

Ten-Year Program Review for the Crab Rationalization Management Program in the Bering Sea/ Aleutian Islands

North Pacific Fishery Management Council

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Photo Credit: M. Fina, Dutch Harbor

EXECUTIVE SUMMARY

This document is a 10-year review of the Bering Sea/ Aleutian Islands (BSAI) Crab Rationalization (CR) Program. Implemented in 2005, the CR Program is a “voluntary three pie cooperative” program which allocates BSAI crab resources among harvesters, processors, and coastal communities. The CR Program was designed to address conservation, social, economic, and management issues associated with the previous over-capitalized derby fishery, as well as increase the safety of crab fishermen by ending the race for fish. The program issued harvest quota shares to vessel owners (License Limitation Program license holders) and captains, as well as processor quota shares to processors based on historic participation to protect investment in and reliance on the program fisheries. Program components include quota share allocation, processor quota share allocation, individual fishing quota and individual processing quota issuance, quota transfers, use caps, crab harvesting cooperatives, protections for Gulf of Alaska groundfish fisheries, an arbitration system, monitoring, economic data collection, and cost recovery fee collection.

In addition, as part of CR Program implementation, the Council established requirements for a series of standardized and comprehensive program reviews. A preliminary 3-year review of the CR Program was first available in 2008 (NPFMC 2008), and a more extensive 5-year review of the program was made available in 2010 (NPFMC 2010a).

The scope of this review was established with direction from a number of documents including: the basic requirements of reviews for limited access privilege program and the 10 National Standards established in the Magnuson-Stevens Fishery Conservation and Management Act, the NOAA Catch Share Policy document, the original program statement implementing the CR Program, examples of other program reviews, and areas of interest within the CR Program highlighted in recent Council discussion. Additionally, this scope was adopted with input from provided from the Advisory Panel and the Council in February 2015, and the Scientific and Statistical Committee in April 2015, and public testimony throughout these meetings. The organization of the document mimics that of the 3- and 5-year program reviews for continuity and additional opportunities for comparison, augmented with additional data that falls within the requested guidance of the Council and its advisory bodies.

Within the proposed scope, Council members directed analysts to produce a document that would provide a basic illustration of the dynamics within the fisheries and a broad evaluation of the program. In order to make definitive statements about the impacts of the CR Program, the analysts would have needed to construct a counterfactual of what trends would have looked in the absence of the program and in many cases to construct econometric models to control for these exogenous forces. In general, this review does not make these types of casual claims about the program’s impact, but instead the analysts examine trends in metrics, which are consistent with programmatic objectives, to evaluate whether there is indication that the objective is being realized in the program.

The objectives of the CR Program, as implied through the original problem statement, are broad, sometimes provide contrasting objectives, and do not identify specific metrics in order to evaluate their success. Their nature exemplifies the balancing act of the Council process; which draws from the diverse and evolving

interests of the stakeholders in the BSAI crab fisheries. Therefore, the success in the program's ability to achieve specific goals is largely subjective and related to the distributional impacts, directly or indirectly created by the new management regime. The final section of the program review summarizes key changes in the CR fisheries in relation to the objectives of the CR Program, and discusses challenges for the management of the program highlighted previously by the Council or identified in the program review.

The review includes 3 appendices:

- Appendix A: BSAI Crab Rationalization Ten-Year Program Review Social Impact Assessment; prepared by Mike Downs and Stev Weidlich of Northern Economics
- Appendix B: Community Fisheries Engagement Indices throughout the BSAI Rationalization Program; prepared by Stephen Kasperski of AFSC, Zachary Koehn of PSMFC, and Amber Himes-Cornell of Université de Bretagne Occidentale
- Appendix C: Assessment of Safety in the Bering Sea/Aleutian Island Crab Fleet; prepared by Devin Lucas, Samantha Case, Alexis DeLeon, Dimitreus Kloczko of NIOSH

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1 INTRODUCTION

In 2001, Congress directed the Council to conduct an analysis of several different approaches to rationalizing the Bering Sea/ Aleutian Islands (BSAI) crab fisheries (see Consolidated Appropriations Act of 2001 (Pub. L. No. 106 554)). In response, the Council adopted the following purpose and need statement to guide it through the process of considering rationalization alternatives for the fisheries:

Vessel owners, processors and coastal communities have all made investments in the crab fisheries, and capacity in these fisheries far exceeds available resources. The BSAI crab stocks have also been highly variable and have suffered significant declines. Although three of these stocks are presently under rebuilding plans, the continuing race for fish frustrates conservation efforts. Additionally, the ability of crab harvesters and processors to diversify into other fisheries is severely limited and the economic viability of the crab industry is in jeopardy. Harvesting and processing capacity has expanded to accommodate highly abbreviated seasons, and presently, significant portions of that capacity operate in an economically inefficient manner or are idle between seasons. Many of the concerns identified by the NPFMC at the beginning of the comprehensive rationalization process in 1992 still exist for the BSAI crab fisheries. Problems facing the fishery include:

- 1. Resource conservation, utilization and management problems;*
- 2. Bycatch and its' associated mortalities, and potential landing deadloss;*
- 3. Excess harvesting and processing capacity, as well as low economic returns;*
- 4. Lack of economic stability for harvesters, processors and coastal communities; and*
- 5. High levels of occupational loss of life and injury.*

The problem facing the Council, in the continuing process of comprehensive rationalization, is to develop a management program which slows the race for fish, reduces bycatch and its associated mortalities, provides for conservation to increase the efficacy of crab rebuilding strategies, addresses the social and economic concerns of communities, maintains healthy harvesting and processing sectors and promotes efficiency and safety in the harvesting sector. Any such system should seek to achieve equity between the harvesting and processing sectors, including healthy, stable and competitive markets.

Given the substantial concerns identified in this problem statement, the Council developed the BSAI crab rationalization program (CR Program or program) to mitigate these issues. This document serves a comprehensive review of the CR Program 10 years after implementation.

1.1 Requirements for a 10-year Program Review

As a part of the initial development of the CR Program, the Council requested a series of comprehensive program reviews. These reviews are intended to objectively measure the success of the CR Program in achieving the goals and objectives specified in the Council's Problem Statement and the Magnuson-Stevens

Fishery Conservation and Management Act (Magnuson-Stevens Act). The scheduled reviews also serve as an opportunity to assess the impacts of the program, and provide a means to highlight certain areas of interest or concern in further analysis as the program develops. Specifically, reviewers were tasked with examining the effects of the CR Program on vessel owners, captains, crew, processors, and communities. The Council may subsequently consider options to mitigate any negative effects.

This first program review occurred 18 months after implementation, when the Council directed staff to focus specifically on two aspects, a) the distribution of benefits between harvesters and processors arising under the harvest share/processor share allocations and arbitration system and b) the distribution of landings of different harvest share types (NPFMC 2007).

In addition, the CR Program established a series of more standardized and comprehensive program reviews in the preferred alternative of the program in a motion from June 2002. This requirement is described in the Fishery Management Plan (FMP) for BSAI King and Tanner Crab, Chapter 11, Section 7 entitled “Program Elements”.

RAM Division in conjunction with State of Alaska will produce annual reports regarding data being gathered with a preliminary review of the program at 3 years.

Option 2. Formal program review at the first Council Meeting in the 5th year after implementation to objectively measure the success of the program, including benefits and impacts to harvesters (including vessel owners, skippers and crew), processors and communities by addressing concerns, goals and objectives identified in the Crab Rationalization problem statement and the Magnuson Stevens Act standards. This review shall include analysis of post-rationalization impacts to coastal communities, harvesters and processors in terms of economic impacts and options for mitigating those impacts. Subsequent reviews are required every 5 years.

The 3-year preliminary review of the CR Program was first available in 2008 (NPFMC 2008b). The more extensive 5-year review of the program was first available in 2010 (NPFMC 2010a).

By Council direction, a 10-year review of the BSAI CR Program should be scheduled for 2015. However, with an interest in having fish ticket information available from the 2014-2015 winter seasons, as well as fully-audited 2014 Economic Data Reports (EDR), the Council determined it would be advantageous to schedule the review for 2016.

Section 303A(c)(1)(G) of the Magnuson-Stevens Act also requires a formal and detailed review of a limited access privilege program (LAPP), such as the BSAI crab rationalization program. MSA requires program review “5 years after the implementation of the program and thereafter to coincide with scheduled Council review of the relevant fishery management plan (but no less frequently than once every 7 years).” Since the Council stipulated a 5-year cycle of reviews for the crab program, this satisfies all Magnuson-Stevens Act program review requirements. Under current requirements, the next review of the program would occur in 2020. It would not be necessary to conduct an additional review at 12 years of the program.

1.2 Establishing a Scope for the Review

Unless otherwise stipulated in program implementation, LAPP reviews do not have a check-list of required elements that must be included.¹ Therefore the Council, with direction from its advisory bodies, identified a scope of information it deemed appropriate to evaluate the objectives of the CR Program.

There could be many ways to organize a review of this program. The outline of this program review mirrors that of the 3- and 5- year BSAI CR Program review (NPFMC 2008b; NPFMC 2010a), augmented with content that falls within the requested scope of the Council and its advisory bodies. Using this familiar outline provides continuity and comparability.

In addition to establishing the minimum cycle for which LAPP reviews must be completed, the Magnuson-Stevens Act helps to establish the scope for evaluating the CR Program by providing some general guidance on what is expected of a LAPP. According to Section 303A(c)(1) a LAPP program shall: promote capacity reductions, promote fishing safety, promote fishery conservation and management, promote social and economic benefits, preclude attainment of excess shares solely for the purpose of realizing the security interest on the privilege, and include an effective system of enforcement, monitoring, and management. Along with the 10 National Standards of the Magnuson-Stevens Act, these goals are considered in any relevant section of the program review.

Requirements for a program review that were established upon implementation of the CR Program also explicitly requested the use of the Council's problem statement in order to evaluate the success and impacts of the crab rationalization program. Rather than explicitly identifying a list of program goals, the Council's purpose and need statement lists and explains the primary areas of concern that existed within these pre-rationalization crab fisheries. Assuming that addressing these primary areas of concern was, in fact, the chief objective of the program, the analysts highlight the program's intent. Specifically, with the creation of the CR Program, the Council was seeking to:

- (1) *[Promote] resource conservation, utilization, and [address] management problems;*
- (2) *[Reduce] bycatch and its' associated mortalities, and potential landing deadloss;*
- (3) *[Reduce] excess harvesting and processing capacity, as well as [discouraging a system that promotes] low economic returns;*
- (4) *[Promote] economic stability for harvesters, processors and coastal communities;*
- (5) *[Eradicate] the high levels of occupational loss of life and injury;*
- (6) *Address the social and economic concerns of communities;*
- (7) *Promote efficiency in the harvesting sector;*
- (8) *[Promote] equity between the harvesting and processing sectors, including healthy, stable, and competitive markets.*

These eight objectives that are embedded in the Council's purpose and need statement are referenced throughout the rest of the program review.

¹ NMFS is currently in the process of developing requirements for conducting reviews of catch share programs in coordination with all regional fishery management councils.

Additionally, the scope of this 10-year program review includes an evaluation of the areas of interest resulting from discussions after the 5-year CR Program review (NPFMC 2010a). Based on the program review from 2010 and subsequent public testimony, a number of social and economic issues were identified. Some testifiers pointed to resulting high lease rates, fleet consolidation, absentee QS ownership, and changes in crew compensation as the program's greatest shortcomings. After an investigation into the regulatory options available (NPFMC 2012a; NPFMC 2012b), the Council determined these issues were best addressed through action initiated at the cooperative level. It asked cooperatives to consider:

- Provisions to promote quota share ownership among crew and active participants;
- Maximum lease rate caps;
- Maximum amount of lease rates that may be charged against crew compensation; and
- Minimum crew pay standards such as a minimum threshold of gross vessel revenue for crew compensation.

The Council remains attentive to these issues. Cooperative reports are requested annually to update the Council on the process made by the cooperative towards addressing these concerns using tools in the private sector. Given the Council's continued interest in these social and economic issues, these elements are included in the scope of review, primarily in Section 5 and Section 10.

There are a number of other sources of guidance that the Council considered in requesting appropriate, relevant information and discussion with which to evaluate the program. NOAA's Catch Share Policy document provides policy recommendation for nine guiding principles in the development and evaluation of catch share plans (NOAA 2010). In addition, there have been other LAPP reviews conducted by the NPFMC and other fishery management councils that serve as examples.² Finally, public comment was an informative and important resource to influence the policy scope of issues highlighted in the 10-year review.

A workplan of this scope and content was first presented to the Advisory Panel (AP) and the Council at the February 2015 meeting.³ At the subsequent April 2015 meeting, the Scientific and Statistical Committee (SSC) provided feedback on proposed data and methods for evaluating the program.⁴ The Council approved the scope and direction of the workplan at the April 2015 meeting.

Council members appeared to be in concurrence on the depth of scope of the review. Members were looking for a broad evaluation of the program. They were hoping the review would provide them with a basic illustration of the dynamics within the CR Program. Council members noted they were not expecting to see an exhaustive study of every issue that has ever been addressed throughout the crab program history.

² The Council conducted a 5-yr review of the Amendment 80 sector in October of 2014 (Northern Economics 2014). Additionally, the Central Gulf Rockfish Pilot Program and the AFA sector both had a 1-year review after their implementation (NPFMC 2008a; NPFMC 2002). NPFMC conducted a review of the Community Quota Entity Program in 2010 (NPFMC 2010). Catch Share programs reviews from out of the North Pacific area include a Red Snapper IFQ Program 5-Year Review from the Gulf of Mexico region (GMFMC 2013) and the Pacific Coast's 12-year review of their Groundfish Limited Entry Fixed Gear Sablefish Permit Stacking program (PFMC 2014).

³ Links from the February 2015 Council meeting: [Council minutes](#) and [AP minutes](#).

⁴ Links to the April 2015 Council meeting: [SSC minutes](#).

Members approved a review focus that evaluates the program as a whole, but places particular emphasis on changes and impacts within the past five years of the program.

A program review is not the only opportunity to critically evaluate this management program. In the existing adaptive management process, if the Council determines an issue in the program warrants action, this consideration of action can be initiated at any meeting. While testifiers to the program review workplan focused on several specific areas of the program where they identified concerns, Council members were clear that they did not wish for a series of discussion papers within a program review. The intent is that the broad program review structure will provide enough information to aid these stakeholders in further identifying their concerns, rooted in data and evidence from the program, without necessarily establishing alternatives and options typically needed when considering a specific action. If concerns are highlighted within the review or from stakeholders while the Council is evaluating the program, additional action may be considered from that point in the form of a discussion paper or analysis.

1.3 Methods and Data Sources

This review uses quantitative and qualitative analyses to describe and evaluate the present status of the crab fisheries in relation to program objectives. Findings from relevant literature are also utilized whenever possible. Primary data sources include harvest activity from Alaska Department of Fish and Game (ADF&G) Fish Tickets/eLandings enhanced by Commercial Fisheries Entry Commission (CFEC) Gross Earnings file, fishing and processing privilege data (LLP licenses, QS, PQS, etc.) from NOAA Restricted Access Management (RAM) Division, wholesale production values self-report by producers in Commercial Operators Annual Report (COAR) and social and economic information is derived from the annually submitted Economic Data Reports (EDRs). Data is sourced and compiled by Alaska Fisheries Information Network (AKFIN) when practicable. Qualitative information is collected from relevant literature, records of public testimony, and solicited communication with stakeholders in the fisheries and the others that reside in the communities they impact. Additionally, Alaska Fisheries Science Center (AFSC) qualitative interview information is utilized in Section 10 to contribute an understanding of the perceptions of entry opportunity by participants in the fishery. A list of persons consulted is available in Section 18.

2 DESCRIPTION OF MANAGEMENT

Mirroring the organization of the 3- and 5- year review, this 10-year CR Program review includes a description of the Federal and State of Alaska authority over the Federal BSAI crab fisheries off the coast of Alaska, a brief description of pre-rationalization management, and current management elements of the CR Program, highlighting amendments to the program. While there is significant repetition in these sections from the previous reviews of the program, this reference is necessary in order to provide a comprehensive description of program management that includes all of the most recent amendments to the program. Necessary administrative duties on the part of the State and Federal agencies are further discussed in Section 12.

2.1 Three Categories of Management Under Federal and State Authority

The Fisheries Management Plan (FMP) for the commercial king and Tanner crab fisheries in the BSAI establishes a State/Federal cooperative management regime that defers BSAI crab management to the State of Alaska with Federal oversight. State regulations are subject to the provisions of the FMP, including its goals and objectives, the Magnuson-Stevens Act National Standards, and other applicable federal laws.

The FMP specifies three categories of management measures for the king and Tanner crab fisheries in the BSAI, as demonstrated in Table 2-1. Category 1 measures are those that are specifically fixed in the FMP, and require an FMP amendment to change. Category 2 measures are those that are framework-type measures which the State can change following criteria set out in the FMP. Category 3 measures are those measures that are neither rigidly specified nor frameworked in the FMP. Category 3 measures are under complete discretion of the State of Alaska.

