and is derived through the annual assessment process. Each crab stock is assessed annually to determine its status and if catch estimates exceed the OFL, then overfishing is occurring. If annual biomass estimates are below MSST (defined as 0.5 Bmsy) then the stock is overfished. If overfishing has occurred or the stock is overfished, the Magnuson-Stevens Act (MSA) requires NPFMC to immediately end overfishing and rebuild stocks. The MSA also requires that the FMP includes accountability measures to prevent ACLs from being exceeded and to correct overages if they do

OCCUR.



**Figure 14.** In-season management decision making by Alaska Department of Fish and Game (ADFG) based on preseason specification of guideline harvest level (GHL). Area management biologists may issue emergency orders closing fisheries, but final decisions are made by the Commissioner or his designee.

**Regulations**

Individual fishing quota program

Crab Rationalization program components include quota share allocation, processor quota share allocation, IFQ and individual processing quota (IPQ) issuance, quota transfers, use caps, crab harvesting cooperatives, protections for Gulf of Alaska groundfish fisheries, arbitration system, monitoring, economic data collection, and cost recovery fee collection. Under the individual fishing quota share system in place for the BSAI crab fishery, fishing capacity (vessels and gear) has been reduced. With the implementation of IFQs in the fishery, the derby type fishery was eliminated, seasons were extended and wastage was reduced in the crab fishery. Regulations in place address waste, discard, bycatch, and endangered species interactions in the halibut fisheries. The NMFS, and ADFG promulgate these regulations through the NPFMC, and the Alaska Board of Fisheries.

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

[2012-2014.pdf](#)

The Community Development Quota (CDQ) Program involves 65 communities within a fifty-mile radius of the Bering Sea coastline who are allocated a portion of the Bering Sea and Aleutian Island harvest of pollock, halibut, Pacific cod, crab and bycatch species. Other regulations governing the crab fisheries include closed areas, seasonal closures, gear restrictions and pot limits, and size and sex limits.

Gear

Fishing gear is regulated to pot gear only (although crabs rings are mentioned in the regulations, they are not used). The size, construction and number of pots a vessel may fish are regulated. Mesh size and escape rings are utilized to reduce the capture of female and undersize crab.

Size limits

The BBRKC fishery is limited to males measuring six and one-half inches or greater in width of shell. The EBSSC fishery is limited to males measuring 3.1 inches or greater in width of shell, however a processor favored width of four inches is generally used by the industry. The SMBKC fishery is limited to males measuring five and one-half inches or greater in width of shell.

Time restrictions

Seasons are established in regulation by the ADFG/ BOF. Open and closed periods, as well as fishing period limits are set in regulation. The crab fisheries are closed during peak spawning times.

Geographical closures

Regulations are in place to address discards of crab species caught as prohibited species in other fisheries. Gear modifications now in place in the Bering Sea flatfish fisheries require the use of bobbins on the trawl sweeps to reduce contact with the ocean floor and limit the mortality of any crab encountered. Additional trawl closures for areas in the waters of Bristol Bay (19,000 sq mi), the Pribilof Island Habitat Conservation Area (7,000 sq mi), the Aleutian Island (277,000 sq mi), the Northern Bering Sea Research Area (85,000 sq mi), the Eastern Gulf of Alaska (53,000 sq miles) and Cook Inlet (7,000 sq mi) closed thousands of square miles of sea bottom to bottom trawling which provides a significant degree of refuge for crab species.

Observer program

Observers are required at 100% coverage for all catcher processor crab vessels. The SMBKC fishery also has 100% observer coverage. The BBRKC and EBSSC fisheries have 20% and 30% of registered vessel observer coverage, respectively. All vessels participating in Amendment 80 trawl fisheries in the BSAI are required to carry fishery observers for 100% of their fishing time. This allows for accurate in-season updates on crab PSC.

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

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

**FAO CCRF 7.1.8/7.6.3/7.6.6/8.4.5/8.4.6/8.5.1/8.5.3/8.5.4/8.11.1/12.10**

**FAO Eco 29.2bis**

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

*There is clearly defined harvest strategy that consists of a set of defined management measures designed to maintain the crab stocks at levels capable of producing maximum sustainable levels. These include harvest control rule, stock status definitions, criteria used to determine stock status using a five-tier system and the step-by-step framework under which the NPFMC sets final overfishing levels (OFLs) and acceptable biological catches (ABCs). Using this strategy and clearly laid out rebuilding plans, two of these stocks were rebuilt from being declared overfished. The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH are necessary to maintain stocks capable of producing maximum sustainable yields. At present, there is an area of overlap between current female red king crab distribution and areas where trawling occurs in the southern Bristol Bay. The NPFMC is currently researching this issue and discussing the best way to proceed with the management of this area.*

Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. The five-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. Under the five-tier system, overfishing and overfished criteria and acceptable biological catch (ABC) levels are annually formulated. The annual catch limit (ACL) for each stock equals the ABC for that stock. Each crab stock is annually assessed to determine its status and whether (1) overfishing is occurring or the rate or level of fishing mortality for the stock is approaching overfishing, (2) the stock is overfished or the stock is approaching an overfished condition, and (3) the catch has exceeded the ACL.

For crab stocks, the overfishing level (OFL) equals maximum sustainable yield (MSY) and is derived through the annual assessment process, under the framework of the tier system. Overfishing is determined by comparing the OFL with the catch estimates for that crab fishing year. Catch includes all fishery removals, including retained catch and discard losses, for those stocks where non-target fishery removal data are available. Discard losses are determined by multiplying the appropriate handling mortality rate by observer estimates of bycatch discards. For stocks where only retained catch information is available, the OFL and ACL will be set for and compared to the retained catch.

The Magnuson-Stevens Act requires that FMPs include accountability measures to prevent ACLs from being exceeded and to correct overages of the ACL if they do occur. Accountability measures to prevent TACs and GHs from being exceeded have been used under this FMP for the management of the BSAI crab fisheries and will continue to be used to prevent ACLs from being exceeded. These include: individual fishing quotas and the measures to ensure that individual fishing quotas are not exceeded, measures to minimize crab bycatch in directed crab fisheries, and monitoring and catch

accounting measures. Accountability measures in the harvest specification process include downward adjustments to the ACL and TAC in the fishing year after an ACL has been exceeded.

Gear modifications include increased mesh size, escape rings and biodegradable panels that reduce the number of female and sub-legal crab that are caught. Time and area closures protect spawning crab populations. Restrictions impressed upon other fisheries and gear groups are designed to minimize crab bycatch and protect the crab resource.

These include areas closed to trawling, crab as a prohibited species in groundfish fisheries and gear modifications in the BSAI trawl fleet to reduce crab mortality. BSAI King and Tanner crab SAFE 2014: <http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (click on [2014 Crab SAFE](#))

The NPFMC and the CPT have been in discussions over the 2010 5-year EFH review and its differences from the 2005 EFH EIS. A 2012 discussion paper addresses the measures already in place for protection of BBRKC EFH and additional measures for consideration. The focus of two Council papers (both 2012 and 2013) included a discussion of the importance of southwestern Bristol Bay for red king crab populations, particularly an area southwest of Amak Island, and whether and how trawl fisheries in that area may be impacting the crab habitat. It was proposed that eggs released here have greater chance of survival through larval and juvenile life history stages due to oceanographic currents in this area and that the extent of the Bering Sea cold pool affects the distribution of ovigerous females and subsequently, the location of larval release. Given the potential redistribution of crab in the area southwest of Amak Island due to temperature changes, the Council also requested that the discussion paper look at the efficacy of existing red king crab protection areas, such as the Red King Crab Savings Area and the Nearshore Bristol Bay Trawl Closure, to see whether these closed areas are still providing both habitat and bycatch protection to red king crab. These studies are now in progress at the Council level.

[http://www.npfmc.org/wp-content/PDFdocuments/conservation\\_issues/EFH/BBRKC\\_EFH213.pdf](http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf)

As illustrated in clause 6 and 7 the three crab stocks part of the assessment are at fluctuating around their target reference point which in turn is consistent with MSY/proxy levels.

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

*FAO CCRF 8.1.7/8.1.10/8.2.4/8.4.5*

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

***Rating determination***

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

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

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

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



## North Pacific Regional Fisheries Training Center



<b>Students Trained</b>	<b>332</b>
<b>Units Trained</b>	<b>28</b>
<b>Resident Courses</b>	<b>8</b>
<b>Days Deployed</b>	<b>102</b>
<b>Ship Rider</b>	
<b>Deployments</b>	<b>7</b>



<http://www.npfmc.org/committees/enforcement-committee/> (see USCG 2014 year in review).