Table 2-1 Management measures used to manage king and Tanner crabs in the BSAI management unit by category

Category 1 (Fixed in the FMP)	Category 2 (Frameworked in the FMP)	Category 3 (Discretion of the State)
Legal Gear	Minimum Size Limits	Reporting Requirements
Permit Requirement	Guideline Harvest Levels/ Total Allowable Catch	Gear Placement and Removal
Federal Observer Requirements	In-season Adjustments	Gear Storage
Limited Access	Districts, Subdistricts, and Sections	Vessel Tank Inspection
Norton Sound Super Exclusive	Fishing Seasons	Gear Modifications
Registration	Sex Restrictions	Bycatch Limits (in Crab Fisheries)
Essential Fish Habitat	Pot Limits	State Observer Requirements
Habitat Areas of Particular Concern	Registration Area	Other
	Closed Waters	

Source: Fishery Management Plan for Bering Sea/Aleutian Islands king and Tanner crabs (NPFMC 2011)

The FMP applies to all Federal crab fisheries in the BSAI (whether they are part of the CR Program or not). In addition to the CR Program fisheries listed in Section 2.3, this also includes: Western Aleutian Islands red king crab (Adak District), Norton Sound red king crab and Pribilof Islands golden king crab. An amendment to the FMP in 2008 removed 12 BSAI crab stocks from the FMP and shifted full authority to the State.⁵

2.2 Pre-rationalization Management

“Limited Access” is one of the elements fixed in the FMP and under Federal jurisdiction. As published in 2000, the License Limitation Program (LLP) replaced a temporary moratorium on the entry of new vessels which had been in place for all of the BSAI/GOA crab and groundfish fisheries under Federal jurisdiction since September 1995.⁶ At the time, the Council was considering comprehensive rationalization of all

⁵ Amendment 24 to the BSAI king and Tanner crab FMP, Final rule was published 73 FR 33925.

⁶ The moratorium on new vessel entry was Amendment 4 to the BSAI king and Tanner crab FMP, Final rule published 60 FR 40771 and the LLP implementation was Amendment 5 to the BSAI king and Tanner crab FMP, Final rule published 63 FR 52643.

Federal fisheries off of Alaska in response to a significant suite of conservation, safety, socio-economic, and management issues present in the open access fisheries. The LLP was considered a first step towards comprehensive rationalization.

The LLP allocates limited entry licenses to harvesters based on historic participation in a particular Federal crab or groundfish fishery. Individual harvests levels are still determined in competitive race for fish. While the direct purpose of the LLP is to limit entry in a fishery, the underlying intent of the program is to help resolve the competing and often conflicting needs of the fisheries that developed under open access. The LLP license is a management tool intended to close the gap between fishing capacity and available fishery resources.

Between implementation of the LLP in 2000 and implementation of the CR Program in 2005, an LLP license with the appropriate endorsements was required on any vessel engaged in directed fishing for crab species managed by the FMP.⁷ A crab LLP license is endorsed by area and species (one or more than one of each), had a designated maximum length overall (MLOA) for the vessel, and were issued by operation type; catcher vessel or catcher processor. Since the seasons in most of the BSAI crab fisheries do not conflict, most participants were active in several of the fisheries, moving from one fishery to another. However, stock declines in the Bristol Bay red king crab and the Bering Sea snow crab led to seasons lasting only a few days or weeks. Consequently, equipment was often idle for several months of the year.

A guideline harvest level (GHL) for each fishery set target catch for the fishery. Initially, these GHLs were ranges, but later they became fixed amounts. Managers monitored harvests by in-season reports and attempted to time the closure of a fishery with complete harvest of the GHL. Harvests exceeded the GHLs in some years, however, because in-season monitoring could not keep pace with harvests during the short seasons. Over time, managers improved their ability to monitor catch in-season, limiting the extent of these GHL overages in the years immediately preceding the implementation of the CR Program.

2.3 Description of the BSAI Crab Rationalization Program

To address the concerns of various stakeholders in these fisheries, the Council developed a “voluntary three pie cooperative” program intended to protect the interests of the harvest sector, the processing sector, and defined regions and communities. Allocations of harvesting and processing privileges under the program are based on historic participation to protect investment in and reliance on the program fisheries.

There are nine large crab fisheries in the BSAI rationalized under the program,⁸ specifically:

⁷ As QS replaced the requirement for an LLP license in the CR fisheries, the LLP for crab was revised in September 2005 to reflect fisheries remaining under governance of the LLP program. This included: Eastern Aleutian Islands red king crab, Aleutian Islands snow crab and Tanner crab, Norton Sound red and blue king crab, and “minor species” including scarlet king crab and triangle and grooved Tanner crab. Amendment 24 was implemented in July 1998 and removed Aleutian Islands Tanner crab, Eastern Aleutian Islands red king crab, scarlet or deep sea king crab, grooved Tanner crab, and triangle Tanner crab from the LLP regulations. These fisheries are managed by the State of Alaska.

⁸ Some crab fisheries are considered one unit stock for assessment purposes, but are managed as more than one fishery. For example, Eastern and Western Aleutian Islands golden king crab are assessed as one stock, but are managed as distinct fisheries with separate TACs. There are 10 stocks assessment conducted for the BSAI crab fisheries: Eastern Bering Sea snow crab, Bristol Bay red king crab, Eastern Bering Sea Tanner crab, Pribilof Islands red king crab, Pribilof District blue king crab, Saint Matthew blue king crab, Norton Sound red king crab (not rationalized), Aleutian

BBR	Bristol Bay red king crab
BBS	Bering Sea snow crab (<i>C. opilio</i>)
EBT	Eastern Bering Sea Tanner crab (<i>C. bairdi</i>) – East of 166° W
WBT	Western Bering Sea Tanner crab (<i>C. bairdi</i>) – West of 166° W
PIK	Pribilof Islands blue and red king crab
SMB	Saint Matthew Island blue king crab
WAG	Western Aleutian Islands (Adak) golden king crab – West of 174° W
EAG	Eastern Aleutian Islands (Dutch Harbor) golden king crab – East of 174° W
WAI	Western Aleutian Islands (Petrol Bank District) red king crab – West of 179° W

When the CR Program was implemented in 2005, the Eastern Bering Sea Tanner crab fishery and Western Bering Sea Tanner crab fishery were one fishery for management purposes.⁹ This document uses the acronym **BST** (Bering Sea Tanner) to describe this fishery. The combined Eastern and Western Aleutian Islands golden king crab fisheries may be referred to as **AIG** (Aleutian Islands golden) in some places in this document.

The Council designed the CR Program as a “voluntary three pie cooperative” program, with elements built in to address interests of the harvesters, processors, and the communities. In his 2003 testimony to Congress, Mr. Kevin Duffy, ADF&G Commissioner of the time stated, “The three-pie approach fits the Bering Sea crab fishery. The Council has a pioneering history of designing rationalization programs unique to the fishery at hand. The Council crafted the IFQ program for halibut and sablefish that fit the small vessel, owner-on board nature of that fishery. For pollock, the mechanism was processor-linked cooperatives. We design rationalization programs to fit the dynamics and needs of the particular fishery. For the large boat, heavily industrialized, corporate nature of the BSAI fisheries, the Council found that a voluntary, three-pie cooperative structure fit best.” The primary elements of the voluntary three pie cooperative CR Program are:

- Total allowable catch (TAC)
- Harvesting shares
- Processing shares
- Regional landing designations
- C share allocation to protect captain and crew interests
- Catcher processor shares
- Binding arbitration system
- Cooperatives
- Community Development Quota (CDQ) and Adak community allocations
- Crew loan program
- Annual economic data collection (or Economic data reports)

The remainder of this section describes each of these program elements and their intended purpose.

Islands golden king crab (not fully rationalized), Pribilof Islands golden king crab (not rationalized), and Western Aleutian Islands red king crab.

⁹ Both Eastern and Western Bering Sea Tanner crab are part of the “Eastern Bering Sea Tanner crab” stock. This stock was further divided into an Eastern and Western fishery through Amendment 20 in an effort to reduce localized depletion.

2.3.1 Total Allowable Catch

Each program fishery is managed with a total allowable catch (TAC), which sets a specific catch limit, instead of a GHL. Although the change to a TAC may be largely semantic, it signifies a change to more precise catch management. To discourage harvesters from exceeding the TAC in a program fishery, any overharvest of an allocation is a violation. Although penalties are at the discretion of NOAA Office of Law Enforcement and NOAA General Counsel, the Council has recommended that all overages be subject to forfeiture and that additional penalties be imposed only for overages in excess of 3% of a harvester's shares at the time of landing. Once the TAC is set for the fishery, 10% of this amount is available for the Community Development Program (CDQ) Program or Adak Community Allocation (in the Western Aleutian Islands golden king crab fishery) and 90% of the TAC is converted into IFQ for harvest under the CR Program.

A 2009 amendment to the program allows post-delivery transfers of QS. This amendment was intended to improve flexibility of the fleet, reduce the number of violations for overages, reduce enforcement costs, and allow more complete harvest of crab allocations.¹⁰

2.3.2 Harvesting Shares

Harvesting quota shares (QS) were created in each crab fishery of the program (see Figure 2-1). QS are a revocable privilege that allow the holder to harvest a specific percentage of the annual TAC in a program fishery. The corresponding annual allocations, which are expressed in pounds, are referred to as individual fishing quota (IFQ). The size of each annual IFQ allocation is based on the amount of QS held in relation to the QS pool in a program fishery — a person holding one percent of the QS pool receives IFQ to harvest one percent of the annual TAC in the fishery. IFQ TACs do not include pounds that have been set aside for the CDQ program. All crab that is sold or kept for personal use, and all deadloss is debited against the IFQ account of the allocation holder. Legal discards, however, are not counted against an IFQ holder's account.¹¹

QS are designated as either catcher vessel QS or catcher processor QS, depending on whether the vessel that created the privilege processed the qualifying landings on board. Approximately 97% of the QS (referred to as "owner QS") in each program fishery were initially allocated to LLP license holders based on their catch histories in the fishery. The remaining 3% of the QS (referred to as "C shares" or "crew QS") were initially allocated to captains based on their catch histories in the fishery.

Catcher vessel owner IFQ are issued in two classes, Class A IFQ and Class B IFQ. Crab harvested using Class A IFQ must be delivered to a processor holding unused individual processing quota (IPQ). In addition, Class A IFQ are subject to regional share designations, whereby harvests are required to be delivered within an identified region.¹² The delivery restrictions of Class A IFQ are intended to add stability to the processing

¹⁰ Amendment 28 to the BSAI king and Tanner crab FMP, Final rule published: 74 FR 41092.

¹¹ There is no prohibition against sorting crab at the rail, and it is common practice to discard females or sub-legal sized crab immediately after the pot is brought on board. While not debited from an individual account, discard mortality is estimated from observer data and factored into the total removals necessary for stock assessments.

¹² The EBT and WBT Tanner crab QS, and a portion of the WAG golden king crab QS, are considered undesignated because they do not carry a regional landing designation.

sector by protecting processor investment in program fisheries and to preserve the historic distribution of landings and processing between regions.

Crab harvested using Class B IFQ can be delivered to any processor that is a registered crab receiver (except a catcher processor) regardless of whether the processor holds unused IPQ. In addition, Class B IFQ are not regionally designated. The absence of delivery restrictions on a portion of the catch is intended to provide harvesters with additional market leverage for negotiating prices for landings of crab.

Therefore, Class B catcher vessel owner IFQ allows for more flexibility for the harvester. The determination of whether and how much Class B versus Class A catcher vessel owner IFQ a person receives is determined by their association with processor quota share (PQS) holdings. If a person holds (or has equity in) both IPQ and IFQ, then that person will be issued Class A IFQ only for the amount of IFQ equal to the amount of IPQ held by that person. Any remaining IFQ held by that person will be issued as Class A and Class B IFQ in a ratio so that the total Class A and Class B IFQ issued in that crab QS fishery is issued as 90% Class A IFQ and 10% Class B IFQ. Consequently, Class B IFQ are allocated to a harvester only to the extent that the QS held by the harvester exceeds the amount of PQS held by that harvester and its affiliates.

If a CVO QS holder has no affiliation with PQS, they are issued Class A and Class B IFQ in a 90:10 ratio, respectively. The absence of an affiliation with a holder of processing shares is established by a QS holder filing an annual affidavit identifying any PQS holdings or affiliations with PQS holders.

Implementation of the program required the initial allocation of QS to eligible harvesters. To be eligible for an allocation of owner QS in a program fishery a harvester must have held a valid, permanent, fully transferable LLP license endorsed for the fishery. A harvester's allocation of QS in a fishery was based on landings in that fishery (excluding landings of deadloss). Specifically, each allocation was the harvester's average annual portion of the total qualified catch during a specific qualifying period. Qualifying periods were selected to balance historical participation and recent participation. Different periods were selected for different program fisheries to accommodate fishery closures and other circumstances in the fisheries in recent years. The most recent seasons were excluded in part to limit the effectiveness of efforts by participants to obtain a larger allocation by increasing participation in recent seasons when it was apparent that allocations would be based on historic harvest levels.

QS and IFQ are transferrable under the program, subject to limits on the amount of shares a person may own or use. Transferability of shares among eligible purchasers of QS and IFQ may promote production efficiency in the harvest sector and provides a means for compensated removal of excess harvesting capacity in the program fisheries. In addition, transferability may be used to avoid overages, in the event a harvester exceeds its available IFQ. Subsequent to an amendment implemented in 2009, IFQ transfers have been allowed post-delivery to remedy a harvest overage.

Leasing of catcher vessel and catcher processor owner QS (or equivalently, the sale of owner IFQ) has been prohibited, except by cooperatives, after the first 5 years of the program. Leasing is defined as the use of IFQ on a vessel in which the owner of the underlying QS holds less than a 10% ownership interest and on which the underlying QS holder is not present. The prohibition on leasing of QS (or sale of IFQ) by persons not in cooperatives is intended to create an incentive for cooperative membership. The 5 year interim period

in which leasing was not constrained was intended to allow a period of adjustment during which harvesters could coordinate fishing activities and build relationships necessary for cooperative membership.

Leasing of C share QS had also been prohibited after the first 3 years of the program, with the exception of those that joined a cooperative. Again, the incentive was also to encourage participation in a cooperative. The Council's original intent for including C share QS in the CR Program was to maintain active participation in the crab fisheries by those QS holders. Thus, an amendment to the CR Program, which became effective on March 1, 2015, established that C share QS (both catcher vessel and catcher processor C shares) may be held only by persons who either demonstrate active participation in a program fishery or are recipients of an initial allocation of C share QS who demonstrate active participation in State or Federal fisheries in or off Alaska.¹³

The same amendment package modified the eligibility requirements for the acquisition of C shares, to attempt to provide entry opportunities for long-time captains and crew displaced from the CR fishery after the program began. Since holders of C shares would be required to satisfy specific participation requirements and these participation requirements would apply to all holders of C shares even when they are members of a cooperative, the Council determined that the prohibition on leasing C share IFQ as a measure to ensure active participation would no longer be necessary.

To be eligible to purchase owner QS or IFQ an individual is required to be a U.S. citizen and to have at least 150 days of sea time in US commercial fisheries in a harvest capacity. Corporations and partnerships can also acquire these shares provided a U.S. citizen with at least 150 days of sea time in US commercial fisheries in a harvest capacity owns at least 20% of the corporation, and the corporation is at least 75% U.S. owned. Initial recipients of QS and CDQ groups are exempt from these eligibility criteria. Sea time requirements are intended to ensure that the harvest sector does not evolve into a fishery owned by persons with no fishing background.

“Individual use caps” are imposed on the use and holdings of harvest shares by any person in order to prevent excessive consolidation of shares under the program.¹⁴ Different caps apply to owner share holdings and C share holdings. Individual use caps vary across program fisheries because of different fleet characteristics and the differences in historic dependency of participants on the different fisheries. In addition, any CR Program holdings by CDQ groups, who each represent the interests of one or more BSAI communities, are subject to higher caps (see Table 2-2). A “grandfather” provision exempted persons who received an initial allocation of QS in excess of the cap.

Individual use caps are applied individually and collectively. Under this approach, all of a person's direct QS holdings are credited toward the cap. In addition, a person's indirect QS holdings are also credited toward the cap in proportion to the person's ownership interest. For example, if a person owns a 20% interest in a company that holds 100,000 units of QS, that person is credited with holding 20,000 units of QS for purposes of determining compliance with the cap.

¹³ Amendment 31 to the BSAI king and Tanner crab FMP; Final rule published: 80 FR 15891.

¹⁴ In other catch share programs (e.g. the halibut sablefish IFQ program) individual use caps are called “QS use caps”. They are also sometimes referred to as “ownership caps”.