<http://www.avtec.edu/amtc-cost.aspx>

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

<http://seagrant.uaf.edu/map/fisheries/>

In addition, MAP conducts sessions of their Alaska Young Fishermen’s Summit (AYFS). Each Summit is an intense, 3-day course in all aspects of Alaska fisheries, from fisheries management & regulation, to seafood markets & marketing. The target audience for these Summits is young Alaskans from coastal communities. The summit provides three days of training in the land-based aspects of running a fishing operation: marketing, business management, the fisheries regulatory process, and the science impacting fisheries management, and an opportunity for fishermen to meet with fisheries managers and researchers.

<https://seagrant.uaf.edu/map/workshops/2013/ayfs/>

Finally, the Alaska Marine Safety Education Association (AMSEA) provides courses on small boating safety, drill conductor training, stability and damage control, ergonomics, dredger safety and survival at sea training (<http://www.amsea.org/>). In addition to the practical training necessary to enter the fishing industry, the NPFMC meetings are public and the process involves extensive industry representation for input in the management process and the drafting of new regulation in a changing conservation environment. Through selected industry representation at these meetings, individual fishermen are kept up to date and remain aware of new requirements for fisheries as they arise throughout the year.

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

### E. Implementation, Monitoring and Control

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

**FAO CCRF 7.1.7/7.7.3/7.6.2/8.1.1/8.1.4/8.2.1**

**FAO Eco 29.5**

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

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

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

**USCG**

The U.S. Coast Guard (USCG) is the lead federal maritime law enforcement agency for enforcing national and international law on the high-seas, outer continental shelf and inland from the U.S. Exclusive Economic Zone (EEZ) to inland waters. The USCG also patrols US waters to reduce foreign poaching, and inspects fishing vessels for compliance with safety requirements.



## 2014 Crab Fisheries

### 2013/2014 Bering Sea Snow Crab

01 January – 31 May 2014

1 – MH60 Helicopter in Cold Bay

5 – Boardings



### 2014/2015 Red King Crab, Eastern Bering Sea Tanner Crab Fisheries, and Bering Sea Snow Crab.

15 October – 31 December 2014

1 – MH60 Helicopter in Cold Bay

14 – RKC Boardings

6 – EBT Boardings

4 – BSS Boardings

Between October and November 2014, the Coast Guard focused commercial vessel safety enforcement activities on the start of the Bering Sea crab fisheries, with CGC MUNRO conducting 14 boardings on vessels targeting Bristol Bay Red King Crab and five boardings on vessels targeting Eastern Bering Sea Tanner Crab. There were no violations found during these boardings although seven vessels had not yet received safety and stability compliance checks. Pre-season safety and stability compliance checks were conducted in Kodiak and Dutch Harbor, and a Coast Guard helicopter was forward deployed to Cold Bay for search and rescue standby.

<http://www.npfmc.org/committees/enforcement-committee/> (see USCG reports)

### NMFS OLE

NOAA Office of Law Enforcement Special Agents and Enforcement Officers perform a variety of tasks associated with the protection and conservation of the nation's living marine resources. In order to enforce these laws, OLE special agents and enforcement officers use OLE patrol vessels to board vessels fishing at sea, and conduct additional patrols on land, in the air and at sea in conjunction with other local, state and Federal agencies. OLE has responsibility for enforcement of the crab rationalization program. In addition, OLE's officers inspect and cross check at landings and processors records for reconciliation, and closely monitor Prohibited Species Catch in non-crab fisheries.

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

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

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

#### **Alaska Division: NMFS OLE 2013 Enforcement Priorities**

##### **Magnuson-Stevens Act**

###### **HIGH PRIORITY**

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

###### **MEDIUM PRIORITY**

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

###### **LOW PRIORITY**

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

##### **Endangered Species Act and Marine Mammal Protection Act**

###### **HIGH PRIORITY**

- Violations wherein responsible subject and species are identifiable.
- Lethal Takes, Level "A" Harassment with the potential to injure marine mammal stock.
- Species of interest are Cook Inlet Beluga, other whale species, Northern fur seal, or Steller sea lion.
- Any violation involving injury or potential injury to people, such as a vessel-whale collision.
- Outreach and education.

**MEDIUM PRIORITY**

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

**LOW PRIORITY**

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

**International/Lacey Act****HIGH PRIORITY**

- Felony and major civil violations. For example, interstate or foreign trafficking of commercial quantities of illegally harvested fish or marine resources.
- Harvest or transshipment of marine resources by foreign fishing vessels.
- Domestic or international violations involving seafood safety; substantive mislabeling of product in domestic or international commerce.
- IUU listed vessels.

**MEDIUM PRIORITY**

- Misdemeanor and civil violations. For example, interstate or foreign trafficking of small quantities of illegally harvested fish or marine resources.
- Mislabeling violations.
- IUU identified product.

**LOW PRIORITY**

- Minor mislabeling violations.
- Violations wherein responsible subject/vessel not identifiable.

**AWT**

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

This detachment has enforcement responsibility for Commercial Fisheries in Salmon, Herring, Crab, and Groundfish in areas that contain some of the nation's richest fisheries, such as the Bering Sea

Crab fisheries. The detachment operates most of the Departments large patrol vessels:

- P/V Stimson 156 foot – Dutch Harbor
- P/V Cama'i 65 foot- Kodiak
- P/V Woldstad 121 foot- Kodiak
- P/V Kvichak 32 foot- King Salmon

The data collected from the Alaska Wildlife Troopers from April 2014 to April 2015 showed 328 pots inspected:

AWT Enforcement measures support bycatch/discards by inspecting gear in water and dockside for tunnel eye opening, including review of pot logs.

Number of boarding for this period was 52, with 121 gear inspections.

Violations included 1 undersized Tanner crab, 2 undersized BBRK crabs, 1 buoy ID and 1 fish ticket.

Overall, the AWT stated that the level of compliance is very high, and increasing, especially so after fishery rationalization (pers. comm., 29 April 2015, Lieutenant Jon Streifel, Deputy Commander, Alaska Wildlife Troopers, Southeast Alaska).

#### Crab Observer Program

Since 1988 ADFG has required varying levels of observer coverage aboard vessels participating in the BAI crab fisheries. The ADFG Observer report for 2013/2014 summarizes commercial crab fisheries by crab observers deployed on floating-processor vessels, catcher-processor vessels, and catcher vessels and provides historical data for comparison. Primary data summaries include estimates of CPUE and information about size and shell condition of both captured and retained crabs. Further information include catch rates by soak time & depth, female reproductive condition, sampled pot lift locations, species composition of sampled pot lifts, total legal tally results.

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

#### Dockside inspections

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

#### Vessel Monitoring System

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

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

3) the vessel has (or is required to have) a Federal Crab Vessel Permit (FCVP).

NMFS' OLE is able to detect through the VMS signal whether a boat is fishing or transiting in an area and through those data they base much of their enforcement decisions to act against a potential offenses.

The NOAA Fisheries VMS database was an invaluable tool for the USCG this crab-fishing year. Although the BBRKC fleet is relatively contained within the "RKC Savings Area," positional information allowed USCG cutters and aircraft effective preparation for Search and Rescue (SAR). VMS was even more important during the EBSSC fishery due to fleet use of a much greater geographic area than for BBRKC. The trend toward fewer vessels distributed over a larger area necessitates future VMS use for SAR planning and response.

#### Logbooks

Logbooks are mandatory. These include:

- 1) The Daily Fishing Log (DFL), which must be maintained by the operator of a catcher vessel using pot gear to harvest CR crab from the BSAI; and,
- 2) The Daily Cumulative Production Log (DCPL), which must be maintained by the operator of a CV vessel using pot gear to harvest CR crab from the BSAI.

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

[www.uscg.mil/d17/](http://www.uscg.mil/d17/)

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

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

*FAO CCRF 7.7.2/8.2.7*

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

*In Alaska waters, enforcement policy section 50CFR600.740 states: (a) The MSA provides four basic enforcement remedies for violations, in ascending order of severity, as follows: (1) Issuance of a citation (a type of warning), usually at the scene of the offense (see 15 CFR part 904, subpart E). (2) Assessment by the Administrator of a civil money penalty. (3) For certain violations, judicial forfeiture action against the vessel and its catch. (4) Criminal prosecution of the owner or operator for some offenses. The MSA treats sanctions against the fishing vessel permit to be the carried out of a purpose separate from that accomplished by civil and criminal penalties against the vessel or its owner or operator. The 2011 Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions issued by NOAA Office of the General Counsel – Enforcement and Litigation, provides guidance for the assessment of civil administrative penalties and permit sanctions under the statutes and regulations enforced by NOAA. The Marine Division of AWT and the State of Alaska Department of Law pursue a very aggressive enforcement policy. They attend the BOF and are integral into the process for regulation formulation and legislation, analogous to the USCG attendance and input in the Council process. AWT has Statutory / Regulatory legislation pertaining to their Authority.*

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

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

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

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

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

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

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

[http://www.nmfs.noaa.gov/sfa/reg\\_svcs/Councils/ccc\\_2011/Tab%20L%20-%20Enforcement%20Issues/Enforcement%20Issues.pdf](http://www.nmfs.noaa.gov/sfa/reg_svcs/Councils/ccc_2011/Tab%20L%20-%20Enforcement%20Issues/Enforcement%20Issues.pdf)

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

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

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

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

The new 2014 revised Policy provides guidance for the NOAA Office of the General Counsel, but does not, nor is it intended to, create a right or benefit, substantive or procedural, enforceable at law or in equity, in any person or company. The basis for penalties calculated under this Policy, however, will be included in charging documents filed by the Agency. Further, although this Policy provides guidance regarding the assessment of proposed penalties and permit sanctions, NOAA retains discretion to assess the full range of penalties authorized by statute in any particular case. For significant violations, the NOAA attorney may recommend charges under NOAA’s civil administrative process (*see* 15 C.F.R. Part 904), through issuance of a Notice of Violation and Assessment of a penalty (NOVA), Notice of Permit Sanction (NOPS), Notice of Intent to Deny Permit (NIDP), or some combination thereof. Alternatively, the NOAA attorney may recommend a violation of a criminal provision is sufficiently significant to warrant referral to a U.S. Attorney’s office for criminal prosecution ([http://www.gc.noaa.gov/documents/Penalty%20Policy\\_FINAL\\_07012014\\_combo.pdf](http://www.gc.noaa.gov/documents/Penalty%20Policy_FINAL_07012014_combo.pdf)).

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

50CFR600.740 Enforcement policy

<http://dps.alaska.gov/awt/mission.aspx>

## F. Serious Impacts of the Fishery on the Ecosystem

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

**FAO CCRF 7.2.3/8.4.7/8.4.8/12.11**

**Eco 29.3/31**

**Evidence adequacy rating:**

**High**

**Medium**

**Low**

**Rating determination**

**Summary**

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

**Ecosystem Effects on the EBS Crab Resources**

**Ocean Acidification on BSAI crabs**

The effects of increased CO<sub>2</sub> on the survival, condition, and growth of king crab species were investigated from 2009 to 2011. At the same time, infrastructure was developed to support a multi-year program capable of assessing both direct and indirect effects of ocean acidification on shell

building in commercial crab species in Alaska. The results of this research program will not only provide empirical data specific to the physiological response of crabs, but will also support modeling efforts on the indirect impacts of ocean acidification associated with food webs and fisheries interactions.

#### **Red King Crab Experimental Studies**

Initial experiments tested the effects of ocean acidification on late-stage embryos and larvae of red king crab (*Paralithodes camtschaticus*) at average ocean pH levels expected within the next 50 years.

#### **Conclusions on King and Tanner Crab Experimental Research**

The results of the experimental red king studies thus far indicate that ocean acidification may have a substantial negative effect on red king crab stocks. Reduced survival at the larval and juvenile stages is likely to reduce recruitment and subsequently affect the number of mature male crabs available for commercial fisheries.

<http://www.afsc.noaa.gov/Quarterly/jas2012/JAS12-Feature2.pdf>

#### **Impacts of fishing gear on the habitat**

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

[http://www.fakr.noaa.gov/habitat/efh/review/efh\\_5yr\\_review\\_sumrpt.pdf](http://www.fakr.noaa.gov/habitat/efh/review/efh_5yr_review_sumrpt.pdf)

<http://alaskafisheries.noaa.gov/habitat/efh/review/appx3.pdf>

#### **Essential Fish Habitat**

The NPFMC and the CPT have been in discussions over the 2010 5-year EFH review and its differences from the 2005 EFH EIS. A 2012 discussion paper addresses the measures already in place for protection of BBRKC EFH and additional measures for consideration. The 2010 CIE review of the Bristol Bay red king crab stock assessment model determined that a more descriptive understanding of the key temporal and spatial biological processes is necessary. Life history characteristics should include primiparous and multiparous mating locations and timing, hatching, larval period and movement, settlement period and location, growth at each stage, molt frequency and timing, time and size at maturity, and adult migration patterns. More specific understanding of these stages would promote a better understanding of habitat requirements and potential impacts of fishing on each stage. Such a conceptual model would help to interpret survey and model results as well as assess key bottlenecks in the life history to identify habitat fishery removal concerns.

The focus of the papers (both 2012 and 2013) included a discussion of the importance of southwestern Bristol Bay for red king crab populations, particularly an area southwest of Amak Island, and whether and how trawl fisheries in that area may be impacting the crab habitat. It was proposed that eggs released here have greater chance of survival through larval and juvenile life history stages due to oceanographic currents in this area and that the extent of the Bering Sea cold pool affects the distribution of ovigerous females and subsequently, the location of larval release. Given the potential redistribution of crab in the area southwest of Amak Island due to temperature changes, the Council also requested that the discussion paper look at the efficacy of existing red king

crab protection areas, such as the Red King Crab Savings Area and the Nearshore Bristol Bay Trawl Closure, to see whether these closed areas are still providing both habitat and bycatch protection to red king crab. These studies are now in progress at the Council level.

[http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/conservation\\_issues/EFH/BBRKC\\_EFH212.pdf](http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/conservation_issues/EFH/BBRKC_EFH212.pdf)

[http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/conservation\\_issues/EFH/BBRKC\\_EFH213.pdf](http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf)

BSAI King and Tanner crab SAFE 2014:

<http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/> (see [2014 Crab SAFE](#))

**Regulations**

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

Fishery	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	
<b>BBRKC</b>	Molting/mating and spawning period											BB fishery open	
<b>EBSSC</b>		Bering Sea fishery open				Molt/mate/spawn							
<b>SMBKC</b>	Molting/ mating and spawning period									SM fishery open			

**Figure 15.** Current fishing seasons for king and Tanner crab stocks in the BS/AI area (second seasons for larger crabs are also possible by State emergency order (EO)). Source: Alaska Department of Fish and Game Commercial Shellfish Regulations.

**Bycatch data**

In order to avoid exceeding stock ABC/ACLs, ADFG must account for all possible sources of fishery mortality when establishing TACs for the state-managed BSAI crab fisheries. BSAI crab stocks are susceptible to three principal sources of fishery mortality: retained catch and bycatch during the directed fishery, bycatch mortality during other state-managed crab fisheries, and bycatch mortality during federally-managed groundfish fisheries. All those sources of fishery mortality are forecasted with uncertainty. However, ADFG can forecast the mortality during crab fisheries with greater confidence than it can forecast the mortality during federal groundfish fisheries because ADFG establishes the TACs for the crab fisheries, has access to extensive observer data on crab bycatch during crab fisheries that can be used to estimate bycatch as a function of retained catch, and has the ability to close areas to crab fishing that have potential for high crab bycatch. On the other hand, ADFG has no control over the bycatch mortality that occurs during the federal groundfish fisheries and no means for forecasting bycatch mortality in groundfish fisheries except for the estimates of

bycatch mortality in past years. To accommodate the uncertainty on bycatch mortality in groundfish fisheries when establishing TACs, ADFG has assumed that the maximum of the annual bycatch mortality due to groundfish fisheries in the previous 20 years could occur.

The NPFMC was delivered a problem statement regarding crab bycatch in October of 2011. Total catch overfishing levels (OFLs) are specified annually for the ten crab stocks included in the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (FMP); these OFLs account for all sources of fishing mortality including directed crab fishery discards and bycatch mortality caused by groundfish, scallop, and Pacific halibut fisheries. Requirements to comply with Annual Catch Limits (ACLs), addressing uncertainty in OFL estimates, include Accountability Measures (AMs) that trigger a management action if an ACL is exceeded.

Crab bycatch in the directed crab and scallop fisheries is controlled by the State of Alaska, however current management structure does not link the crab and groundfish FMPs; if a crab ACL is exceeded due to bycatch mortality in a groundfish fishery the resulting AM would reduce directed crab fishery harvest the following year. Crab bycatch management measures were first adopted for BSAI groundfish trawl fisheries in 1986. These measures, established in the BSAI groundfish FMP, consist of triggered or fixed time and area closures and prohibited species catch (PSC) limits; PSC limits apply only to Bristol Bay red king, Bering Sea Tanner, Golden King crab and Bering Sea snow crab. There are no PSC limits for the remaining seven FMP crab stocks and the existing closure areas do not circumscribe the full distributional range of stocks they are intended to protect, thereby allowing bycatch mortality to occur without accrual towards PSC limits. Furthermore, no bycatch management measures are imposed on the fixed gear groundfish or Pacific halibut sectors. In order to address crab bycatch in the BSAI groundfish fisheries the BSAI groundfish FMP must be amended.