Table 2-2 QS use caps for CVO/ CPO, CVC/CPC, and CDQ groups

Fishery	CVO/CPO		CVC/CPC		CDQ holdings of CVO/CPO	
	As a % of the initial CVO/CPO QS pool	In QS units	As a % of the initial C share pool	In QS units	As a % of the initial CVO/CPO QS pool	In QS units
BBR	1%	3,880,000	2%	240,000	5%	19,400,000
BSS	1%	9,700,000	2%	600,000	5%	48,500,000
EBT	1%	1,940,000	2%	120,000	5%	9,700,000
WBT	1%	1,940,000	2%	120,000	5%	9,700,000
PIK	2%	582,000	4%	36,000	10%	2,910,000
SMB	2%	582,000	4%	36,000	10%	2,910,000
EAG	10%	970,000	20%	60,000	20%	1,940,000
WAG	10%	3,880,000	20%	240,000	20%	7,760,000
WAI	10%	5,820,000	20%	360,000	20%	11,640,000

Source: CFR 680.42(a); <https://alaskafisheries.noaa.gov/sites/default/files/reports/1415ifqquotacaps.pdf>

“Vessel use caps” limit the amount of owner IFQ that may be harvested by a single vessel in a given season.¹⁵ Vessel use caps do not apply to cooperatives, thereby providing an additional incentive for cooperative participation.

Table 2-3 Vessel use caps as a percent of the respective fishery’s quota share pool

Fishery	Vessel use cap	
	As a % of the initial QS pool (or annual TAC)	In raw crab pounds for the 2014/2015 season
BBR	2%	179,748
BSS	2%	1,223,100
EBT	2%	152,640
WBT	2%	119,250
PIK	4%	No fishery
SMB	4%	23,580
EAG	20%	595,800
WAG	20%	536,400
WAI	20%	No fishery

Source: CFR 680.42(c)

To protect independent vessel owners and processors that are not vertically integrated, processor harvest share holdings are also limited by caps on vertical integration. A PQS holder’s harvest share holdings are limited to 5% of the share pool on a fishery basis. These caps are applied using a threshold rule for determining whether the shares are held by a processor, and then the individual and collective rule for determining the extent of share ownership. Under the threshold rule, any entity with 10% or more common ownership with a processor is considered to be a part of that processor. Any direct holdings of those entities

¹⁵ Vessel use caps are also referred to as Vessel IFQ caps in other catch share programs (e.g. the halibut sablefish IFQ program) because they apply to the IFQ harvested on one vessel on an annual basis.

are fully credited to the processor's holdings. Indirect holdings of an entity are credited towards the processor's cap in proportion to the entity's ownership.

2.3.3 Processing Shares

The program also created processing quota shares (PQS), which are allocated to processors and are analogous to the QS allocated to harvesters. PQS are a revocable privilege to receive deliveries of a fixed percentage of the annual TAC from a program fishery. These annual allocations are referred to as individual processing quota (IPQ). IPQ is issued for 90% of the catcher vessel owner IFQ pool, corresponding to the 90% allocation of catcher vessel owner IFQ issued as Class A IFQ. As with Class A IFQ, PQS and IPQ are designated for processing by region.¹⁶ These processing shares are intended to protect processor investment in program fisheries and preserve regional interests in the fisheries.

IPQ landing requirements do not apply to the remaining 10% of the owner IFQ, corresponding to the 10% of the owner IFQ allocated as Class B IFQ, as these Class B IFQ are intended to provide harvesters with additional bargaining power. In addition, Class B IFQ may provide an opportunity for the entry of new processors in the program fisheries. Alternatively, new processors can enter a fishery by purchasing PQS or IPQ or by purchasing landings of CDQ crab. To ensure harvesters the latitude to use their Class B IFQ to pursue the best markets, processors are not permitted to leverage their IPQ to acquire crab harvested using Class B IFQ; the penalty is forfeiture of all of the processor's IPQ.

As in the harvest sector, processors received initial allocations of PQS based on processing history during a specified qualifying period for each fishery. A processor's PQS allocation, as a percentage of the pool, in a program fishery was equal to its share of all qualified processing in the qualifying period (i.e., pounds processed by the processor divided by pounds processed by all qualified processors).

Processing shares are transferable, including leasing of PQS (or equivalently, the sale of IPQ) subject to use caps. As with harvesting shares, transferability of processing shares is intended to promote efficiency and facilitate compensated reduction of excess capacity. In addition, IPQ transfers may aid in the coordination of deliveries from the fisheries. To provide a period of general stability for processors and communities to adjust to the program a two-year "cooling off period" was established during which processing shares could not be relocated from the community where the historical processing occurred that led to the allocation (the community of origin).¹⁷

In addition, a right of first refusal was granted to community groups and CDQ groups from communities with significant crab processing history on the sale of any processing shares for use outside of the community of origin. The intention of this element is to allow the community of origin the opportunity to keep PQS in a community under the same terms and conditions the seller of PQS would have offered

¹⁶ With the exception of EBT and WBT Tanner crab PQS, and a portion of the WAG golden king crab PQS, which do not carry a regional landing designation.

¹⁷ The "cooling off" limitation applied to most processing shares, but shares allocated based on processing history in communities with minor amounts of crab were not subject to the provision. In addition, each processing share holder was permitted to move small amounts of IPQ out of the "community of origin" during the cooling off period to allow for some coordination of landings and more complete use of Class A IFQ and IPQ allocations.

another buyer. A recent CR Program amendment package (effective February 12, 2016), is intended to improve the transparency and effectiveness of the right of first refusal program.¹⁸

A processing share cap prevents any person from holding in excess of 30% of the outstanding PQS in any program fishery unless that person received an initial allocation of PQS in excess of this limit. As with vertical integration caps, processor share caps are applied using a threshold rule for determining whether the shares are held by a processor and then the individual and collective rule for determining the extent of share ownership. Under the threshold rule, any entity with 10% or more common ownership with a processor is considered to be a part of that processor. Any direct holdings of those entities are fully credited to the processor's holdings. Indirect holdings of those entities are credited toward the processor's cap in proportion to the entities ownership.

In addition to PQS holdings, regulations state a person may not *use IPQ* that, combined with that person's PQS holdings, exceeds 30% of the outstanding PQS in any program fishery. In other words, all share holdings of an entity and any custom processing by a plant owned by an entity is counted toward that entity's cap. A custom processing arrangement exists when one IPQ holder 1) has a contract with the owners of a processing facility to have their IPQ-matched crab processed at that facility, 2) that IPQ holder does not have an ownership interest in the processing facility, and 3) that IPQ holder is not otherwise affiliated with the owners of that crab processing facility.

However, there are several exemptions to the provision about IPQ use as amendments to the program. The 2006 reauthorization of the Magnuson-Stevens Act included a provision to exempt custom processing in the North region of the Bering Sea snow crab fishery from processing use caps established under the CR Program. However, in addition to the PQS ownership cap, no processor in the Bering Sea snow crab is permitted to use in excess of 60% of the IPQ issued in the North region.

Amendment 27, effective June 29, 2009, extended the exemption to several other fisheries in addition to Bering Sea snow crab in the North region. This suite of exemptions excludes custom processing from the calculation of the use caps in the Pribilof red and blue king crab, the Saint Matthew Island blue king crab, the Western Aleutian Islands red king crab, the Western Aleutian Islands golden king crab, and the Eastern Aleutian Islands golden king crab fisheries.¹⁹ This exemption allows consolidation beyond the caps in fisheries and regions that pose particular economic challenges to processors.²⁰

Compliance with the processing share caps is identified after processing has occurred. NMFS RAM Division calculates an individual or entities' IPQ use cap by summing the total amount of IPQ that is 1) held by that person/entity, 2) held by other persons/entities who are affiliated with that person/entity through common ownership or control, and 3) any IPQ crab that is custom processed at a facility an IPQ holder

¹⁸ Amendment 44 to the BSAI king and Tanner crab FMP, Final rule published: 81 FR 1557.

¹⁹ Amendment 27 to the BSAI king and Tanner crab FMP, Final rule published: 74 FR 25449.

²⁰ The exemption is limited to custom processing that occurs within a "community of origin" (defined by the original ROFR) to protect community interests. Along with the exemption, a provision limits the processing in any facility to 60 percent of the IPQ in the Western Aleutian Islands red king crab, and the Eastern Aleutian Islands golden king crab fisheries.

owns, with exemptions for specific crab fisheries. The use cap considers all of the IPQ used at a facility by adding all of the IPQ used by any person, whether custom processed or not, at a facility.

Recently, an emergency exemption was approved by NMFS that exempts the Eastern and Western Bering Sea Tanner crab fishery for the IPQ cap for custom processing through the 2015/2016 season (effective January 26 through June 30, 2016).²¹ A subsequent regulatory amendment is currently under consideration to allow custom processing to be exempt from the 30% cap.²²

2.3.4 Regional Share Designation

The allocation to regions is accomplished by regionally designating all Class A (delivery restricted) harvest shares and all corresponding processing shares (Table 2-4). In most CR Program fisheries, regionalized shares are either North or South, with North shares designated for delivery in areas on the Bering Sea north of 56° 20' north latitude and South shares designated for any other areas, including Kodiak and other areas on the Gulf of Alaska. In the Western Aleutian Islands (Adak) golden king crab fishery, the designation is based on an east/west line to accommodate a different distribution of activity in that fishery. Share designations are based on the historic location of the landings and processing that gave rise to the shares.

Table 2-4 Regional designations in CR Program Fisheries

Crab QS Fishery	North Region	South Region	West Region	Undesignated Region
EAG	x	x		
WAG			x	x
EBT				x
WBT				x
BSS	x	x		
BBR	x	x		
PIK	x			
SMB	x	x		
WAI		x		

Source: 50 CFR 680.40 (b)(2)(iii)

There have been several amendments to allow for temporary exemptions from the regional delivery requirements. One amendment provides an exemption from the regional landing requirement in the West region of the Western Aleutian Islands golden king crab fishery on the agreement of all holders of more than 20% of the QS pool, all holders of more than 20% of the PQS pool, and the communities of Adak and Atka (effective June 20, 2011).²³ The amendment is intended to allow for the movement of deliveries in the event that processing capacity is unavailable in the West region. Due to lack of processing capacity, this exemption has been employed each season since 2011.

²¹ No FMP Amendment number, published 81 FR 4206

²² This fishery was originally excluded from the exemptions because the harvesters do not have a regional delivery requirement in which would have required processing in specific regions. Therefore, they could technically rely on a wider geographic region of processors. However, due to the location of the harvesting activity, stakeholders have argued it would be impractical and wasteful (i.e. create significant deadloss) to attempt to regionally diversify.

²³ Amendment 37 to the BSAI king and Tanner crab FMP; Final Rule published: 76 FR 35781.

Effective June 14, 2013, the Council also approved an amendment that established a process whereby holders of regionally designated IFQ and IPQ in six CR Program fisheries may receive an exemption from regional delivery requirements in the North or South Region.²⁴ This regulatory action establishes a process that can mitigate disruptions in a CR Program fishery that prevent participants from complying with regional delivery requirements. For example, in the event of a strong ice pack around St. Paul Island, North-designated harvested crab might be stranded if there is not flexibility to allow processing to occur elsewhere. A privately signed framework agreement stipulates the circumstances under which relief is granted from regional delivery requirements. This temporary exemption could apply to Bristol Bay red king crab, Bering Sea Snow crab, St. Matthew's blue king crab, Eastern Aleutian Islands golden king crab, Western Aleutian Islands red king crab, and Pribilof Island red and blue king crab.

2.3.5 Catcher Processor Shares

Catcher processors participate in both the harvest and processing sectors and therefore have a unique position in the program. Catcher processors are allocated catcher processor QS and issued corresponding catcher processor IFQ. These shares carry both a harvest privilege and an accompanying onboard processing privilege. To be eligible for the initial allocation of catcher processor QS, a person must have been eligible for a harvest allocation by holding a permanent, fully transferable catcher processor LLP license. In addition, the catcher processor must have processed crab in either 1998 or 1999. These requirements parallel the harvester QS and processor PQS eligibility requirements, respectively. Persons meeting these eligibility requirements were allocated catcher processor QS in accordance with the allocation rules for harvest shares for all qualified catch that was processed onboard.

Since catcher processor IFQ provide both harvesting and on board processing privileges, a person holding those shares may harvest and process crab onboard under the allocation. In addition, holders of catcher processor IFQ may choose not to process harvested crab, instead delivering their catch to any other processor. Use of catcher processor IFQ in this manner is akin to the use of Class B IFQ, which do not require the receiving processor to hold unused IPQ. Catcher/processor shares do not have regional designations.

Holders of catcher processor QS may also sever the harvesting and processing privileges, thereby creating separate QS and PQS. These newly severed interests create a privilege to annual IFQ allocations and IPQ allocations, which can be held by different persons. When severed, the resulting QS and PQS must be designated for a region with both shares taking the same regional designation. Allowing the conversion of shares permits a catcher processor shareholder to realize the maximum value of shares and provides greater flexibility in using the privileges.

Some catcher processors historically accepted delivery of crab from catcher vessels for processing. PQS are allocated based on this activity to the extent that processing vessels met processor eligibility requirements and had qualifying processing history. In addition, catcher processors are permitted to purchase and use additional IPQ. All processing of deliveries by catcher processors is required to take place within three miles of shore in the applicable region. The requirement of processing within three miles of

²⁴ Amendment 41 to the BSAI king and Tanner crab FMP, Final Rule published: 78 FR 28523.

shore is intended to ensure that the regional benefits of processing activity occur. Catcher processors may not purchase for processing crab harvested with Class B shares.

2.3.6 Crew Shares

To protect captains' historical interests in the program fisheries, 3% of the initial allocation of QS were issued to eligible captains. These "C shares" are to be held only by active captains and crew and are intended to provide additional leverage to those captains and crew when negotiating contracts with vessel owners. The Council chose to exempt C shares from all IPQ and regional landing requirements, as it recognized the logistical complications that would likely arise under the program as a result of the interaction of active participation requirements, fleet contraction, and the IPQ and regional landing requirements.²⁵

To be eligible for the initial allocation of C share QS, a captain was required to demonstrate both historical dependence on a program fishery and recent participation. Allocations to captains were based on participation in landings during the same qualifying years applicable to owner QS allocations. To ensure C share holders are an integral part of the program, C share holders are permitted to join cooperatives. IFQ attributable to C share QS of cooperative members are allocated directly to the cooperative and are harvested in accordance with the applicable cooperative agreement.

To ensure that C shares benefit active participants in the program fisheries, C share QS and IFQ may be acquired by transfer only by persons who are active in one of the program fisheries in the 365 days prior to the application for transfer.²⁶ Under current rules, individuals who hold C share IFQ are required to be on board the vessel harvesting those IFQ. However, C share holders who choose to join a cooperative are effectively exempted from the 'owner on board' rule, since the IFQ are held by the cooperative.

Under Amendment 31, annual C share IFQ are issued only to C share QS holders who meet an active participation requirement of being on board a vessel for one landing in the three years preceding the IFQ allocation.²⁷ In addition, C share QS is revoked from persons who are not active in at least one of the crab fisheries for 4 consecutive years.²⁸ The Council also included a transition period for persons who would be deprived of IFQ or QS by these active participation requirements. Under this transition period, no IFQ would be withheld until 3 years after implementation of the amendment and no QS would be revoked until 5 years after the implementation of the amendment. This amendment became effective May 1, 2015.

²⁵ The initial exemption from these requirements applied only for the first 3 years of the program. The Council extended this exemption indefinitely under an amendment to the program, which became effective through Amendment 26 to the BSAI king and Tanner crab FMP (published 73 FR 35084, effective July 21, 2008).

²⁶ The Council adopted a provision that would allow initial recipients of C share QS and persons who fished in the BSAI crab fisheries in 3 of the 5 seasons preceding implementation of the CR Program to acquire C shares. This provision is intended to address concerns of crews displaced by fleet consolidation who are interested in acquiring C shares to maintain an interest in the fisheries (part of Amendment 31).

²⁷ Amendment 31 to the BSAI king and Tanner crab FMP; Final rule published: 80 FR 15891.