Potential alternatives for the FMP Amendment:

**Alternative 1 - No action**

Maintain existing crab PSC limits and closure areas.

**Alternative 2 - Variable PSC limits**

Crab PSC limits would be set annually based on crab abundance.

Components with options for Alternative 2 (Note: different components may be chosen for each FMP crab stock):

- 1.) Component 1: Closure areas
  - a) Existing closure areas
  - b) Expand triggered closure areas to include full distribution of each crab stockOption: Triggered closure areas encompassing distribution of vulnerable size/sex components of crab stock
- 2.) Component 2: Timing of closure areas
  - a) Fixed
    - i. Year-round
    - ii. SeasonalOption: based on vulnerable life history or gear susceptibility
  - b) Triggered
    - iii. Full
    - iv. Stair-stepped (area closed expands as bycatch triggers are reached)
- 3.) Component 3: Groundfish sectors/target fisheries included
  - a) All trawl sectors
  - b) All fixed gear sectors

- c) Halibut IFQ
- 4.) Component 4: Accountability measures
  - a) Crab bycatch would accrue inseason towards groundfish sector PSC limit and an overage would trigger accountability measures during the subsequent season or year for that groundfish sector
- 5.) Component 5: Catch accounting issues
  - a) Account for PSC limit accrual against time/area closure thresholds on a crab fishing year (June-May)
  - b) Account PSC limit accrual against time/area closure thresholds on a groundfish fishing year (January - December).

**Table 13.** Summary of groundfish management measures to address crab bycatch in the trawl fisheries.

Stock	Area	Gear type	Timing	For trigger closures		
				Allocation by sector or target fishery in 2013	How catch accrues	2013 PSC limit
Bristol Bay red king crab	Red King Crab Savings Area	nonpelagic trawl	closed year-round, except subarea			
	Nearshore Bristol Bay Trawl Closure	nonpelagic trawl	closed year-round, except Togiak subarea open 4/15-6/15			
	Zone 1	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole Pacific cod pollock/mackerel/ other species	RKC bycatch in Zone 1, by fishery	97,000 allocated among target fisheries
EBS Tanner crab	Zone 1	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 1, by fishery	980,000 allocated among target fisheries
	Zone 2	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 2, by fishery	2,970,000 allocated among target fisheries
Pribilof Islands blue king crab	Pribilof Islands Habitat Conservation Area	all trawl	year-round			
EBS snow crab	<i>C. opilio</i> Bycatch Limitation Zone (COBLZ)	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Snow crab bycatch in the COBLZ, by fishery	10,501,333 allocated among target fisheries
	Northern Bering Sea Research Area	nonpelagic trawl	currently year-round; fishing may resume in future under a research plan			
St Matthew blue king crab	St Matthew Island Habitat Conservation Area	nonpelagic trawl	year-round			

NPFMC staff suggests prioritization, the stocks for which the State faces the most challenges in TAC setting should likely be addressed first as these are the ones with the highest variability in bycatch and difficulties in projecting bycatch estimates. Stock status however, plays a very important role in

the ability to adequately account for relative removals in the groundfish fisheries. In recent years, the two stocks which have been the most problematic for estimating bycatch needs are the EBS Tanner crab stock and the St. Matthew blue king crab stock. For Tanner crab the existing trawl measures appear to comprise the majority of the trawl bycatch but a significant contribution to the overall bycatch occurs in the fixed gear fisheries for which there are no measures. While there are no limits for the St. Matthew blue king crab stock, trawl bycatch is generally minimal and fixed gear (especially pot gear) bycatch can be significant in some years. Measures to limit fixed gear bycatch for both stocks (Tanner crab, St. Matthew blue king crab) could be considered.

**BSAI PSC limits for crab**

PSC limits have been established for red king crab, Tanner crab, and snow crab. The limits accrue for catch in a defined area, and fluctuate based on annual estimates of crab abundance. PSC limits are apportioned among fisheries in anticipation of their bycatch needs for the year. Attainment of PSC limits triggers a defined area closure for the relevant fishery. The stair step procedure for determining PSC limits for red king crab taken in Zone 1 trawl fisheries is based on abundance of Bristol Bay red king crab. Up to 25% of the red king crab PSC limit can be used in the 56° - 56°10' N strip of the Red King Crab Savings Area. The red king crab PSC limit has generally been allocated among the pollock/Atka mackerel/other species, Pacific cod, rock sole, and yellowfin sole fisheries. Nearly all BBRKC PSC is taken within Zone 1, however only trawl crab PSC accrues toward the PSC limit. Trawl PSC has comprised between 11-96% of the total BBRKC PSC. The proportion of hook and line and pot gear proportion of PSC catch has ranged from 3-19% (hook and line) and 0-86% (pot gear).

**Table 14.** PSC limits for red king crab.

<b>PSC limits for Zone 1 red king crab (No Zone 2 RKC)</b>	
<b>Abundance</b>	<b>PSC Limit</b>
Below threshold or 14.5 million lbs of effective spawning biomass (ESB)	33,000 crabs
Above threshold, but below 55 million lbs of ESB	97,000 crabs
Above 55 million lbs of ESB	197,000 crabs

**EBS Snow Crabs**

EBS snow crab trawl PSC limits are based on total abundance of snow crab as indicated by the NMFS standard trawl survey. The cap is set at 0.1133% of snow crab abundance index, with a minimum of 4.5 million snow crabs and a maximum of 13 million snow crabs; the cap is further reduced by 150,000 crabs. Only snow crab taken within the COBLZ accrue toward the PSC limits established for individual trawl fisheries.

[http://www.npfmc.org/wp-content/PDFdocuments/conservation\\_issues/EFH/BBRKC\\_EFH213.pdf](http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf)

<http://www.npfmc.org/crab-bycatch-overview/bsai-crab-bycatch/>

**North Pacific Fishery Management Council****C-6 BSAI Crab PSC limits****Motion - February 7<sup>th</sup> 2014**

The Council requested a revised discussion paper to outline the steps and information needed to consider the appropriateness of revising or implementing crab PSC limits or other management measures to minimize crab PSC in directed groundfish fisheries. This paper should include:

1. A discussion of implementing future PSC limits in weights rather than numbers.
2. A template that could be used for any crab stock that outlines the necessary information. The paper should use the snow crab stock and (COBLZ) management area as an example to develop the template.

Information needed to evaluate current management measures could include:

- Figures depicting sample size, sex ratio and size frequency of crab bycatch in groundfish fisheries by gear.
- Graphs of size data including a reference to average size of crabs taken in directed crab fisheries.
- Maps that overlay existing closure area(s) with crab stock distribution at the time of survey (by sex and size category), the directed crab fishery(s), and groundfish bycatch by trawl, pot, and hook-and-line gear from 2008 – 2013.
- Tables showing PSC reported by groundfish fishing year; actual PSC limits for trawl gear by area/zone; total PSC and total PSC within the closure area(s) by gear type.

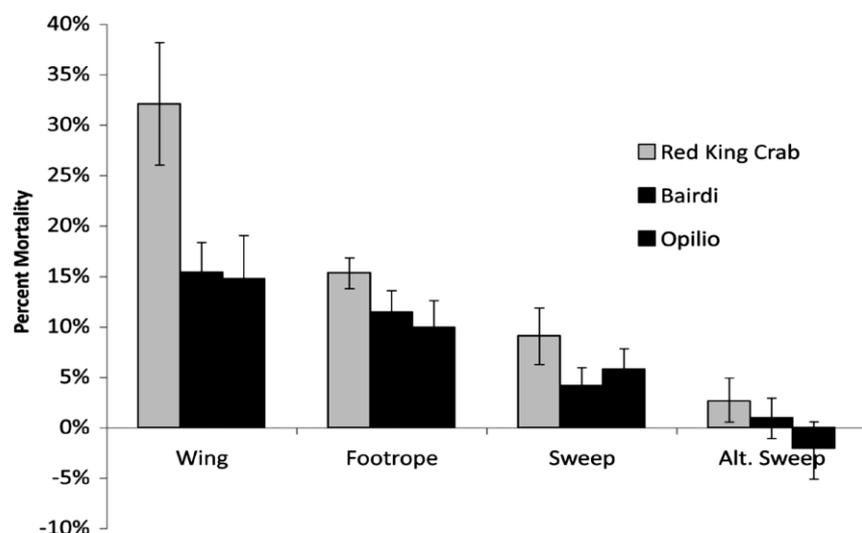
Information needed to develop future management measures could include:

- A description of the methodology that could be applied to set or revise abundance based PSC limits.
- A discussion of the application of mortality rates to the crab PSC that accrues to trigger limits, by gear type.