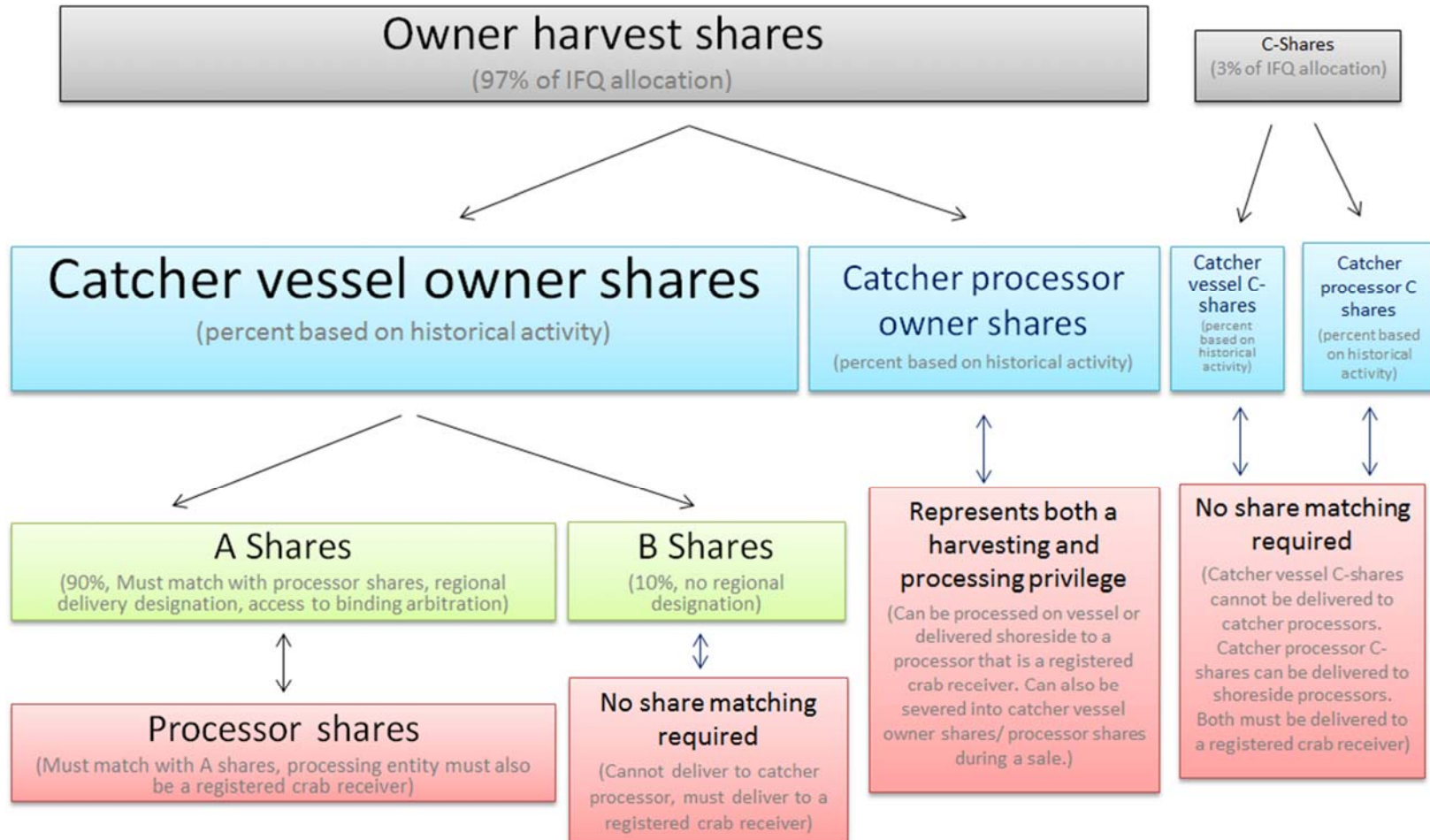
²⁸ An alternative active participation requirement can be met by recipients of an initial allocation of C share QS. Initial recipients of C share QS allocations, who are active in a fishery in or off Alaska for a total of at least 30 days during 3 crab seasons preceding the annual IFQ allocation would receive that allocation (regardless of whether they are active in a crab fishery). In addition, C share QS would not be revoked from initial recipients who have at least 30 days of participation in a fishery in or off Alaska in the previous 4 crab seasons.

Individual C share holdings and use are capped at the same level as the vessel use caps applicable to owner IFQ (i.e., twice the owner QS cap level). A “grandfather” provision exempted initial allocations of Class C shares in excess of the cap. C share IFQ are not considered in determining a vessel’s compliance with the vessel use caps applicable to owner IFQ.

Catcher processor captains are allocated catcher processor C share QS that include both a harvesting and onboard processing privilege. Harvests with catcher processor C share IFQ may also be delivered to shoreside or stationary floating processors. Harvests with catcher vessel C share IFQ must be delivered to shoreside or stationary floating processors (i.e., they cannot be delivered to catcher processors).

Figure 2-1 Diagram of quota shares in the CR Program

Crab Fishery TAC - 10% for CDQ & Adak = IFQ allocation



2.3.7 Binding Arbitration System

The arbitration system serves several important purposes in the program, including dissemination of market information to facilitate negotiations, the coordination of matching Class A IFQ held by harvesters to IPQ held by processors, and a binding arbitration process to resolve terms of delivery.

A “market analyst” and a “formula arbitrator,” jointly selected by the harvesting and processing sectors, develop a market report and non-binding price formula, which specifies an ex-vessel price as a portion of the first wholesale price, to be used by participants to guide their delivery negotiations. The market report and the formula price are non-binding, but are intended to provide information concerning the market and a reasonable price that might be generated by the arbitration system on the basis of the historical distribution of the first wholesale price.

Matching of Class A IFQ with IPQ is facilitated through a process of share commitments and dissemination of information concerning available shares. Once shares are matched, any parties unable to negotiate terms of delivery may use the arbitration system to resolve those terms.

To ensure predictability and fairness, the arbitration system sets forth standards to be followed by formula arbitrators and contract arbitrators. Although different standards apply to the formula arbitrator and the contract arbitrator, the differences between the standards are very limited and do not substantively change the general approach to be applied. The regulations state that both the non-binding price formula and contract arbitrator’s decision must “(A) Be based on the historical distribution of first wholesale revenues between fishermen and processors in the aggregate based on arm’s length first wholesale prices and ex-vessel prices, taking into consideration the size of the harvest in each year; and (B) Establish a price that preserves the historical division of revenues in the fishery while considering” several listed factors.²⁹

Section 9 contains a more detailed description of the Arbitration System, which allows for an understanding of the performance of this system. Since program implementation, there have been two amendments directly related to adjusting the timing and information available during the Arbitration System.

2.3.8 Cooperatives

The program allows harvesters to form voluntary cooperatives associated with one or more processors holding PQS. Cooperatives receive the annual IFQ allocated to their members. Formation of cooperatives is intended to facilitate production efficiency by aiding harvesters in coordinating harvest activities among members and deliveries to processors. In addition, the

²⁹ Listed factors in both standards include current ex-vessel prices for all IFQ types, consumer and wholesale product prices, innovations and developments of both sectors, efficiency and productivity of both sectors, quality, the interest of maintaining financially healthy and stable harvesting and processing sectors, safety and expenditures for ensuring adequate safety, timing and location of deliveries, and cost of harvesting and processing less than the full IFQ or IPQ allocation (underages) to avoid penalties for overharvesting IFQ and reasonable deadloss.

cooperative relationship can facilitate the trading of IFQ under prearranged terms and conditions. Such trades help harvesters consolidate small portions of their allocations on a single vessel when a small portion of each vessel's allocation is remaining. In addition, processors can benefit by associating with a cooperative; for example, coordinated deliveries can result in less down time for processing crews and equipment and decrease deadloss by reducing queuing of harvesters waiting to offload their catches. Scheduling of deliveries is especially important under the program because the allocation of harvest shares can result in the extension of fishing over a longer period.

A minimum membership of 4 unique QS holders is required for cooperative formation. Cooperatives must file a cooperative agreement with NOAA Fisheries annually. Once the filing is made, the cooperative receives the annual allocation of its members in the applicable program fisheries. Cooperative members are permitted to leave a cooperative at any time after a season retaining their QS and associated IFQ. Harvesters within a cooperative may transfer IFQ freely since those IFQ are directly allocated to the cooperative and are counted against the cooperative's allocation. Vessels on which cooperative shares are fished are not subject to use caps. IFQ are also freely transferable between cooperatives, but these transfers require approval by NOAA Fisheries before they can be fished.

Section 5 describes the participation in cooperatives over the lifetime of the CR Program and their role in QS leasing.

2.3.9 Community Development Quota and Adak Community Allocation

The CR Program made changes in the BSAI crab allocations under the Community Development Quota (CDQ) program. The community quota allocations were also broadened through the development of the CR Program to include the Eastern Aleutian Islands golden king crab fishery and the Western Aleutian Islands red king crab fishery. In addition, the allocations in all crab fisheries covered by the CDQ program were increased from 7.5 to 10% of the TAC. These changes in the CDQ allocations are intended to further facilitate fishing activity and economic development in rural Western Alaska communities. The CDQ allocations are managed independently from the program and are not subject to IPQ and regional landing requirements. However, CDQ groups are required to deliver at least 25% of the allocations to shoreside processors. Sea time eligibility requirements for the purchase of owner QS are waived for CDQ and community groups in eligible communities allowing those communities to build and maintain local interests in harvesting. CDQ and community groups are not permitted to purchase C shares. The program also made an allocation to the community of Adak from the Western Aleutian Islands golden king crab fishery in an amount equal to the unused resource during the qualifying period. This allocation is capped at 10% of the total allocation in that fishery.

2.3.10 Crew Loan Program

The rationalization program includes a low interest loan program to assist eligible captains and crew in purchasing QS. Implementation of the loan program was delayed because of the absence of a Congressional appropriation to authorize loans, which was provided in early 2008. In February of 2008, the Council passed a motion recommending that loan funds be available exclusively to

licensed crew who are U.S. citizens with at least 150 days sea time as part of a harvesting crew in any U.S. commercial fishery, and who have made at least one delivery in a fishery subject to the CR Program in 2 of the 3 years prior to application for the loan. Effective January 18, 2011, the previously established NOAA Fisheries Finance Program was expanded to include Federal loan opportunities for captains and crew actively engaged in CR Program fisheries and seeking to purchase or refinance debt from the purchase of QS. Section 10.2.3 further discusses this program and its current usage.

2.3.11 Sideboards to Protect Participants in Other Fisheries

Sideboards in the CR Program discourage spillover activity that former crab vessels may have had after the implementation of the program, in order to protect historical participants of other fisheries. In the development of the program, the Council included sideboards to protect harvesters in GOA groundfish fisheries from the potential for increased effort from former participants in the Bering Sea snow crab fisheries.

Amendment 45 establishes, for a limited period of time, a process for NMFS to permanently remove Pacific cod sideboards, applicable to certain hook-and-line catcher/processors in the Central and Western Gulf of Alaska (GOA) Regulatory Areas. This action authorizes NMFS to remove these Pacific cod sideboard limits in the Central and/or Western GOA if each eligible participant in the hook-and-line catcher/processor sector in a regulatory area signs and submits a request that NMFS remove the sideboard limit. Each eligible participant will be required to submit the request to NMFS within 1 year of the date of publication of this final rule. This action is necessary to provide participants in the Central and Western GOA hook-and-line catcher/processor sectors with an opportunity to cooperatively coordinate harvests of Pacific cod through private arrangement to the participants' mutual benefit, which would remove the need for sideboard limits in these regulatory areas

There have been two amendments to the CR Program related to the sideboards initially established. These amendments relax the provisions for a small number of vessels in specific circumstances.³⁰ Section 15 describes the different types of harvester and processor non-crab sideboards applied to entities that had historical participation in crab fisheries before the CR Program was implemented.

2.3.12 Economic Data Collection Program

The BSAI Crab Economic Data Report (EDR) program is a mandatory census involving reporting of detailed operational and financial information by owners and leaseholders of vessels and

³⁰ Amendment 34 to the BSAI king and Tanner crab FMP revised the Crab Sideboards for the GOA Pacific Cod and Pollock Fishery to exempt some vessels that demonstrated historical participation in these non-crab fisheries (76 FR 35772). Amendment 45 to the BSAI king and Tanner crab creates, for a limited period of time, a regulatory process for NMFS to permanently remove Pacific cod sideboard limits, that are applicable to some participants in the Central GOA) and Western GOA hook-and-line catcher/processor sectors. This amendment was necessary after the Pacific cod sector splits changed impact of the sideboards on the former crab vessels (80 FR 28540).

processing plants, and Registered Crab Receivers (RCRs), participating in CR Program fisheries. EDRs contain cost, revenue, ownership and employment data.

The EDR program was designed by the Council as a component of the CR Program to improve the ability to monitor and assess achievement of social and economic objectives of management set forth in the FMP. Broadly speaking, the objectives of this reporting requirement are to monitor the economic performance of the CR Program in terms of changes in the efficiency and profitability of the fisheries, and economic stability for harvesters, processors, and coastal communities, including changes both pre and post implementation of the program. Therefore, while the EDR reporting requirement was implemented in 2005, historical data submission was required retroactively for 1998, 2001, and 2004. Subsequently, on an annual basis, reports have been required for each calendar year of crab fishing and processing activities for 2005 through the present.

Revised EDR reporting requirements implemented under a program amendment³¹ went into effect during 2013 for 2012 and subsequent calendar year data. A more detailed discussion of the design and implementation of the EDR program and limitations associated with EDR data is provided in Section 16 of this document.

Participation in the data collection program is mandatory for all participants in the program fisheries, including catcher vessels, catcher processors, stationary floating crab processors and shoreside crab processors and, as of 2012, RCRs that hold IPQ and purchase crab from delivering vessels, but do not operate a crab processing plant. Should a CR Program participant fail to submit an annual EDR by the due date, NMFS is authorized to withhold issuance or transfer of QS, PQS, IFQ, and IPQ to that person. Persons submitting the data have an opportunity to correct errors before enforcement action is taken.

These data are collected and held by the Pacific States Marine Fisheries Commission (PSMFC), the designated NMFS Data Collection Agent for the EDR program. PSMFC abides by all statutory and regulatory data confidentiality requirements, and will only release the data to NMFS, Council staff, and any other authorized users in a “blind” format. Specifically, all identifiers associated with data submitters will be eliminated and replaced with fictitious vessel and processor identifiers for purposes of analyses. However, in cases where the data are requested by NMFS Alaska Region Restricted Access Management (RAM), NMFS Office of Law Enforcement (OLE), NOAA General Counsel (GC), the U.S. Department of Justice or the Federal Trade Commission for a purpose connected to law enforcement or qualification for quota and other Federal permits, PSMFC will provide the data and the identity of the submitter.

EDR data are used in analyses of changes in the harvest and processing sectors, and communities, included in this document (as described in Sections 5, 7, and 9, and in Appendix B). EDR data are used extensively in preparation of the annual Crab SAFE Economic Status Report, which is submitted to the Council each February as an appendix to the Crab SAFE, and data documentation is available at <https://inport.nmfs.noaa.gov/inport/item/21673>.

³¹ Amendment 42 to the BSAI king and Tanner crab FMP, Final Rule published 78 FR 36122.

Following presentation of the initial draft of the 10 Year Review document to the Council, one recommendation from the Council's Scientific and Statistical Committee stated:

"The document would be enhanced by a discussion of what was learned in the process of designing and implementing the data collection for monitoring and evaluating the crab rationalization program, and how it led to discontinuities that limit its current value."

Data from the Crab Economic Data Report (EDR) is published annually in the Crab SAFE Economic Status Report (Crab Economic SAFE), which is submitted to the Council each February as an appendix to the Crab SAFE. A chapter in the 2016 Economic SAFE provides an overview of the data collected in Crab Economic Data Report (EDR) program to date, in light of the original design and intent of the data collection, changes in reporting requirements made under Amendment 42 to the FMP, and data quality assessment efforts and findings to date.

2.4 Program Amendments

A program review provides a unique opportunity for a comprehensive evaluation of all the components of a catch share plan. However, the Council and its advisory bodies systematically evaluate impacts from the program through an adaptive management process. Since Amendment 18 and 19 to the BSAI king and Tanner crab FMP which implemented the 3-pie voluntary cooperative CR Program, there have been 24 amendments to the crab FMP,³² several Federal regulatory amendments that did not require FMP changes, and many discussion papers in which changes to the program were considered. When the Council and its advisory bodies determine a proposed action warrants evaluation, the traditional analytical process requires the consideration of a wide range of impacts. This analytical template includes direct and indirect environmental impacts, a range of economic and social impacts from the individual resource users all the way out to a national scope, as well as analysis specifically focused on the distributional impact on small entities. Table 2-5 provides a snapshot of the amendments to the FMP and Federal regulations since CR Program implementation.³³

³² Amendment numbers were given to Amendment 22, Amendment 32, and Amendment 36 of the king and Tanner crab FMP; however, action was not taken by the Secretary.

³³ Not all of these FMP amendments have directly impacted the management of the CR Program.