(See motion at the following address <http://www.npfmc.org/crab-bycatch-overview/bsai-crab-bycatch/> 2014: February BSAI Crab Bycatch Limits [Discussion Paper](#), [Motion](#).)

**BSAI Groundfish Gear Requirements**

Instituted in 2011, vessels fishing in the trawl flatfish fishery are required to use Bering Sea Flatfish Trawl Gear; this gear utilizes strategically placed bobbins to elevate the trawl sweeps and footrope off of the seafloor. The gear has been developed to reduce habitat impacts on the fishing grounds and to reduce the bycatch of bottom-dwelling invertebrates such as crab and soft corals. The bobbins reduced seafloor contact by 90 percent, and greatly reduced crab mortality.



**Figure 16.** Mortality rates for crabs passing under trawls or past sweeps. Alternative sweeps were equipped with disk clusters to raise sweeps 5 – 7.5 cm above seafloor.

<http://www.nmfs.noaa.gov/stories/2012/07/docs/rosereduceedeffectstrawlingquarterlyfeature2010feature.pdf>  
[http://www.nmfs.noaa.gov/stories/2012/07/07\\_26\\_12trawl\\_gear\\_innovation.html](http://www.nmfs.noaa.gov/stories/2012/07/07_26_12trawl_gear_innovation.html)

**Bycatch from the crab fisheries**

The table below shows total pot contents from the observed pot lifts in the 2013-14 BBRKC fishery. Bycatch species included multiple species of crab, Pacific cod, Pacific halibut, other flatfish, sculpins and invertebrates. The contents contained no species of concern.

**Table 15.** Total contents of 657 pot lifts sampled during 2013/14 Bristol bay red king crab fishery.

Commercial Crab species	Number	Other Species	Number
<b>Bristol Bay Red King Crab</b>		bigmouth sculpin	2
legal	17538	Dover sole	1
sublegal	12723	giant octopus	1
female	6070	graceful decorator crab	2
<b>Tanner crab</b>		great sculpin	29
legal	1925	hermit crab unident.	6
sublegal	194	jellifish unident.	334
female	62	Pacific cod	161
<b>Snow crab</b>		Pacific halibut	27
legal	9	Pacific lyre crab	1
sublegal	0	Pribilof welk	1
female	0	pygmy cancer crab	1
<b>Hair crab</b>		rockfish unident.	1
legal	86	sculpin unident.	19
sublegal	32	sea anemone unident.	13
female	39	sea cucumber unident.	8

		snail unident.	43
		sponge unident.	26
		starfish unident.	9
		tunicate unident.	13
		worm unident.	2
		yellowfin sole	251
		yellow Irish lord	3

The table below shows total pot contents from the observed pot lifts in the 2013/14 EBSSC fishery. Bycatch species included multiple species of crab, Pacific cod, Pacific halibut, sculpins and invertebrates. Snails and Pacific cod were the most prevalent species in the bycatch. The contents contained no species of concern.

**Table 16.** Total contents of 2664 pot lifts sampled during 2013/14 Bering Sea Snow crab fishery.

<b>Commercial Crab species</b>	<b>Number</b>	<b>Other Species</b>	<b>Number</b>	<b>Other species</b>	<b>Number</b>
<b>Snow Crab</b>		angled buccinum	1	sea anemone unident.	189
legal	860855	arrowtooth flounder	2	sea urchin unident.	3
sublegal	10898	Atka mackerel	1	sea whip unident.	3
female	11389	basket star	148	sinuous whelk	6
<b>Tanner crab</b>		bigmouth sculpin	1	skate unident.	6
legal	32582	Buccinum snail unident.	9	snale unident.	13274
sublegal	10481	circumboreal toad crab	1	spinyhead sculpin	1
female	1076	cockle unident.	1	sponge unident.	6
<b>Tanner crab unident.</b>		crab unident.	1	starfish unident.	17
		flatfish unident.	1	walleye pollock	30
male	1169	flathead sole	1	worm unident.	2
female	2	giant octopus	43	yellowfin sole	6
<b>Hybrid Tanner crab (legally <i>opilio</i>)</b>		great sculpin	3	yellow Irish lord	109
legal	1263	Oregon triton	248		
sublegal	0	hermit crab unident.	123		
female	37	jellifish unident.	25		
<b>Hybrid Tanner crab (legally <i>bairdi</i>)</b>		ladder whelk	91		
legal	407	lyre whelk	1		
sublegal	57	mussel unident.	2		
female	9	Neptune snail unident.	27		

<b>Red King Crab</b>		northern rockfish	1		
legal	94	octopus unident	18		
sublegal	0	Pacific cod	682		
female	0	Pacific halibut	77		
<b>Golden King Crab</b>		Pacific lyre crab	12		
legal	0	Pribilof whelk	1038		
sublegal	0	prowfish	3		
female	1	rex sole	1		
		rockfish unident.	3		
		scale worm unident.	1		
		sculpin unident.	2		

Note that the SMBKC season in 2013/14 was not opened as the biomass of the stock was insufficient for harvest.

<http://www.arlis.org/docs/vol1/H/904449643.pdf>

Typically, low levels of bycatch of these species do not impact their abundance. Several of the species found as bycatch in the BBRKC, EBSSC and SMBKC fisheries are managed individually and go through their own stock assessment (SAFE report) process. The NPFMC, ADFG and the AFSC have management measures in place to prevent overfishing in these species and to take into account any bycatch from other fisheries. The International Pacific Halibut Commission is responsible for the management of the Pacific halibut resource in the U.S. and Canada. They account for the take of Pacific halibut in other non-halibut directed fisheries in their management efforts. As noted in the Endangered Species Act EIS report, crab fisheries do not adversely affect ESA listed species, destroy or modify their habitat, or comprise a measurable portion of their diet.

Therefore, given that the impacts covered (less than 1%), bycatch levels seem to be minimal, and there are no endangered species interactions, overall these fisheries do not impact the ecosystem and associated species in a significant way.

**Predator and Prey relationships**

There are few species identified as predators of legal-sized male crab and specific information is limited due to the difficulty of identifying prey items to the species level with only partial carapace or dactyl pieces. Based on food habits data collected in the summer months during the annual EBS bottom trawl survey, Pacific cod, Pacific halibut and skates are the primary predators of large or legal size crab although legal-sized crab are a minimal component of these predators diets.

**Bristol red King Crab**

Pacific cod is the main predator on red king crabs. Walleye pollock, yellowfin sole, and Pacific halibut are minor consumers of pelagic larvae, settling larvae, and larger crabs, respectively. Juvenile crab may be cannibalistic during molting.

**Bering Sea Snow Crabs**

Pacific cod, sculpins, skates, and halibut are the main predators on snow crabs in terms of biomass. Snow crabs less than 7-cm CW are most commonly consumed. Other predators include yellowfin

sole, flathead sole, Alaska plaice, walleye pollock, rock sole, bearded seals, and walrus. Juvenile snow crabs have been observed to be cannibalistic during molting in laboratory environments.

### **St Matthews Blue Crab**

Pacific cod is a predator on blue king crabs.

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

### **Male only fisheries**

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.

### **Area closures for BSAI groundfish fisheries**

- The *Red King Crab Savings Area* is closed year-round to non-pelagic trawling. Implemented in 1996, the intent was to increase protection of adult red king crab and their habitat. A small subarea (south of 56°10') is opened to trawling under a specific PSC limit, during years of high red king crab years biomass, to allow access to productive rock sole fishing.
- The *Nearshore Bristol Bay Closure*, east of 162° W, is also closed to all trawling, with the exception of a small area that remains open during April 1 to June 15 each year. Implemented in 1996, this closure protects juvenile red king crab and critical rearing habitat.
- The *Crab and Halibut Protection Zone* has, for practical purposes, largely been superseded by the Nearshore Bristol Bay Closure. A small closure area extends west from March 15 to June 15.
- The *Pribilof Islands Habitat Conservation Area* was established in 1995. All trawling is prohibited from the area to protect high concentrations of blue king crab and hair crab stocks, as well as reduce the bycatch of juvenile halibut and crab and mitigate any unobserved mortality or habitat modification that occurred due to trawling.

No new closures or modifications have occurred between April 2014 and April 2015.