Table 2-5 Table of amendments to the BSAI king and Tanner crab FMP

K&TC FMP amendment number	Topic	Effective
Amendment 46	Correct the text around LLP vessel lengths in FMPs	Apr 27, 2015
Amendment 45	Modify freezer longline GOA Pacific cod sideboards	Jun 18, 2015
Amendment 44	Modify right of first refusal provisions with trailing amendment	Feb 12, 2016
Amendment 43	Revise PI blue king crab rebuilding plan with spatial closures for the groundfish fisheries	Jan 1, 2015
Amendment 42	Revise Economic Data Reports	Jul 17, 2013
Amendment 41	Create process for emergency exemption from regional delivery requirements	Jun 14, 2013
Amendment 40	Amend essential fish habitat (EFH) provisions	Oct 31, 2012
Amendment 39	Modify the snow crab rebuilding plan to define the stock as rebuilt the first year the stock biomass is above the level necessary to produce maximum sustainable yield	Aug 2, 2011
Amendment 38	Establish a mechanism to specify ACL and accountability measures for crab stocks	Aug 2, 2011
Amendment 37	Create process for Western AI golden king crab regional delivery requirement exemption	Jun 20, 2011
Amendment 36	Authorize collection of permit fees	Action dropped
Amendment 35	Crab FMP housekeeping	Oct 2011
Amendment 34	Revise crab sideboard exemptions for the Gulf of Alaska Pacific cod and pollock fishery	Jun 20, 2011
Amendment 33	Reduce the amount of fees collected under the CR Program to the amount need to finance the Federal loan program	Aug 24, 2009
Amendment 32	Extending cooling off period for St. George and revise right of first refusal conditions for St. George	Action dropped
Amendment 31	Modification to temporarily expand C-Share transfer eligibility, increase C-share active participation requirements, remove prohibition on leasing of C-shares, and to establish an	May 1, 2015
Amendment 30	Modify procedures for producing and submitting documents under the arbitration system	Dec 5, 2011
Amendment 29	Joint amendment implementing the Arctic FMP	Dec 3, 2009
Amendment 28	Establish provision allowing post-delivery transfer of QS	Sept 14, 2009
Amendment 27	Exempt custom processing from use caps on processing shares in some CR fisheries	Jun 29, 2009
Amendment 26	Exempt C shares from processor share and regional landing requirements (they were already exempt from the first 3 years of the program)	Jul 21, 2008
Amendment 25	Allow conversion of North region CVO and PQS to CPO quota for eligible entity as required under MSA reauthorization and issue PQS to Blue Dutch, LLC under specific conditions, as required by the Coast Guard Act	Jun 23, 2008
Amendment 24	Specify the 5-tier system for determining stock status, and for setting OFL. Remove 12 crab stocks from the FMP	Jun 6, 2008
Amendment 23	Revise the Aleutian Islands Habitat Conservation Area boundary to allow nonpelagic trawling in an area historically fished and prohibit nonpelagic trawling in an area of known coral and sponge occurrence	Mar 20, 2008
Amendment 22	Modify CDQ Eligibility for consistency between regulations and MSA	Superseded by MSA change
Amendment 21	Modify deadline to match harvesting and processing shares and the timing for initiating arbitration proceedings	Aug 14, 2006
Amendment 20	Split the Eastern Bering Sea Tanner crab stock be split into 2 fisheries with separate harvester and processor QS	Jul 7, 2006
Amendment 19	Amendments 18 and 19 implemented the voluntary 3-pie cooperative Crab rationalization program (with correction in Jun 8, 2005)	Apr 1, 2005
Amendment 18		

Source: NOAA AK Region

Table note: FMP amendment text, Final (Secretarial) Review Draft Analyses, Proposed, and Final Rules to these amendments are linked here: <https://alaskafisheries.noaa.gov/fmp-amendments>

3 STOCK STATUS AND BIOLOGICAL INDICATORS

This section begins by providing baseline information on the stock status for the crab species in the CR Program fisheries. While it is difficult to isolate the impact of the CR management regime on the overall health of the crab resource given other ecological factors, it is important to consider this program review in the context the species stock status. Including information on the status of the resource is necessary context in understanding impacts from the CR Program on other aspects of the fishery (e.g. harvesting, processing, communities, crew, etc.).

While it may be difficult to attribute casualty to the total health of the crab resource resulting from the implementation of the CR Program, there are certain more specific biological indicators that were expected to be directly impacted through coordinated management efforts between amendments to Alaska State policy and the Federal implementation of the CR Program. The goals for the program broadly speak to resource utilization and conservation objectives:

- 1) *[Promote] resource conservation, utilization, and [address] management problems;*
- 2) *[Reduce] bycatch and its' associated mortalities, and potential landing deadloss;*

Slowing the race for fish, resulting in changes in fishing patterns was expected to affect a number of biological indicators. This review evaluates indicators such as: 1) harvest above the catch limits, 2) improvement of data quality, 3) abundance of overfished stocks, 4) high grading, 5) rail dumping, 6) handling mortality, 7) soak times, catch per unit effort (CPUE) and gear selectivity, 8) lost pots and ghost fishing, and 9) season lengths and temporal and spatial dispersion. This section evaluates these indicators in the context of the program.

3.1 Stock Status

There are 10 crab stock assessments conducted for the BSAI crab fisheries managed under the FMP. Some crab stocks are considered one unit stock for assessment purposes, but are managed as more than one fishery. Eastern and Western Aleutian Islands golden king crab are assessed as one stock, but are managed as distinct fisheries with separate apportionments for the TAC. The Eastern Bering Sea Tanner crab stock was also split into 2 distinct fisheries in the CR Program through Amendment 20. Conversely, Pribilof red and blue king crab are managed as one fishery, with one TAC, but are assessed as separate stocks. Additionally, two and a half of the stocks managed under the FMP, and assessed on an annual basis, are not part of the nine fisheries identified in the CR Program (as listed in Section 2.3). The 10 Federal crab stocks annually assessed include:

- Eastern Bering Sea snow crab
- Bristol Bay red king crab
- Eastern Bering Sea Tanner crab (*represents 2 rationalized fisheries*)
- Pribilof Islands red king crab (*combined with PI blue king crab in rationalized fishery*)
- Pribilof Islands blue king crab (*combined with PI red king crab in rationalized fishery*)
- Saint Matthew blue king crab

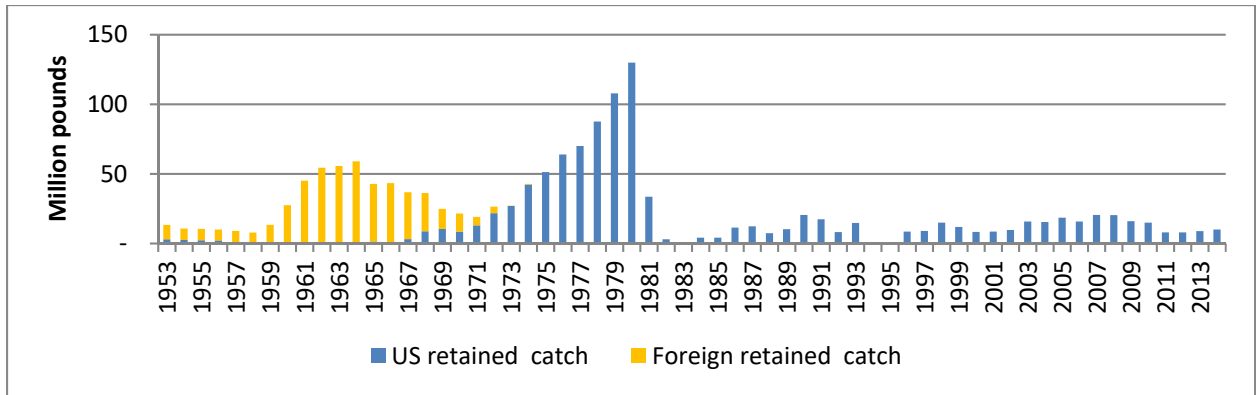
- Norton Sound red king crab (*not rationalized*)
- Aleutian Islands golden king crab (*represents 2 rationalized fisheries*)
- Pribilof Islands golden king crab (*not rationalized*)
- Western Aleutian Islands red king crab (*rationalized west of 179° W longitude*)

This section provides a very brief overview of the status of the nine CR Program crab fisheries relative to these stock assessments and TACs. The most recent and more detailed information on BSAI crab stock status can be found in the annual SAFE report (NPFMC 2015b).

The domestic red king crab fishery in Bristol Bay began to expand in the late 1960s and peaked in 1980 with a directed pot catch of 129.9 million pounds (see Figure 3-1). The catch declined dramatically in the early 1980s, resulting in a fishery closure 2 years later. Catch has remained at moderate to low levels during the last three decades. An annually updated sex and size structured stock assessment model is available for this stock 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. This assessment (together with Eastern Bering Sea snow crab) continues to be among the most data-rich crab assessments³⁴ for the federally managed BSAI crab stocks. Model estimates of total survey biomass increased from 544.8 million pounds in 1975 to 349.5 thousand t in 1978, fell to 76.1 million pounds in 1985, generally increased to 207.01 million pounds in 2007, and subsequently declined to 156.1 million pounds in 2015. 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 gradual declining trend. Recruitment has been poor (less than the mean from 1984-2015) since 2006. In the 2015/2016 season the catch limit was set at 9.974 million pounds. The stock was estimated to be at 95% of its target (B_{MSY}) level in 2015/16 (Zheng & Siddeek 2015).

³⁴ Bristol Bay red king crab has been determined by the SSC to be in Tier 3 of the BSAI Crab Tier System, indicating that reliable estimates of B (*biomass*), F_{MSY} (a harvest strategy which, if implemented, would be expected to result in a longterm average catch approximating maximum sustainable yield (MSY)), and B_{MSY} (the biomass that results from fishing at constant FMSY and is the minimum standard for a rebuilding target when a rebuilding plan is required) or their respective proxy values, are available.

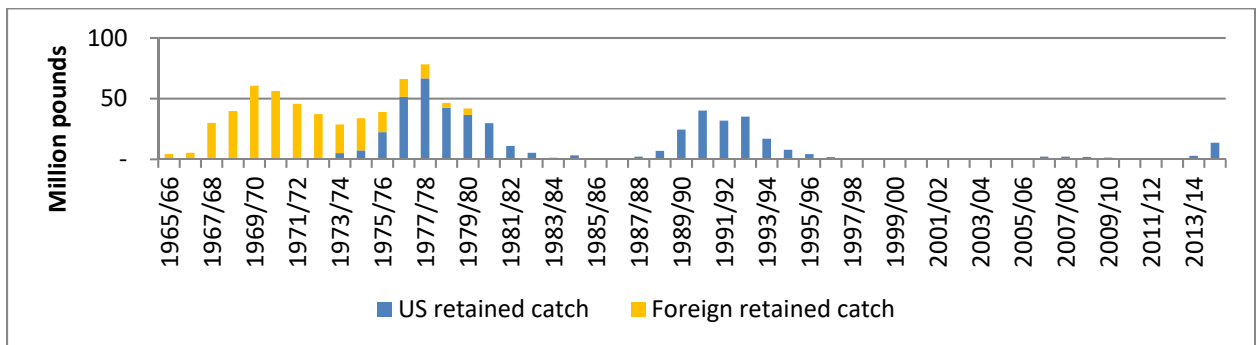
Figure 3-1 Retained catch for the BBR directed pot fishery



Source: Table 1. from Zheng and Siddeek (2015, page 205)

The overall Eastern Bering Sea Tanner crab stock is considered a single stock but as noted previously, it has been managed in two distinct areas (east and west of 166° W longitude) for TAC-setting purposes since 2006. The stock has gone through cycles of being declared overfished, with fishery closures in 1997 to 2005 and then again between 2010 and 2013 (refer to Section 3.2.2.1). Since 2012, an annually updated size and sex specific stock assessment model has been employed to estimate stock size and biological parameters, this coupled with a revised estimate of B_{MSY} have led to a different perception of stock status. The stock is considered to be in healthy condition. Nevertheless, estimates of recruitment since 1999 have been generally low relative to the peaks estimated for the period prior to 1990 and estimates of recruitment in the last four years are below the 1982 – 2015 average. The stock is currently estimated to be well above its target B_{MSY} value.

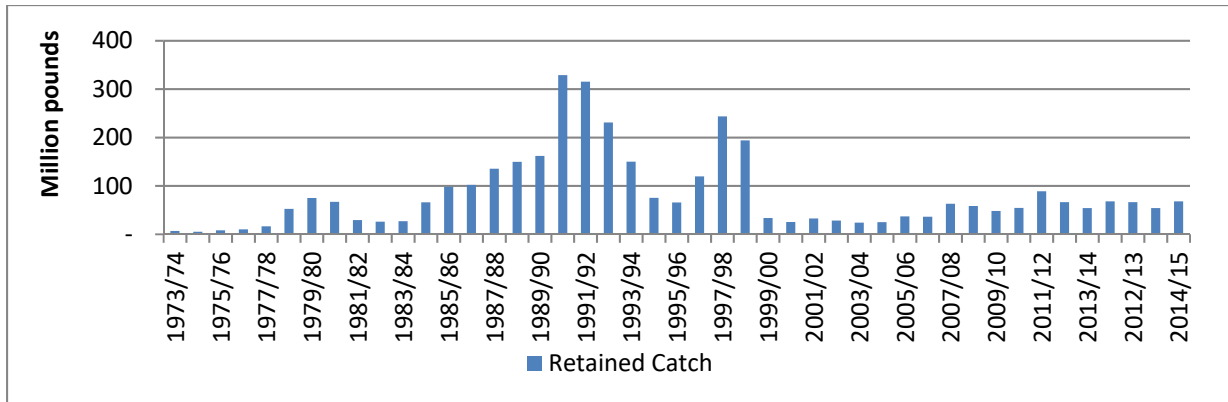
Figure 3-2 Retained catch for the EBT and WBT directed pot fisheries combined



Source: Table 2. from Stockhausen (2015, page 340)

The largest volume of crab is traditionally harvested in the Eastern Bering Sea snow crab fishery. This stock is also information-rich for BSAI crab stocks with an assessment based on a size and sex structured annually updated assessment model. Stock status for snow crab has fluctuated over the years following an overfished declaration in 1999 and a period of rebuilding resulting in the stock being rebuilt in 2011. Mature male biomass estimates increased until 2013 then declined. Current biomass is estimated at 84% of B_{MSY} .

Figure 3-3 Retained catch for BSS directed pot fishery

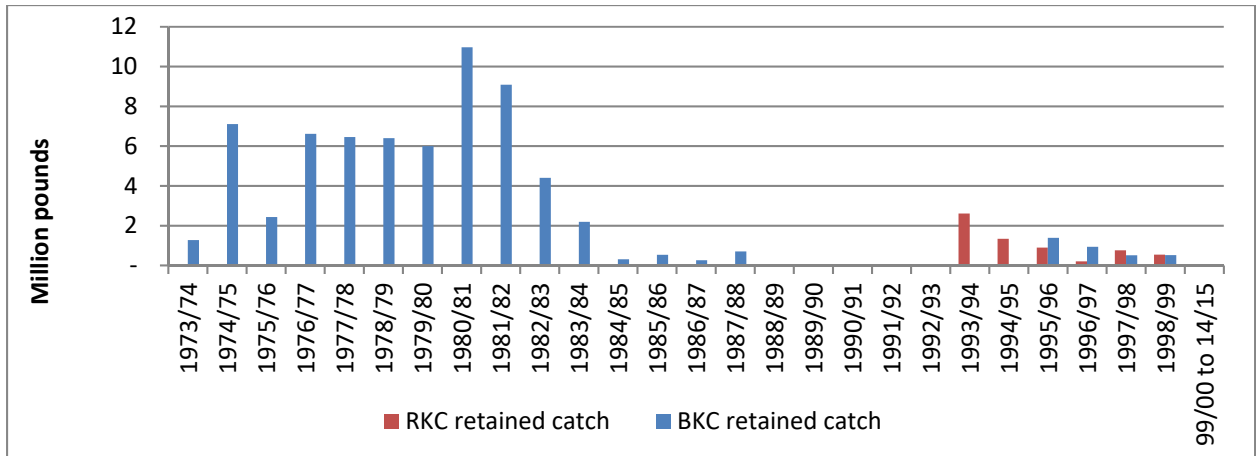


Source: Table 1. from Turnock and Rugolo (2015, page 78)

Note: Between 1973/74 through 1981/82 retained catch includes Japanese directed fishing

Pribilof Islands red king crab and blue king are separate species and stocks, but operate as a combined fishery for purposes in the CR Program. A separate harvest strategy by stock has not been established by the Board of Fisheries thus a single GHL was used for both stocks when the fishery was last prosecuted from 1996-1998. As a result, the Pribilof red king crab fishery has been closed since 1999 due to uncertainty in estimated red king crab abundance and concerns for bycatch mortality of blue king crab, which is overfished and severely depressed. The red king crab stock has very rarely produced an abundant fishery in the Pribilof Islands. The Pribilof Islands blue king crab stock was declared overfished in 2002 and since that time has failed to demonstrate progress toward rebuilding. A revised rebuilding plan was implemented under Amendment 43 in 2015 which closes the Pribilof Island Habitat Conservation Zone (PIHCZ) to fishing for Pacific cod with pot gear, which accounts for the highest recent bycatch rates on this stock. The PIHCZ has been closed to groundfish trawling since 1998. Both stocks have annually updated stock assessments which rely on a random effects model applied to survey data from the annual EBS bottom trawl survey. The Pribilof Island red king crab stock trawl survey abundance estimates have fluctuated dramatically leading to concerns regarding the uncertainty in trawl survey estimates for this stock while the Pribilof Islands blue king crab stock abundance continues to be depressed with limited signs of recruitment.

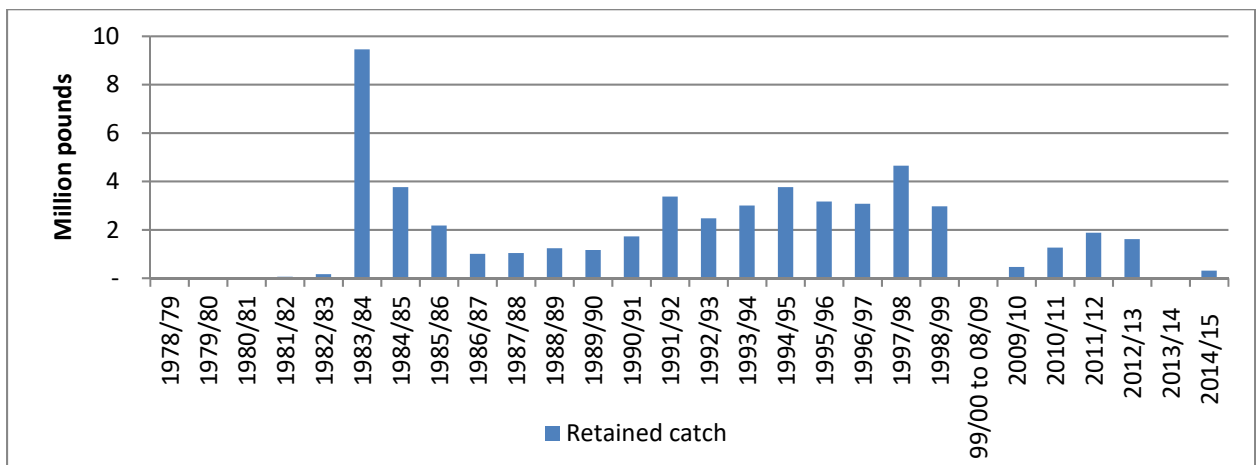
Figure 3-4 Retained catch for PIK



Source: Table 1. from Szuwalski and Turnock (2015, page 464) and Table 1. from Stockhausen (2015, page 531)

After a closure that lasted for 10 years, while under a rebuilding plan which began in 2000, the Saint Matthew Island blue king crab stock was declared rebuilt in 2009 and the fishery was opened for the 2009/10 season (see Section 3.2.2.1 for more detail on rebuilding overfished stocks). Due to low area-swept survey results in 2013, the fishery was closed for the 2013/14 season, but was subsequently reopened for the 2014/15 season and is currently open to fishing. The stock is assessed using a three-stage catch-survey analysis that is considered an improvement on the use of smoothed survey data alone as it incorporated multiple data sets including commercial catch data, survey data, bycatch data and size composition data. Trawl survey data have shown a decline until 2013, with recent estimates higher but estimated with a great deal of uncertainty. The stock has been estimated to be in a decline for several years with limited outlook for recovery in the near future.

Figure 3-5 Retained catch for SMB



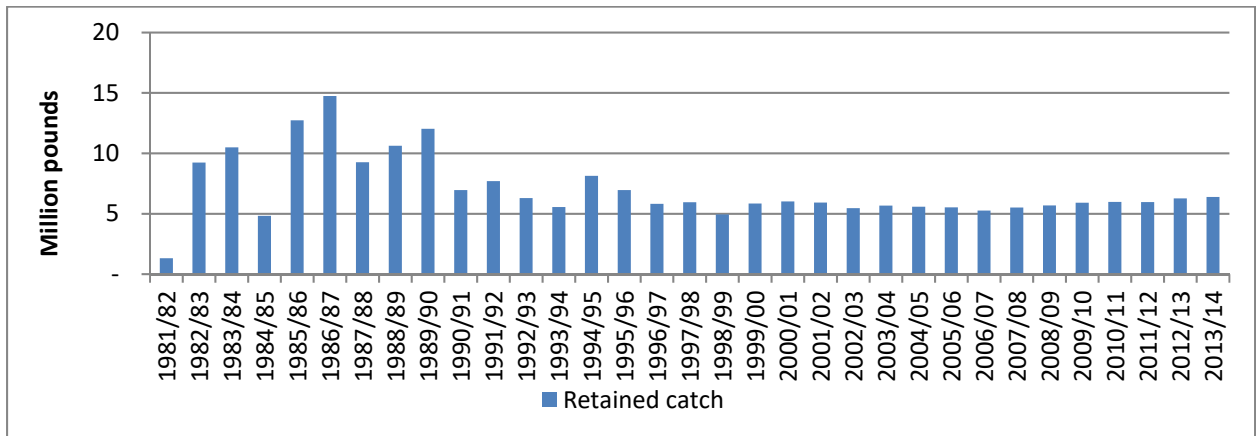
Source: Table 1. from Zheng and Pengilly (2015, page 582)

Note: Harvest in 1978/80 is confidential due to participation from less than 3 vessels

Aleutian Island golden king crab is a Tier 5 stock, which means there is no reliable biomass information available nor an approved model-based stock assessment based upon other available

data (e.g., CPUE). Instead stock assessment is based on historical average catch with a significant buffer (25% in recent years) between the ABC and OFL. Catch limits are specified in State regulation thus harvest has remained consistent between 5.2 and 6.3 million pounds. Catch per pot lift of retained legal males decreased from the 1980s into the mid-1990s, but increased steadily following the 1994/95 season and increased markedly at the initiation of the CR Program in the 2005/06 season (Pengilly 2015).

Figure 3-6 Retained catch for WAG and EAG



Source: Table 1. from Pengilly (2015, page 861)

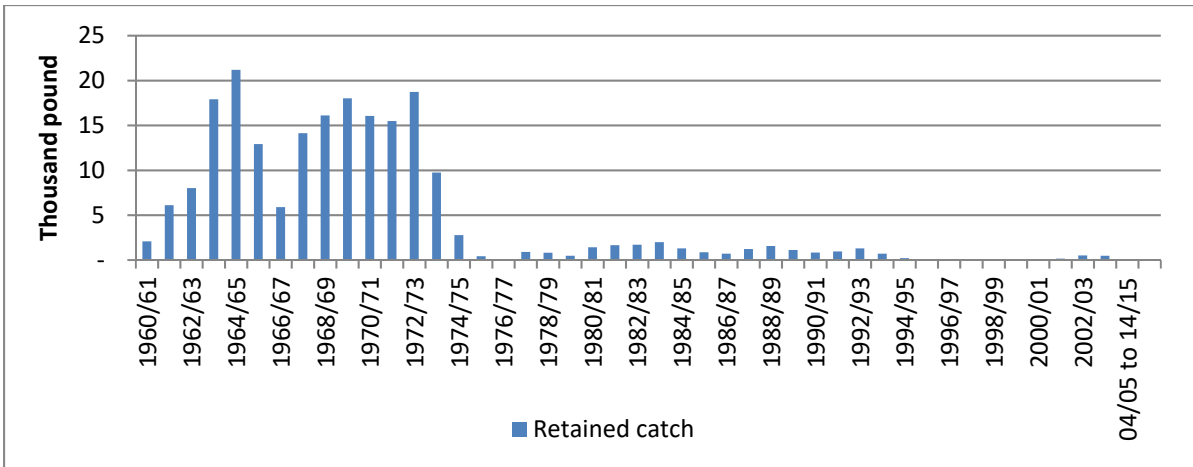
The Aleutian Islands red king crab stock is composed of an eastern fishery (East of 171° W longitude; the “Dutch Harbor stock”), which has been closed since the 1983-1984 season and is not in the FMP, and 2 fisheries in the west region (West of 171° W longitude)³⁵ that are in the FMP. The fisheries in the western region are subject to different management regimes. The Petrel Bank portion (West of 179° W longitude) is subject to the CR Program and the Adak portion (between 171° W and 179° W longitude) is not.³⁶ Biomass information for the stock is insufficient to determine stock status thus assessments are based solely on average historical catch with catch specifications recommended based upon bycatch needs in other fisheries.

Retention of red king crab in the western Aleutian Islands has been permitted only sporadically since 1995 and the entire western Aleutian Islands has been closed to fishing for red king crab since the 2004/2005 season. ADF&G conducted pot surveys on the Petrel Bank in 2001, 2006, and 2009, with limited crab encountered in these surveys. A recent exploratory survey conducted in 2015 also encountered limited crab in the area.

³⁵ The western fishery was considered west of 172° W longitude prior to 1984-1985 and west of 171° W longitude since 1984-1985.

³⁶ A proposal currently being considered by the Council would remove the Adak portion of the Western Aleutian Islands red king crab stock from the FMP and move the management authority to the state of Alaska.

Figure 3-7 Retained catch for WAI

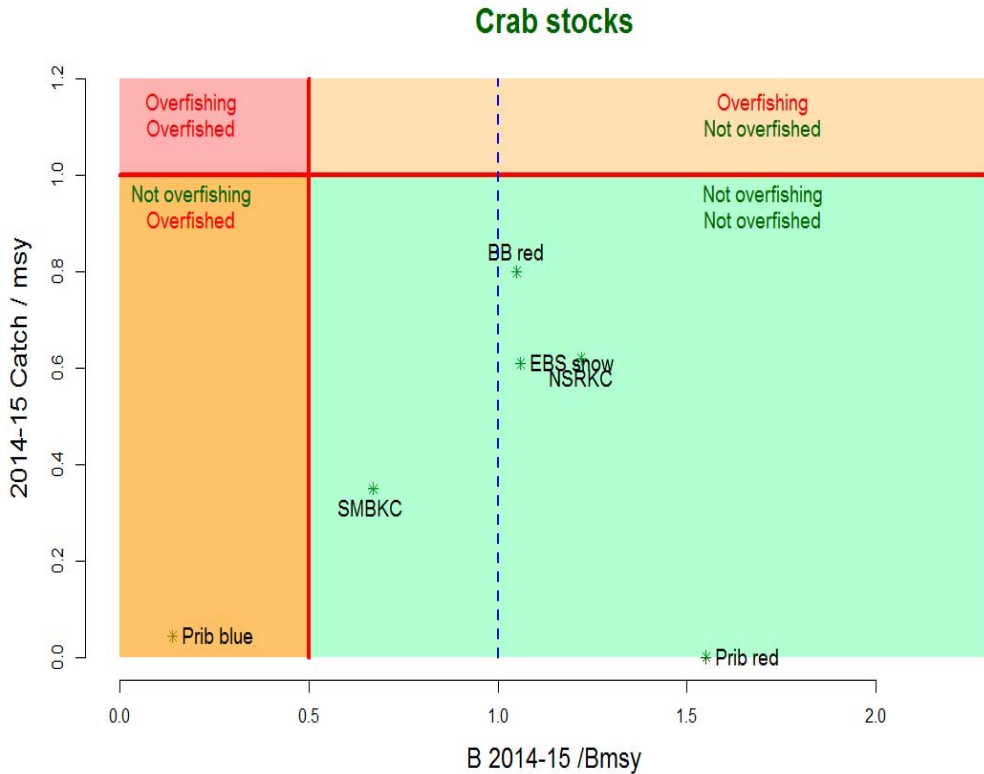


Source: Table 1. from Pengilly (2015, page 929)

Note: Harvest represents Aleutian Islands red king crab harvest west of 172° W longitude prior to 1984/85 and harvest west of 171° W longitude since 1984/85. Harvest in 1998/99 is confidential due to participation from less than 3 vessels.

Figure 3-8 visually represents where each stock falls in relation to stock status determination criteria. This figure demonstrates that the North Pacific is not overfishing any federal BSAI crab stocks; however, Priblof blue king crab remains overfished.

Figure 3-8 2014/15 Status of 7 Bering Sea crab stocks in relation to status determination criteria (BMSY, MSST, overfishing)



Note: Information is insufficient to assess Tier 5 stocks according to these criteria (WAIRKC, AIGKC, PIGKC).

3.2 Biological Indicators

3.2.1 Harvest Above the Catch Limits

Catch in excess of the harvest targets was difficult to prevent in the derby-style fisheries that predated the CR Program. Even with good in-season assessment and catch reporting, a large efficient fleet can quickly surpass a harvest target when they locate high concentrations of crab. Between 2000 and 2004, the GHl for Bristol Bay red king crab was exceeded in 2 out of 5 years; the GHl for Bering Sea snow crab was exceeded in 5 out of 6 years; and the GHl for Aleutian Islands golden king crab was exceeded in 2 out of 5 years (NPFMC 2015b). Since the implementation of the CR Program, the TAC for these target fisheries has never been exceeded (Table 3-1).

Table 3-1 GHL, or TAC, and harvest for crab fisheries in 2000 through 2014/2015 in millions of pounds

Season	BBR		BSS		AIG		BST		SMB	
	GHL/TAC	Harvest	GHL/TAC	Harvest	GHL/TAC	Harvest	GHL/TAC	Harvest	GHL/TAC	Harvest
2000	7.7	7.5	26.4	30.8	5.7	6	Closed		Closed	
2001	6.6	7.8	25.3	23.4	5.7	5.9				
2002	8.6	8.9	28.5	30.2	5.7	5.5				
2003	14.5	14.5	23.7	26.2	5.7	5.7				
2004	14.3	14.1	19.3	22.2	5.7	5.6				
2005	no season		19.4	23	no season		1.5	1	Closed	
2005/2006	16.5	16.5	33.5	33.3	5.1	5				
2006-2007	13.9	13.9	32.9	32.7	5.1	4.7				
2007-2008	18.3	18.3	56.7	56.7	5.1	4.9				
2008-2009	18.4	18.3	52.7	52.7	5.4	5.1				
2009-2010	14.4	14.3	43.2	43.2	5.4	5.3	1.2	1.2	1.1	0.1
2010-2011	13.4	13.3	48.9	48.9	5.4	5.4	Closed		1.4	1.1
2011-2012	7.1	7.1	80	79.9	5.4	5.4			2.1	1.7
2012-2013	7.1	7.1	59.7	59.6	5.7	5.6			1.5	1.5
2013-2014	7.7	7.7	48.6	48.6	5.7	5.6	2.8	2.5	Closed	
2014-2015	9	8.9	61.2	61.1	5.7	5.4	13.6	12.2	0.6	0.3

Source: ADF&G fish ticket database 2015

Table notes: For seasons prior to 2005-2006, seasons are designated by the year in which they opened prior to the CR Program. All GHL/TACs and harvests are for general/IFQ fishery (excluding CDQ).

3.2.2 Improvements in Data Quality

3.2.2.1 Data Collection

New recordkeeping and reporting regulations implemented with the CR Program have improved in-season fishery data collection. All vessels are required to complete daily fishing logbooks.³⁷ This has increased the consistency of reporting among participants and improved summaries of catch and effort data by fishing location collected by observers and dockside samplers at the time of landing. Federal regulations also require Registered Crab Receivers to use eLandings, an interagency electronic reporting system, for crab landing reports. The system has built-in error checking, such that only valid values can be entered. In this way, most processor entry errors are caught immediately.

The slower pace of the crab fisheries also contributes to data improvements. Sampling paperwork is completed, entered, and edited more promptly. Longer seasons provide additional in-season opportunities to instruct dockside and observer staff, which also contributes to higher quality data.

3.2.2.2 Fishery Foundations

³⁷ § 680.5 (a)

Progress towards developing collaborative research programs between the crab industry and management agencies was slow prior to the CR Program. Along with the CR Program came the formation of industry-funded research foundations starting with the Bering Sea Fisheries Research Foundation (BSFRF) in 2003. BSFRF was formed by crab industry leaders to support collaborative research projects aimed at improving the management of Bering Sea crab fisheries.

Voluntary contributions from Bering Sea and Aleutian Island crab industry members provide the majority of funding for BSFRF. Other important funds for BSFRF research have come from North Pacific Research Board grants, Alaska community support funds, and marine trade support industries. Currently, about 95% of the industry (both harvesters and processors) contribute the Foundation. BSFRF has worked with managers from NMFS and ADF&G, as well as researchers at the University of Alaska Fairbanks and the University of Washington to advance the scientific information used in the annual assessments of Bering Sea crab stocks. Project and funding highlights of BSFRF include:

- Results from net efficiency surveys conducted for snow crab in 2009 and 2010 parallel to the eastern Bering Sea (EBS) bottom trawl survey have improved the survey catchability parameters within the snow crab stock assessment model and have increased the accuracy and precision of snow crab biomass estimates.
- Improved trawl selectivity experiments; side-by-side sampling during NMFS summer survey covered Bristol Bay survey stations during the 2013-2015 field seasons collecting red king crab and Tanner crab. The pending results from this 3-year project are expected to improve Tanner and red king crab survey catchability parameters.
- Snow and Tanner crab growth studies; data from these experiments (2010-11, 2014) will improve the estimation of snow and Tanner crab growth per molt within the stock assessment models. Collection and holding of live molting samples is difficult, current sample sizes are small, and further efforts to increase growth sample sizes for both snow and Tanner crab are underway.
- Snow and Tanner crab discard mortality research; specially trained observers collected data during crab fishing (2011-2012) to assess the condition of crab on deck. Data from these projects are used to refine the estimates of discard and handling mortality within the stock assessment models.
- Funding of independent research for management; analysis of the minimum size limit for EBS Tanner crab fisheries; this research was reviewed and approved by the Alaska Board of Fisheries where the minimum size limit for legal Tanner crab was reduced.
- Independent expert reviews of research and baseline science used in modeling and stock assessment of Bering Sea crab stocks. BSFRF science advisors attend and participate in most crab management meetings hosted by NPFMC and others.
- Alternative model support; annual support for research and development of the Generic Models for Alaska Crab (GMAC, since 2009). BSFRF initiated the development of independent and generic stock assessment models for crab with important collaboration to date with current crab stock assessment modelers/authors. GMACs are expected to come online in support of current modeling in 2016.
- Increased support for other crab research groups; expanded support of the Alaska King Crab Research, Rehabilitation, and Biology Program (AKCRRAB, since 2011). BSFRF

has committed to support of a post-doc researcher (2015-16) for life history and other research, and furthering future goals of rehabilitation efforts.