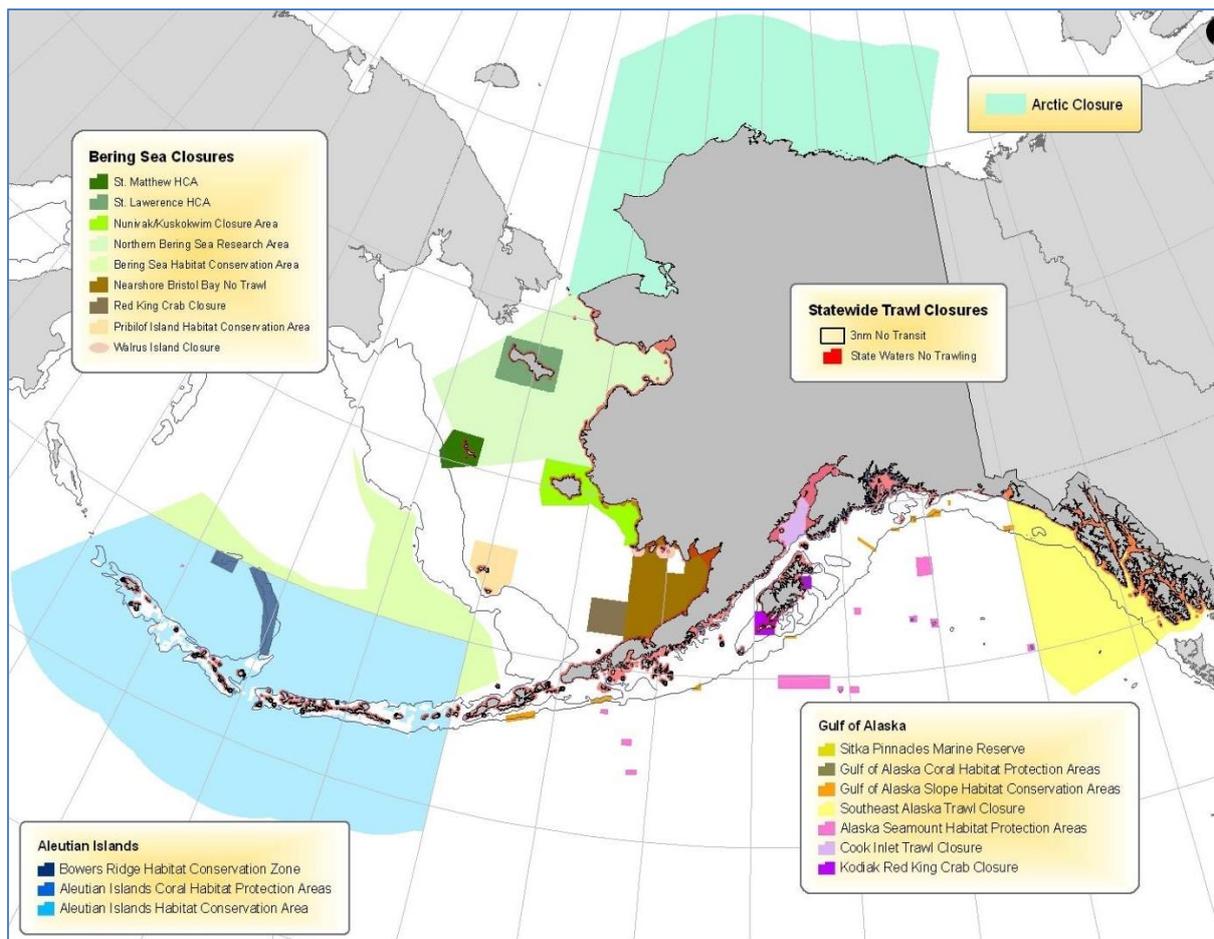
<http://www.npfmc.org/crab-bycatch-overview/bsai-crab-bycatch/>

### **Alaska Marine Protected Areas**

Fisheries managers have established many marine protected areas (MPA's) in the Federal and state waters off Alaska to protect ecological structure and function, establish control sites for scientific research studies, conserve benthic habitat, protect vulnerable stocks, and protect cultural resources. Many MPA's achieve multiple objectives. Over 40 named MPA's, many of which include several sites, encompass virtually all Federal waters off Alaska and most of the state waters where commercial fisheries occur. All of the MPA's include measures to prohibit a particular fishery or gear type (particularly bottom trawls) on a seasonal or year-round basis, and several MPA's prohibit virtually all commercial fishing. Although the effectiveness of MPA's is difficult to evaluate on an individual basis, as a group they are an important component of the management program for sustainable fisheries and conserving marine biodiversity off Alaska (Witherell and Woodby, Marine Fish. Rev. 67(1)) <http://alaskaseafood.org/sustainability/pdf/Marine%20Protected%20Areas%20Brochure.pdf>

**Bering Sea Habitat Conservation Measures**

Non-pelagic trawl gear fishing is prohibited in St. Matthew Island Habitat Conservation Area in the vicinity of St. Matthew Island to protect blue king crab stocks and habitat. Other habitat areas closed to bottom trawling include the Northern Bering Sea Research Area; the Bering Sea Habitat Conservation Area; the St. Lawrence Island Habitat Conservation Area and the Nunivak Island, Etolin Strait and Kuskokwim Bay Habitat Conservation Area.



**Figure 17.** Bering Sea Habitat Conservation measures closure areas.

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

**Clause 14** “where fisheries enhancement is utilized, environmental assessment and monitoring shall consider genetic diversity and ecosystem integrity” is not relevant to this fishery.

## 8. Performance specific to agreed corrective action plans

Not Applicable. This is the 3<sup>rd</sup> FAO RFM Bering Sea king and snow crab surveillance assessment report. No non-conformances were issued during the full assessment, the 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> surveillance assessment.

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

Not applicable.

## 10. Future Surveillance Actions

The assessment team will review the following during the 2016 surveillance assessment:

- Re-instatement of Alaska Coastal Management Plan
- Trawling areas in Bristol Bay relating to EFH for female red king crab.
- Accounting for crab bycatch in groundfish fisheries (including fixed gear).
- Continue to monitor studies relating to male-only fisheries.

## 11. Client signed acceptance of the action plan

Not applicable.

## 12. Recommendation and Determination

Following this 3<sup>rd</sup> surveillance assessment, in 2015, the assessment team determined that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is maintained for the management system of the applicant fishery, the U.S. Alaska King and Snow Crab Bering Sea Commercial Fisheries [Bristol Bay Red King Crab (*Paralithodes camtschaticus*), Eastern Bering Sea Snow Crab (*Chionoecetes opilio*) and St. Matthew Island Blue King Crab (*Paralithodes platypus*)] legally employing pot gear within Alaska jurisdiction (200 nautical miles EEZ) and subjected 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.