In 2012, the Aleutian King Crab Research Foundation (AKCRF) was formed by quota share holders in the Aleutian Islands golden king crab fishery. Many of these individuals also hold quota shares for the Aleutian Islands red king crab fishery. The goal of the Foundation is to promote scientific research activities essential for the management and conservation of Aleutian Islands king crab. In order to accomplish this, the Foundation engages in cooperative research between the industry, ADF&G, and NMFS to improve stock assessment of Aleutian Islands golden and red king crabs and provide other stock-specific life history information. Relatively little information exists on the stock status and basic life history of these animals, especially golden king crab. For these reasons, AKCRF has focused on filling in gaps in the knowledge of these crabs, especially information needed for population modeling. To help gain biological information essential to understanding these crabs, AKCRF has provided several small shipments of live golden king crab to the NMFS lab in Kodiak for a variety of research, including handling mortality, ocean acidification impacts, and growth studies.

One of the first issues AKCRF focused on was the lack of female and young male crabs caught in commercial pots, which are designed to allow these smaller crabs to escape. A cooperative project with ADF&G comparing catch from small mesh pots with catch from commercial gear showed that there were large numbers of female and small male crabs and that the commercial pots were successfully allowing them to escape.

Pilot surveys for golden king crab began in the eastern and western Aleutian Islands in 2014. In August 2015, a fully developed stratified random survey design was successfully implemented in the eastern Aleutian Islands. This approach will be extended to the western Aleutians in 2016. Because of the large changes in the conduct of the fishery over the years, an appropriately designed and implemented pot survey would provide a more reliable index of relative stock abundance, than the current draft approach that uses standardized fishery CPUE indices. In 2015, AKCRF also collaborated with ADF&G and the Adak Community Development Corporation on a “reconnaissance” survey for red king crab in the waters of the Adak District and exploratory red king crab survey work in the Petrel Bank District has been proposed for 2016. As part of these surveys, AKCRF is cooperating with ADF&G in the collection of genetic samples for both golden and red king crab. This information will help define stock structure and may help identify management boundaries.

3.2.3 Abundance of Overfished Stocks

Section 304(e)(3)(A) of the Magnuson-Stevens Act requires the Council to implement a plan to rebuild stocks that are determined to be overfished to a level that can support maximum sustainable yield. The Bering Sea snow crab, Bering Sea Tanner crab, Pribilof Islands blue king crab, and Saint Matthew Island blue king crab stocks were managed under rebuilding plans when the CR Program was implemented. As of 2016, only the Pribilof Islands blue king crab stock remains overfished.

The Bering Sea snow crab stock was declared overfished in 1999 when the stock size fell below the minimum stock size threshold. A rebuilding harvest strategy was developed and implemented in 2000 (Amendment 14). The stock was declared rebuilt in 2011.

The Saint Matthew Island blue king crab stock was declared overfished in 1999 and a rebuilding plan was implemented in 2000 (Amendment 15). The rebuilding plan included a regulatory harvest strategy established in regulation by the Alaska Board of Fisheries (5 AAC 34.917), area closures, and gear modifications. The stock was declared rebuilt in 2009.

The Bering Sea Tanner crab stock was first declared overfished in 1999 and the NPFMC developed a rebuilding plan. In 2007, NMFS determined that the stock was rebuilt. In 2010, the mature male biomass was estimated to be below the Minimum Stock Size Threshold and NMFS declared the stock overfished. The stock was declared rebuilt in 2012.

The Pribilof Islands blue king crab stock was declared overfished in 2002 and a rebuilding plan was implemented in 2003 (Amendment 17). ADF&G developed a rebuilding harvest strategy as part of the comprehensive rebuilding plan, which included closing the directed fishery until the stock was rebuilt. In 2009, NMFS determined the stock would not meet its 10-year rebuilding horizon of 2014 and a revised rebuilding plan was implemented. Amendment 43 to the Crab FMP amends the prior rebuilding plan to incorporate new information on the likely rebuilding timeframe for the stock, taking into account environmental conditions and the status and population biology. Amendment 103 to the BSAI Groundfish FMP closes the Pribilof Islands Habitat Conservation Zone to pot fishing for Pacific cod to promote bycatch reduction on the stock. These amendments were adopted by the Council in 2012 and approved by the Secretary of Commerce in early 2015. The Pribilof Islands Habitat Conservation Zone has been closed to bottom trawling since 1995.

3.2.4 Deadloss

Deadloss is the amount of dead crab landed at the dock. Deadloss also includes any illegal crab that cannot be processed or sold, such as illegal species, females, and undersized male crabs. All deadloss is discarded, because it cannot be sold. As long as all deadloss is landed, it is an economic problem rather than a biological problem, because deadloss is deducted from the TAC and IFQ allocations. Deadloss is exacerbated when vessels are not able to offload quickly, due to longer trips or extended wait times at the dock, as mortality of crab in the tank increases over time.

Deadloss in the Bristol Bay red king crab and the Aleutian Islands golden king crab fisheries has decreased post-rationalization, compared to the time period immediately preceding implementation of the CR Program (Table 3-2). In the Bering Sea snow crab fishery, the rate of deadloss is overall lower than before the CR Program. In the first year of fishing after being closed for more than 10 years, the rate of deadloss in the Saint Matthew Island blue king crab was greater than other fisheries at slightly more than 2% of catch. Since deadloss is counted against IFQ allocations, this deadloss presents no biological risk.

Table 3-2 Deadloss in the crab fisheries, 2000 through 2014/2015

Fishery	Season	Live Catch** (in pounds)	Deadloss* (in pounds)	Deadloss per pound of catch
BBR	2000	7,514,027	32,118	0.004
	2001	7,729,152	57,294	0.007
	2002	8,824,651	32,177	0.004
	2003	14,300,854	228,270	0.016
	2004	13,951,875	160,563	0.012
	2005-2006	16,400,951	77,507	0.005
	2006-2007	13,965,363	99,320	0.007
	2007-2008	18,195,826	131,954	0.007
	2008-2009	18,142,200	160,812	0.009
	2009-2010	14,220,336	111,467	0.008
	2010-2011	13,250,317	99,612	0.008
	2011-2012	7,020,040	30,155	0.004
	2012-2013	7,035,753	28,783	0.004
	2013-2014	7,679,892	60,587	0.008
	2014-2015	8,893,428	52,390	0.006
BBS	2001	22,952,162	429,884	0.019
	2002	29,648,206	585,288	0.02
	2003	25,535,615	662,409	0.026
	2004	21,945,773	224,377	0.01
	2005	22,812,094	224,139	0.01
	2005-2006	32,933,551	322,595	0.01
	2006-2007	32,320,742	379,132	0.012
	2007-2008	56,224,574	500,156	0.009
	2008-2009	52,290,488	402,679	0.008
	2009-2010	42,712,534	500,049	0.012
	2010-2011	48,537,947	314,505	0.006
	2011-2012	79,356,202	585,054	0.007
	2012-2013	59,191,288	428,314	0.007
	2013-2014	48,230,385	354,423	0.007
	2014-2015	60,600,530	546,042	0.009
BST	2001 - 2005	Closed		
	2005-2006	776,752	14,288	0.018
	2006-2007	1,900,183	27,449	0.014
	2007-2008	1,886,915	19,796	0.01
	2008-2009	1,647,653	15,231	0.009
	2009-2010	1,182,452	10,492	0.009
	2010-2011 - 2012-2013	Closed		
	2013-2014	2,491,840	28,458	0.011
	2014-2015	12,100,739	140,673	0.012
	AIG	2000-2001	5,918,414	109,157
2001-2002		5,825,157	93,549	0.016
2002-2003		5,374,929	87,526	0.016
2003-2004		5,540,501	125,327	0.023
2004-2005		5,487,915	87,136	0.016
2005-2006		4,902,057	50,291	0.01
2006-2007		4,643,121	51,079	0.011
2007-2008		4,893,875	44,225	0.009
2008-2009		5,034,618	46,919	0.009
2009-2010		5,249,096	64,691	0.012
2010-2011		5,268,392	101,957	0.019
2011-2012		5,316,298	55,716	0.01
2012-2013		5,510,474	128,288	0.023
2013-2014		5,529,173	65,167	0.012
2014-2015	5,273,253	87,416	0.017	
SMB	2004 - 2009-2010	Closed		
	2009-2010	450,375	10,484	0.023
	2010-2011	1,098,415	9,253	0.008
	2011-2012	1,673,125	25,582	0.015
	2012-2013	1,433,248	19,806	0.014
	2013-2014	Closed		
	2014-2015	295,197	5,525	0.019

Source: ADF&G fish ticket database 2015

Table notes: For seasons prior to 2005-2006, seasons are designated by the year in which they opened prior to the CR Program. All GH/L/TACs and harvests are for general fishery, excluding CDQ.

3.2.5 Highgrading

Highgrading is the sorting of legal crab for the most valuable (typically the largest and/or cleanest) crab, and discard of the remaining legal crab to ensure that only the highest-priced portion of the catch is landed and counted against the IFQ. Some of this discarded crab dies. Highgrading can lead to additional fishing mortality of legal males in excess of IFQ allocations and can cause target harvest rates to be exceeded. Highgrading may also affect mortality of female and sublegal crab, if more pot lifts are required to catch the TAC. Highgrading is driven by market preferences for clean-shelled crab, as processors may pay less for or refuse to accept dirty (old shell) crab.

During the 2005-2006 Bristol Bay red king crab fishery, the number of legal male crabs captured during the fishery and subsequently discarded was dramatically higher than pre-rationalized

seasons (Table 3-3). After the high discard rates in 2005-2006, ADF&G identified concerns about resource sustainability under their harvest strategy because they had not accounted for the high level of discards. The 2005-2006 legal male discards were linked to the shell condition of the crab (Barnard and Pengilly 2006); the 2005 Eastern Bering Sea trawl survey found a notably higher proportion of old shell condition crab (40 percent) than had occurred in previous years. A high incidence of old shell crab during the fishery and subsequent lower market value was likely a key contributor to the widespread highgrading. After the 2005-2006 season, crab industry harvesters, processors, and cooperative members agreed to improve retention of legal size crab to the level of the pre-rationalized fishery in the years 1999-2004, and to reduce bycatch of females and sublegal males. From 2006-2007 through 2013-2014, processors changed their pricing structure to reflect their support for a full retention policy by moving to a single price that does not distinguish for shell condition. ADF&G reduced the TAC for the 2006-2007 season by a corresponding amount of the higher rate of legal male mortality during the 2005-2006 season. Highgrading was not evident during the 2006-2007 through 2013-2014 seasons; however, higher levels of highgrading occurred during the 2014-2015 season. The 2014-2015 legal male discard rates were similar to levels seen during the 2005-2006 season and were again associated with shell condition. Some processors offered tiered pricing during the 2014-2015 season, which likely contributed to the high discard levels. ADF&G reduced the TAC for the 2015-2016 season to account for the high legal male discard rates of the 2014-2015 season.

Discard rates for legal males have been slightly higher during the Bering Sea snow crab fishery in some years under the program, but have not increased to a level that required adjustments in the TAC setting process. New shell condition is particularly important in the Bering Sea Tanner and snow crab fisheries, and snow and Tanner crab are selectively harvested for sizes larger than the minimum legal size. Harvesters try to avoid areas with high concentrations of old shell snow and Tanner crab when it is economical to do so. Harvest strategies for both fisheries account for these selectivities and the resulting bycatch in setting the harvest rate (NMFS 2004).

Table 3-3 Discarding in the crab fisheries 2000 through 2014/2015, in thousands of pounds

Fishery	Season	Total bycatch (in pounds)			
		Legal, non-retained	Sublegal	Female	
BBR	2000	25	3,986	440	
	2001	67	3,759	1,190	
	2002	138	4,708	71	
	2003	248	9,394	3,377	
	2004	161	4,034	1,374	
	2005-2006	4,602	8,543	3,543	
	2006-2007	95	1,853	222	
	2007-2008	46	3,554	831	
	2008-2009	56	410	812	
	2009-2010	78	2,691	332	
	2010-2011	263	9,050	1,249	
	2011-2012	62	4,320	221	
	2012-2013	406	2,127	161	
	2013-2014	485	3,398	1,103	
2014-2015	2,387	3,857	728		
BSS	2001	6,248	112	6	
	2002	7,474	99	4	
	2003	15,923	297	33	
	2004	19,989	385	10	
	2005	398	86	3	
	2005-2006	10,434	197	13	
	2006-2007	17,778	508	10	
	2007-2008	21,820	550	157	
	2008-2009	18,234	245	164	
	2009-2010	9,546	241	98	
	2010-2011	5,085	15	48	
	2011-2012	12,363	351	767	
	2012-2013	17,831	249	164	
	2013-2014	27,833	374	400	
2014-2015	24,737	658	1,063		
BST	2000-2004	Closed			
	2005-2006	4	541	69	
	2006-2007	22	1,349	392	
	2007-2008	40	5,270	371	
	2008-2009	15	1,950	185	
	2009-2010	5	105	8	
	2010-2011 - 2012-2013	Closed			
	2013-2014	732	168	58	
	2014-2015	3,810	1,739	112	
	EAG	2005-2006	18	202	119
2006-2007		19	219	203	
2007-2008		21	200	128	
2008-2009		32	205	142	
2009-2010		27	253	173	
2010-2011		104	745	611	
2011-2012		174	652	434	
2012-2013		190	564	551	
2013-2014		144	604	515	
2014-2015		268	564	526	
WAG		2005-2006	12	301	119
		2006-2007	6	256	203
		2007-2008	5	335	128
		2008-2009	3	299	142
	2009-2010	10	193	173	
	2010-2011	96	55	679	
	2011-2012	96	529	655	
	2012-2013	170	546	594	
	2013-2014	212	897	743	
	2014-2015	202	788	938	
SMB	2000 - 2008	Closed			
	2008-2009	Closed			
	2009-2010	40	5,270	371	
	2010-2011	23	649	186	
	2011-2012	40	1,095	80	
	2012-2013	6	995	253	
	2013-2014	Closed			
	2014-2015	2	98	1	

Source: NPFMC 2007 (2000-2005); Barnard and Burt 2007 (2005-2006 to 2007-2008); Barnard and Burt 2008 (2006-2007); ADF&G (2007-2008 to 2009-2010 and 2014-2015); Gaeuman 2011, 2013, 2013, and 2014 (2010-2011 to 2013-2014; weights applied to bycatch numbers by ADF&G)

Table notes: values for 2014/2015 are preliminary

3.2.6 Rail Dumping

Rail dumping is the practice of emptying pots at the rail before they can be brought on deck and sorted. Because the catch is not brought on deck, it is not possible to track the contents of rail dumped pots. Prior to the CR Program, rail dumping occurred when vessels were left with pots soaking after the season had ended, which was permitted if less than 24-hour notice of a closure was provided. Short notice during the pre-rationalized seasons occurred occasionally for the Bristol Bay red king crab fishery. Rail-dumped pots were not tracked prior to the CR Program. Under the CR Program, rail dumping occurs when vessels have reached their IFQ shares or on rare occasions, to reduce sorting time when most of the catch is female or otherwise undesirable catch. Under the CR Program, vessels may form gear cooperatives, which allows vessels to share gear. This reduces the overall amount of rail-dumping and helps vessels to reach their quotas more efficiently.

Rail dumping has occurred in all of the CR Program crab fisheries. Discards associated with rail-dumped pots are estimated using average CPUE and crab weight applied to each rail-dumped pot. Mortality associated with rail dumps is not currently considered in the stock assessment or TAC setting process. The proportion of rail dumped pots, as compared to total harvested pot lifts, ranges from 0% to 5.3% and is variable by season within each fishery (Table 3-4).