## References

ADEC. 2014. Homepage. Department of Environmental Conservation, P.O. Box 111800, 410 Willoughby Ave., Ste. 303, Juneau, AK 99811-1800. Accessed Nov 2014.	<a href="http://dec.alaska.gov/">http://dec.alaska.gov/</a>
ADFG. 2012. Commercial King and Tanner Crab Fishing Regulations 2012-2014. Alaska Department of Fish and Game, P.O. Box 115526, 1255 W. 8th Street Juneau, AK 99811-5526	<a href="http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/KingTannerCrab-2012-2014.pdf">http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/KingTannerCrab-2012-2014.pdf</a>
ADFG. 2015. ADFG Habitat Permits. Alaska Department of Fish and Game, P.O. Box 115526, 1255 W. 8th Street Juneau, AK 99811-5526	<a href="http://www.adfg.alaska.gov/index.cfm?adfg=uselicense.main">http://www.adfg.alaska.gov/index.cfm?adfg=uselicense.main</a>
AFSC Quarterly Report. Cooperative Research to Reduce the Effects of Bering Sea Flatfish Trawling on Seafloor Habitat and Crabs. Accessed 2014.	<a href="http://www.nmfs.noaa.gov/stories/2012/07/docs/rosereduceedeffectstrawlingquarterlyfeature2010feature.pdf">http://www.nmfs.noaa.gov/stories/2012/07/docs/rosereduceedeffectstrawlingquarterlyfeature2010feature.pdf</a>
AFSC. Research feature. Ocean Acidification: Monitoring and Measuring the Physiological and Population Response of Living Marine Resources in Alaska. Alaska Fisheries Science Center National Marine Fisheries Service. 7600 Sand Point Way NE Seattle, WA 98115	<a href="http://www.afsc.noaa.gov/Quarterly/jas2012/JAS12-Feature2.pdf">http://www.afsc.noaa.gov/Quarterly/jas2012/JAS12-Feature2.pdf</a>
AMSEA. 2014. ALASKA MARINE SAFETY EDUCATION ASSOCIATION HOMEPAGE. 2924 Halibut Point Road ~ Sitka, AK 99835	<a href="http://www.amsea.org/#!Happy-Holidays-from-AMSEA/ck6b/4B5EA797-4DF1-4BF1-A4C5-AFBF93E438F7">http://www.amsea.org/#!Happy-Holidays-from-AMSEA/ck6b/4B5EA797-4DF1-4BF1-A4C5-AFBF93E438F7</a>
ASMI. Responsibly Managing Alaska Fisheries. Alaska Seafood Marketing Institute. 150 Nickerson Street Suite 310 Seattle, WA 98109-1634	<a href="http://alaskaseafood.org/sustainability/pdf/Marine%20Protected%20Areas%20Brochure.pdf">http://alaskaseafood.org/sustainability/pdf/Marine%20Protected%20Areas%20Brochure.pdf</a>
AVTEC. 2015. AVTEC Alaska Maritime Training Center. - Alaska's Institute of Technology Department of Labor and Workforce Development Seward Campus: P.O. Box 889 ~ 809 2nd Avenue ~ Seward, Alaska 99664	<a href="http://www.avtec.edu/amtc-cost.aspx">http://www.avtec.edu/amtc-cost.aspx</a>
AWT. 2013. Detachments. Accessed 2014. Alaska Wildlife Troopers. 5700 E Tudor Road, Anchorage, AK 99507	<a href="http://dps.alaska.gov/AWT/detachments.aspx">http://dps.alaska.gov/AWT/detachments.aspx</a>
AWT. 2014. Division of Alaska Wildlife Troopers Mission. 5700 E Tudor Road, Anchorage, AK 99507.	<a href="http://dps.alaska.gov/AWT/mission.aspx">http://dps.alaska.gov/AWT/mission.aspx</a>
BOEM. 2015. Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012-2017. U.S. Department of the Interior	<a href="http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf">http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf</a>
BOF. 2015. Board of Fisheries homepage. Alaska Department of Fish and Game P.O. Box 115526 1255 W. 8th Street Juneau, AK 99811-5526	<a href="http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main">http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main</a>

<p>Bristol Bay red King Crab discussion paper. 2013. Bristol Bay red king crab essential fish habitat and bycatch interactions with groundfish fisheries. Accessed 2014.</p>	<p><a href="http://alaskafisheries.noaa.gov/npfmc/PDFdocument/s/conservation_issues/EFH/BBRKC_EFH213.pdf">http://alaskafisheries.noaa.gov/npfmc/PDFdocument/s/conservation_issues/EFH/BBRKC_EFH213.pdf</a></p>
<p>BSFRF. 2015. Crab Research homepage. Bering Sea Fisheries Research Foundation. 23929 22nd Dr SE Bothell WA 98021</p>	<p><a href="http://www.bsfrf.org/crab_research.php">http://www.bsfrf.org/crab_research.php</a></p>
<p>DNR. 2014. Flowchart Cook Inlet Offshore Oil &amp; Gas Exploration Permit Application &amp; Approval Process. Department of Natural Resources, 550 W. 7th Ave, Suite 1260, Anchorage, AK 99501-3557. Accessed Nov 2014.</p>	<p><a href="http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis_Flowchart_CookInletOffshore_Draft.pdf">http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis_Flowchart_CookInletOffshore_Draft.pdf</a></p>
<p>DNR. 2014. Homepage. Department of Natural Resources, 550 W. 7th Ave, Suite 1260, Anchorage, AK 99501-3557. Accessed Nov 2014.</p>	<p><a href="http://dnr.alaska.gov/">http://dnr.alaska.gov/</a></p>
<p>Fissel, Ben, Michael Dalton, Ron Felthoven, Brian Garber-Yonts, Alan Haynie, Amber HimesCornell, Stephen Kasperski, Jean Lee, Dan Lew, Lisa Pfeifier, Jennifer Sepez and Chang Seung. Stock Assessment and Fishery Evaluation Report for the Groundfish Fisheries of the Gulf of Alaska and Bering Sea/Aleutian Island Area: Economic Status of the Groundfish Fisheries o Alaska, NPFMC, November, 2014</p>	<p><a href="http://www.afsc.noaa.gov/REFM/Docs/2014/economic.pdf">http://www.afsc.noaa.gov/REFM/Docs/2014/economic.pdf</a></p>
<p>Fitch, H., M. Schwenzfeier, B. Baechler, T. Hartill, M. Salmon, M. Deiman, E. Evans, E. Henry, L. Wald, J. Shaishnikoff, K. Herring, and J. Wilson. 2012. Annual management report for the commercial and subsistence shellfish fisheries of the Aleutian Islands, Bering Sea and the Westward Region’s shellfish observer program, 2010/11. Alaska Department of Fish and Game, Fishery Management Report No. 12-22, Anchorage.</p>	<p><a href="http://www.adfg.alaska.gov/FedAidPDFs/FMR12-22.pdf">http://www.adfg.alaska.gov/FedAidPDFs/FMR12-22.pdf</a></p>
<p>Gaeuman, W, B. 2013. Summary of the 2012-2013 Mandatory Crab Observer Program Database for the Bering Sea/Aleutian Islands Commercial Crab Fisheries. Alaska Department of Fish and Game, Fishery Data Series No. 13-54, Anchorage.</p>	<p><a href="http://www.adfg.alaska.gov/FedAidPDFs/FDS13-54.pdf">http://www.adfg.alaska.gov/FedAidPDFs/FDS13-54.pdf</a></p>
<p>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.</p>	<p><a href="http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS14-49.pdf">http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS14-49.pdf</a></p>
<p>MAP. 2015. Seagrant Marine Advisory Program. Alaska Sea Grant College Program, PO Box 755040, Fairbanks, Alaska, 99775-5040</p>	<p><a href="http://seagrant.uaf.edu/map/fisheries/">http://seagrant.uaf.edu/map/fisheries/</a></p>
<p>NEPA. 2007. A Citizen Guide to NEPA. A Citizen Guide to the NEPA. US Council on Environmental Quality</p>	<p><a href="https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf">https://ceq.doe.gov/nepa/Citizens_Guide_Dec07.pdf</a></p>

<p>NMFS. 2011. Update of NOAA Fisheries Enforcement Programs and Operations. NOAA Fisheries Service. Alaska Regional Office. PO Box 21668 Juneau, AK 99802-1668</p>	<p><a href="http://www.nmfs.noaa.gov/sfa/reg_svcs/Councils/cc_c_2011/Tab%20L%20-%20Enforcement%20Issues/Enforcement%20Issues.pdf">http://www.nmfs.noaa.gov/sfa/reg_svcs/Councils/cc_c_2011/Tab%20L%20-%20Enforcement%20Issues/Enforcement%20Issues.pdf</a></p>
<p>NOAA Fisheries. 2012. Trawl Gear Modification— Preserving Fish Habitat in the Bering Sea. Accessed 2014. National Marine Fisheries Service, Alaska Region; National Oceanic and Atmospheric Administration. 7600 Sand Point Way. N.E. Seattle. Washington. 98115</p>	<p><a href="http://www.nmfs.noaa.gov/stories/2012/07/07_26_12trawl_gear_innovation.html">http://www.nmfs.noaa.gov/stories/2012/07/07_26_12trawl_gear_innovation.html</a></p>
<p>NOAA Fisheries. 2013. BSAI Crab Rationalisation - Economic Data Reports. Alaska Fisheries Science Center National Marine Fisheries Service. 7600 Sand Point Way NE Seattle, WA 98115</p>	<p><a href="http://alaskafisheries.noaa.gov/sustainablefisheries/crab/rat/edr/">http://alaskafisheries.noaa.gov/sustainablefisheries/crab/rat/edr/</a></p>
<p>NOAA Fisheries. 2015. Draft 2015 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. Fisheries Monitoring and Analysis Division, Alaska Fisheries Science Center National Marine Fisheries Service. 7600 Sand Point Way NE Seattle, WA 98115</p>	<p><a href="https://alaskafisheries.noaa.gov/sustainablefisheries/observers/draft2015adp.pdf">https://alaskafisheries.noaa.gov/sustainablefisheries/observers/draft2015adp.pdf</a></p>
<p>NOAA Fisheries. 2015. Fishery Management Plan Amendments. Alaska Regional Office. PO Box 21668 Juneau, Alaska 99802-1668</p>	<p><a href="https://alaskafisheries.noaa.gov/sustainablefisheries/amds/">https://alaskafisheries.noaa.gov/sustainablefisheries/amds/</a></p>
<p>NOAA Fisheries. 2015. Shellfish Assessment Program. Alaska Fisheries Science Center, National Marine Fisheries Service National Oceanic and Atmospheric Administration, Department of Commerce; 301 Research Ct. Kodiak, Alaska 99615</p>	<p><a href="http://www.afsc.noaa.gov/RACE/shellfish/default_sf.php">http://www.afsc.noaa.gov/RACE/shellfish/default_sf.php</a></p>
<p>NOAA Fisheries. Alaska Fisheries Science Centre Home Page. Alaska Fisheries Science Center, National Marine Fisheries Service National Oceanic and Atmospheric Administration, Department of Commerce; 7600 Sand Point Way N.E., Building 4 Seattle, Washington 98115.</p>	<p><a href="http://www.afsc.noaa.gov/">http://www.afsc.noaa.gov/</a></p>
<p>NOAA Fisheries. Alaska Fisheries Science Centre, Kodiak Laboratory Home Page, Kodiak Laboratory. Alaska Fisheries Science Center, National Marine Fisheries Service National Oceanic and Atmospheric Administration, Department of Commerce; 301 Research Ct. Kodiak, Alaska 99615</p>	<p><a href="http://www.afsc.noaa.gov/Kodiak/default.htm">http://www.afsc.noaa.gov/Kodiak/default.htm</a></p>
<p>NOAA Fisheries. Daly, B. J., Armistead C. E., Foy R. J. 2014. The 2014 Eastern Bering Sea continental shelf bottom trawl survey: Results for commercial crab species. Alaska Fisheries Science Center, National Marine Fisheries Service National Oceanic and Atmospheric Administration, Department of Commerce; 301 Research Ct. Kodiak, Alaska 99615</p>	<p><a href="http://www.afsc.noaa.gov/Kodiak/shellfish/crabebes/2014EBSSurveyTechMemoDraft.pdf">http://www.afsc.noaa.gov/Kodiak/shellfish/crabebes/2014EBSSurveyTechMemoDraft.pdf</a></p>

NOAA. 2011. Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions; NOAA Office of the General Counsel – Enforcement Section. National Marine Fisheries Service, Alaska Region; National Oceanic and Atmospheric Administration. 7600 Sand Point Way. N.E. Seattle. Washington. 98115	<a href="http://www.gc.noaa.gov/documents/Penalty%20Policy_FINAL_07012014_combo.pdf">http://www.gc.noaa.gov/documents/Penalty%20Policy_FINAL_07012014_combo.pdf</a>
NOAA. 2013. NOAA's Office of Law Enforcement; Division Enforcement Priorities for 2013. National Marine Fisheries Service, Alaska Region; National Oceanic and Atmospheric Administration.	<a href="http://www.nmfs.noaa.gov/ole/docs/2013/ole-division-priorities-2013-final.pdf">http://www.nmfs.noaa.gov/ole/docs/2013/ole-division-priorities-2013-final.pdf</a>
NOAA. 2014. NOAA's Office of General Counsel; Penalty Policy and Schedules. Alaska Settlement Schedules. NOAA Office of General Counsel	<a href="http://www.gc.noaa.gov/enforce-office3.html">http://www.gc.noaa.gov/enforce-office3.html</a>
NPFMC. 2010. Essential Fish Habitat. 5 Year Review for 2010. Summary Report. Appendix 3 BSAI Crab FMP species reviews. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://alaskafisheries.noaa.gov/habitat/efh/review/appx3.pdf">http://alaskafisheries.noaa.gov/habitat/efh/review/appx3.pdf</a>
NPFMC. 2010. Essential Fish Habitat. 5 Year Review for 2010. Summary Report. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://www.fakr.noaa.gov/habitat/efh/review/efh_5yr_review_sumrpt.pdf">http://www.fakr.noaa.gov/habitat/efh/review/efh_5yr_review_sumrpt.pdf</a>
NPFMC. 2011. Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf">http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf</a>
NPFMC. 2013. Item C-1(b) February 2013. Bristol Bay red king crab essential fish habitat and bycatch interactions with groundfish fisheries North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf">http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EFH/BBRKC_EFH213.pdf</a>
NPFMC. 2014. BSAI Crab Bycatch. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://www.npfmc.org/crab-bycatch-overview/bsai-crab-bycatch/">http://www.npfmc.org/crab-bycatch-overview/bsai-crab-bycatch/</a>
NPFMC. 2014. Homepage. North Pacific Fishery Management Council. 605 West 4th, Suite 306, Anchorage, Alaska 99501-2252.	<a href="http://www.npfmc.org/">http://www.npfmc.org/</a>
NPFMC. 2014. North Pacific Fishery Management Council C-6 BSAI Crab PSC limits Motion 2-7-14. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="https://npfmc.legistar.com/View.ashx?M=F&amp;ID=2910191&amp;GUID=22190000-1E29-4E52-8446-45762D472A05">https://npfmc.legistar.com/View.ashx?M=F&amp;ID=2910191&amp;GUID=22190000-1E29-4E52-8446-45762D472A05</a>
NPFMC. 2014. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the BSAI Regions. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.	<a href="http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/">http://www.npfmc.org/fishery-management-plan-team/bsai-crab-plan-team/</a> (see 2014 Crab SAFE)

<p>NPFMC. 2015 Upcoming Council Meetings. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.</p>	<p><a href="http://www.npfmc.org/upcoming-council-meetings/">http://www.npfmc.org/upcoming-council-meetings/</a></p>
<p>NPFMC. 2015. BSAI Crab staff discussion paper. 2013. Crab Bycatch in the Bering Sea/Aleutian Islands Fisheries. AGENDA C-2(a)(2) February 2013. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.</p>	<p><a href="http://www.npfmc.org/wp-content/PDFdocuments/bycatch/CrabBycatchBSAI213.pdf">http://www.npfmc.org/wp-content/PDFdocuments/bycatch/CrabBycatchBSAI213.pdf</a></p>
<p>NPFMC. Habitat Protections. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.</p>	<p><a href="http://www.npfmc.org/habitat-protections/">http://www.npfmc.org/habitat-protections/</a></p>
<p>NPFMC. NPFMC Enforcement Committee webpage. North Pacific Fisheries Management Council. Anchorage, 605 West 4th, Suite 306, Alaska 99501-2252.</p>	<p><a href="http://www.npfmc.org/committees/enforcement-committee/">http://www.npfmc.org/committees/enforcement-committee/</a></p>
<p>NPFVOA. Vessel Safety Program. Home Page. North Pacific Fishing Vessel Owners' Association. 1900 West Emerson, Suite 101 Seattle, WA 98119</p>	<p><a href="http://www.npfvoa.org/">http://www.npfvoa.org/</a></p>
<p>OPMP. 2014. Alaska National Interest Lands Conservation Act (ANILCA) Homepage. Office of Project Management and Permitting; 550 West 7th Avenue, Suite 1430; Anchorage, AK 99501-3579.</p>	<p><a href="http://dnr.alaska.gov/commis/opmp/nilca/#">http://dnr.alaska.gov/commis/opmp/nilca/#</a></p>
<p>OPMP. 2014. OPMP Homepage. Office of Project Management and Permitting; 550 West 7th Avenue, Suite 1430; Anchorage, AK 99501-3579.</p>	<p><a href="http://dnr.alaska.gov/commis/opmp/">http://dnr.alaska.gov/commis/opmp/</a></p>
<p>SEAGRANT. 2014. Alaska Young Fishermen's Summit. Marine Advisory Program main office 1007 West 3rd Ave, Suite 100; Anchorage, AK 99501.</p>	<p><a href="https://seagrant.uaf.edu/map/workshops/2013/ayfs/">https://seagrant.uaf.edu/map/workshops/2013/ayfs/</a></p>
<p>USCG. 2014. USCG District 17 Homepage. United States Coast Guard. US COAST GUARD 2703 MARTIN LUTHER KING JR AVE SE WASHINGTON DC 20593-7000.</p>	<p><a href="http://www.uscg.mil/d17/">http://www.uscg.mil/d17/</a></p>
<p>USFWS. 2015. Home page. U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service</p>	<p><a href="http://www.fws.gov/help/about_us.html">http://www.fws.gov/help/about_us.html</a></p>

## Appendix 1

### Alaska BSAI crab Assessors

Based on the Technical expertise required to carry out the above fishery surveillance assessment, Global Trust Certification Ltd. confirmed the Assessment Team members for this fishery as follows.

#### **Dr. Géraldine Criquet (Assessor)**

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

#### **Dr. Ivan Mateo (Assessor)**

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

**Dr. Gerald P. Ennis (Assessor)**

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

**Vito Ciccio Romito (Lead Assessor)**

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