Table 3-4 Estimated number of rail-dumped pots in the crab fisheries, 2005/2006 through 2014/2015

Fishery	Season	Rail dumped pots	Rail dumped pots as a percent of total effort	Average CPUE	Average weight (lbs)	Estimate of legal males rail dumped (lbs)
BBR	2005-2006	NA	NA	25	6.6	NA
	2006-2007	1,745	2.6	34	6.3	376,739
	2007-2008	813	1.2	28	6.4	146,435
	2008-2009	424	0.3	22	6.6	61,565
	2009-2010	591	0.6	21	6.3	78,189
	2010-2011	840	0.6	17.2	6.1	88,133
	2011-2012	1,018	2.3	31	6.1	192,504
	2012-2013	960	2.5	31	6.8	202,368
	2013-2014	730	1.6	25.7	6.9	129,451
	2014-2015	786	1.3	25.5	6.7	134,288
BSS	2005-2006	600	0.9	204	1.5	184,165
	2006-2007	1581	2.4	332	1.2	645,329
	2007-2008	1057	1.6	352	1.3	467,112
	2008-2009	1381	0.9	279	1.3	500,889
	2009-2010	1269	1	255	1.4	453,033
	2010-2011	1034	0.7	284.5	1.4	411,842
	2011-2012	916	0.3	231.3	1.5	317,806
	2012-2013	771	0.3	213.1	1.4	230,020
	2013-2014	1,155	0.5	186	1.3	279,279
	2014-2015	684	0.2	191.8	1.2	157,429
AIG	2005-2006	243	0.4	23	4.4	24,357
	2006-2007	1193	1.8	23	4.5	123,476
	2007-2008	527	0.8	24	4.5	56,822
	2008-2009	741	1.7	25	4.5	83,363
	2009-2010	1066	2.3	26	4.5	124,722
	2010-2011	1,223	2.2	23.3	4.6	131,081
	2011-2012	231	0.5	30.7	4.6	32,622
	2012-2013	971	1.8	28.7	4.6	128,191
	2013-2014	321	0.5	27.4	4.5	39,579
	2014-2015	742	1.3	27.8	4.5	92,824

Fishery	Season	Rail dumped pots	Rail dumped pots as a percent of total effort	Average CPUE	Average weight (lbs)	Estimate of legal males rail dumped (lbs)	
BST	2005-2006	NA	NA	12	2.2	NA	
	2006-2007	216	0.3	17	2.3	8,347	
	2007-2008	142	0.2	17	2.3	5,552	
	2008-2009	176	5.3	17	2.3	6,882	
	2009-2010	308	3.5	28	2.8	24,147	
	2010-2011 - 2011-2012	Closed					
	2013-2014	518	1.3	43.5	1.9	42,813	
	2014-2015	577	0.3	32.6	1.8	33,858	
	SMB	2005-2006 - 2008-2009	Closed				
		2009-2010	22	0.7	10	4.5	990
2010-2011		0	0	10.2	4.2	0	
2011-2012		0	0	9.4	4.3	0	
2012-2013		69	0.2	10.1	4.3	2,997	
2013-2014		Closed					
2014-2015		23	0.2	6.8	4.5	704	

Source: ADF&G

Table notes: 2014/2015 are preliminary estimates

3.2.7 Handling Mortality

Crab discarded during fishing operations contributes to mortality over and above the retained catch. Handling mortality reduces future recruitment to the fishery by reducing both survival of pre-recruits and effective spawning biomass due to deaths of mature females and sublegal males (NMFS 2004). The time of year when crabs are harvested affects the crab survival rate. Fishing seasons are designed to close during molting and mating to avoid additional mortality during these biologically-sensitive periods. Additionally, evidence indicates that crabs captured in extremely cold and windy weather suffer higher rates of handling mortality (NMFS 2004). Estimates of total catch for overfishing determinations include a calculation for mortality of crab that is brought on deck, sorted, and then discarded. This mortality calculation is based on experimental studies of crab survival. A mortality rate of 20% is applied to king crab bycatch during crab fishing operations. Improved understanding of handling mortality in Bering Sea snow and Tanner crab (Chilton et al., 2011) led to new calculations of handling mortality for stock assessments. Where a 50% mortality

rate had been applied to the crab fishery discards, the Tanner crab stock assessment now applies a handling mortality rate of 32.1% and the snow crab stock assessment now applies a handling mortality rate of 30%.

Under CR Program, the season length has extended considerably, thereby slowing the pace of fishing and allowing fishermen to improve fishing methods, including sorting on deck. Some vessels have conveyors and chutes that discard bycatch without additional handling. Under the CR Program, fishermen have more flexibility regarding when to fish, and for safety reasons are more likely to choose not to fish in the extreme weather conditions that may have been necessary prior to rationalization. It is possible that some of these considerations may have affected handling mortality.

3.2.8 Soak Times, CPUE, and Gear Selectivity

Experimental studies have shown that longer soak times, in conjunction with the required pot escape mechanisms, are likely to increase the proportion of legal versus non-legal crabs caught in the fishery (Barnard & Pengilly 2006). CPUE is also dependent on other factors as well: the size-sex distribution of the crab population, where fishing is conducted relative to the spatial distribution of non-legal and legal crabs, and the sorting of legal crabs for retention or non-retention.

Soak times in the Bristol Bay red king crab fishery have lengthened since the program was implemented from an average of 25 hours pre-program to an average of 58 hours in the first 5 years of the program and an average of 61 hours in the most recent 5 years (see Table 3-5). Over this same period, CPUE has increased from an average of 20 legal male crab per pot lift (2001- 2005) to an average of 26 legal crab per pot lift under the program (see Table 3-6).

For the Bering Sea snow crab fishery, the average soak time pre-program was 31 hours, and increased to an average of 64 hours in first five seasons of the CR Program before decreasing to an average of 54 hours during the last five years of the program. Catch per unit effort averaged 145 legal male crab per pot lift in the five seasons preceding the program, increasing to an average of 283 crab per lift in the first five seasons of the program and decreased to an average of 220 crabs per lift in the most recent five years. Anecdotal reports note that the CPUE has likely been affected by the extent of sea ice (particularly in 2005-2006 and 2011-2012) which, at times, has kept fishermen off the most productive grounds.

While data may suggest a correlation between extended soak times and legal male catch for some stocks, Table 13-3 appears to indicate that the levels of sublegal and female catch under the program remain within the range of bycatch levels from previous years.

Soak time and fishery CPUE have increased post-rationalization in both the eastern and western Aleutian Island golden king crab fisheries. Average soak time in the eastern fishery was just over four days (97 hours) pre-program and increased to an average of more than 15 days (356 – 389 hours) since the CR Program. Average CPUE in the eastern Aleutian Island golden king crab fishery increased from 13 crabs per pot pre-program to more than 25 crabs per pot in the 10 years of the program. Similarly, soak times in the western Aleutian Island golden king crab fishery

increased from an average of 12 days (281 hours) pre-program to more than 23 days (554 – 599 hours) under the program. Average CPUE in the western fishery increased from 9 to 22 crabs per pot in the 5 seasons before and after the program and decreased slightly to 20 crabs per pot during the most recent 5 years.

Table 3-5 Soak Times in the Crab Fisheries in Hours, 2001 through 2013/2014

Season	BBR	BSS	BST		AIG		SMB	
			EBT	WBT	EAG	WAG		
2001	24	44	Closed		106	230	Closed	
2002	18	40			97	291		
2003	31	27			97	322		
2004	28	21			88	279		
2005	no season	21			no season			
2005-2006	65	65	Closed	43	340	560	Closed	
2006-2007	51	64	44	54	277	456		
2007-2008	57	77	67	55	413	534		
2008-2009	57	61	47	42	358	577		
2009-2010	62	55	52	Closed	391	643		36
2010-2011	63	64	Closed		334	559		36
2011-2012	70	44			444	665		50
2012-2013	53	49			442	595		50
2013-2014	58	59	40	42	336	576		Closed
Average 2001 - 2005	25	31	NA	NA	97	281		NA
Average 2005 - 2010	58	64	53	49	356	554	36	
Average 2010 - 2014	61	54	40	42	389	599	45	

Source: ADFG summary of the mandatory shellfish observer program database (2001 through 2013/14)

Table 3-6 CPUE or catch per pot lift in crab fisheries, 2001 through 2013/2014

Season	BBR	BSS	BST		AIG		SMB	
			EBT	WBT	EAG	WAG		
2001	19	97	Closed		12	7	Closed	
2002	20	76			12	8		
2003	18	154			11	10		
2004	23	157			18	12		
2005	no season	239			no season			
2005-2006	25	203	Closed	12	26	21	Closed	
2006-2007	34	332	20	12	25	20		
2007-2008	28	349	20	11	28	21		
2008-2009	22	279	20	2	27	23		
2009-2010	21	254	28	Closed	26	25		10
2010-2011	18	254	Closed		25	21		10
2011-2012	28	224	Closed		38	24		9
2012-2013	30	220	Closed		34	20		10
2013-2014	26	180	45	32	31	15		Closed
Average 2001 - 2005	20	145	NA	NA	13	9		NA
Average 2005 - 2010	26	283	22	9	26	22	10	
Average 2010 - 2014	26	220	45	32	32	20	10	

Source: ADFG fish ticket database 2015

3.2.9 Lost Pots and Ghost Fishing

Mortality occurs when lost crab pots continue to capture animals, resulting in ghost fishing. Mortality of crab caused by ghost fishing is difficult to estimate given existing information, but studies have shown that unbaited crab pots continue to catch crabs, and pots are subject to rebaiting due to capture of other fish and crab. The impact of ghost fishing on crab stocks remains unknown. Pre-rationalization, it was estimated that 10% to 20% of crab pots were lost each year (Kruse & Kimker 1993). All pots currently fished in Bering Sea crab fisheries contain biodegradable escape mechanisms that allow catch to escape after an extended period of time, which reduces ghost fishing.

Although pot limits have been removed under the program, in practice, the average number of pots fished per vessel remains less than what was allowed pre-rationalization (NPFMC 2010a). Combined with the decrease in the number of vessels participating in the crab fisheries, overall there is less gear on the fishing grounds under the CR Program. Individual pots are used more frequently under the program during a fishing season and the higher CPUE in most fisheries results in an overall reduction in gear.

Estimates of lost pots in the post-rationalized seasons range from 1% to 14% of registered pots; however, estimates of lost pots are imprecise. In the Bering Sea snow crab fishery, sea ice is a major factor in crab pot losses caused by sea ice moving crab pots or breaking crab pot buoy lines. In the Aleutian Islands golden king crab fishery, steep bottom topography of the inter-island passes necessitates the use of longline pot gear, which is the only legal gear type. ADF&G records of lost pots represent 1% or less of the total registered pots annually in the Aleutian Islands golden king crab fishery. Longer soak times post-rationalization have led the Board of Fisheries to adopt regulations for larger biodegradable escapement twine, which may increase the amount of time that lost pots can continue ghost fishing in this fishery.

3.2.10 Season Length, Temporal and Spatial Dispersion

Under the program, the seasons for the fisheries have lengthened considerably (see Section 5.4). In years leading up to the implementation of the CR Program, the Bristol Bay red king crab fishery lasted 3 to 4 days and opened annually on October 15. Under the program, the fishery opens on the same date, but closes on January 15. Despite the extended season, most of the harvest in the fishery is completed within the first month based on market considerations. Spatial distribution of catch in the Bristol Bay red king crab fishery has diversified under the CR Program. During the 5 years prior to program implementation, harvest came from a total of 24 statistical areas, with 91% of the harvest coming from 6 statistical areas. During the 10 years since implementation, a total of 36 statistical areas have been fished, with 92% of the harvest coming from 12 statistical areas.

The Bering Sea snow crab fishery, which prior to rationalization frequently lasted less than one month, is now open for seven months (from October 15 until May 31 in the Western Subdistrict). Most Bering Sea snow crab harvest is still made during the traditional period of the fishery, from January to March; however, effort typically begins in December and often persists until late April or May. Timing of Bering Sea snow crab harvest is based on marketability due to meat-fill and shell hardness. Extensive sea ice during the 2011-2012 season resulted in ADF&G extending the season until June 15. Prior to rationalization, most of the Bering Sea snow crab fishery harvest occurred in the southern portion of the snow crab range, possibly due to ice cover and proximity to port. In 2003 and 2004, two-thirds or more of the catch was made south of 58.5° N latitude; however, in both of those years the ice edge was farther north than in past years, allowing some fishing to occur as far north as 60-61° N latitude. Since implementation of the program, catch distribution is similar to years prior to the program with catch made south of 58° N latitude and west of the Pribilof Islands between about 171° W longitude and 173° W longitude. However, during the 2008-2009 season, more than 6 million pounds of catch was harvested east and south of the Pribilof Islands between 168° W and 167° W longitude and 55.5° N and 56.6° N latitude. This southern distribution of catch has raised concern by the SSC and Crab Plan Team, which have noted that the southern catches could add pressure to the northward migration of the stock. Bering Sea snow crab harvest in the 2011-2012 fishery was primarily along the shelf edge due to sea ice covering the majority of the fishing grounds for most of the season. Harvest was again concentrated southeast of the Pribilof Islands in 2014-2015, due to poor catches in the western area of the fishery.

Bering Sea Tanner was not open in the years leading up to the CR Program but the current fishery timing is similar to historical temporal distribution, with eastern Bering Sea Tanner crab primarily harvested in October and November, and western Bering Sea Tanner crab primarily harvested in January through March. Spatial distribution of Bering Sea Tanner harvest in recent years is driven by closed areas. The eastern Bering Sea Tanner crab fishery has been restricted to waters west of 163° W longitude since the mid-1990s to protect red king crab in Bristol Bay. Management of the eastern Bering Sea Tanner crab fishery has changed since the mid-1990s which makes comparisons pre- and post-rationalization difficult. The western Bering Sea Tanner crab fishery has been restricted in recent years from areas of historically high Tanner crab fishing effort in between St. Paul and St. George Islands due to an extensive closure of waters around the Pribilof Islands to protect the Pribilof blue king crab stock.

St. Matthew blue king crab was also not open in the years leading up to the program. Prior to the fishery closure in 1998, the St. Matthew blue king crab season opened in September. After the CR Program was implemented the season for St. Matthew blue king crab was set from October 15 until February 1, however fishery effort ends prior to December due to weather. Prior to 1999, the St. Matthew blue king crab fishery harvest was concentrated nearshore, just outside state waters near St. Matthew Island (state waters around the island are closed to fishing). Since reopening under the program, catches have shifted further offshore to the southwest. Effort has been made to locate blue king crab in historical fishing locations; however, fishermen have been unable to locate concentrations of crab near St. Matthew Island and have found better catch rates to the southwest. This shift in distribution of blue king crab may be due to the later season opening date.

The Eastern Aleutian Islands golden king crab fishery is primarily prosecuted between August and November, while the western Aleutian Islands fishery runs through the entire season from August 15 through the May 15 closure. Season dates for the eastern and western Aleutian Islands golden king crab fisheries beginning in the 2015-2016 season were shifted to August 1 through April 30. Fishing effort in the eastern Aleutian Islands golden king crab fishery focuses primarily around Yunaska Island, and the Islands of Four Mountains, and in Seguam and Amukta Passes. In the western Aleutian Islands, the golden king crab fishery was prosecuted around the Delarof Islands, Amchitka Pass, and the Petrel Bank. Because of the small number of vessels participating in these fisheries, most of the landings information is confidential, both pre- and post-rationalization.

Longer seasons may benefit the crab stocks by reducing the pressure associated with derby-style fishing and allowing time for improving handling methods and sorting of crab at sea which should improve the survivability of crab bycatch. Overall, while the temporal distribution of catches has increased under the program, this expansion has been somewhat limited.

4 HARVEST SHARE HOLDINGS

Prior to implementation of the rationalization program, NOAA Fisheries managed the BSAI crab fisheries under the License Limitation Program (LLP), whereby vessels that were assigned a LLP license could participate in those fisheries designated by the license.³⁸ With the implementation of the CR Program, participation in program fisheries has been limited by QS allocation and the IFQ yielded annually by those QS.

The allocation of harvesting privileges able to be transferred through market transactions was intended to directly address some of the concerns that were present in the crab fisheries pre-implementation. Specifically allocating harvesting privileges to those holding LLP licenses and allowing these QS to be consolidated within cooperatives worked to:

³⁸ Exceptions to the LLP license requirement included vessels that do not exceed 32 feet LOA in the BSAI and a few exceptions pertaining to the Community Development Quota program.

- 3) *[Reduce] excess harvesting and processing capacity, as well as [discouraging a system that promotes] low economic returns;*
- 4) *[Promote] economic stability for harvesters, processors and coastal communities; and*
- 7) *Promote efficiency in the harvesting sector.*

This section of the review summarizes the distribution of harvest privileges under the LLP and CR Program pre- and post- implementation, with a special emphasis on the last 5 years. Presenting time-series information on the number of QS holding entities, the movement, and the concentration of privileges among entities over time, is one basic way to understand participation and changing participation in the fishery. Given the diversity and sometimes complexity in the types of entities that hold harvest privileges, this section also discusses the relative holdings of different types of entities.

Information from this section also provides context to Section 10 in which the program review focuses on trends in QS transfers in terms of entry into the fishery.

4.1 LLP Licenses

Beginning January 1, 2000 a Federal LLP license was required for vessels participating in any BSAI LLP crab fishery (as well as LLP groundfish species in GOA or BSAI). The LLP is a limited entry program which allocated licenses based on historic participation. Licenses were issued with species-area (fishery) endorsements. Licenses were issued by vessel type (catcher vessel or catcher processor) and specified a maximum vessel length (MLOA). Table 4-1 demonstrates the number of LLP licenses that were in circulation for each crab fishery at the time of program implementation (2005). Since licenses can carry multiple species-area endorsements, the total number of licenses in Table 4-1 is not additive. This type of matrix demonstrates some of the overlap between endorsements, indicative of LLP license holder diversification.

Table 4-1 LLP license in the Bering Sea and Aleutian Islands crab fisheries (2005)

Licenses endorsed for also endorsed for	BBR	BST and BSS	PIK	SMB	WAI	AIG	CP
BBR	270	264	110	168	28	25	26
BST and BSS		273	109	169	30	27	27
PIK			118	77	15	8	2
SMB				170	26	19	13
WAI					30	8	4
AIG						28	9

Source: NMFS RAM Division

The moratorium, established in 1995, limited speculative entry into the fisheries while the LLP was being developed and approved. Nevertheless, the fisheries remained heavily overcapitalized. Further, the limited access management increased the incentive for all license holders to participate in the fisheries because a person could not receive a return without participating. Some participants

allege that financial pressures of boat payments ensured their participation, as revenues from the fisheries were their primary source of income from their vessels. Participants also likely remained in the fisheries to reinforce their stake in any future history-based allocation.

Pre-CR Program, entry into the fisheries occurred in different ways. Crew members worked their way up to become skippers and used their crew compensation to purchase interests in vessels. Alternatively, persons entered the fisheries as an investment. These persons, who in some cases had no other interest or involvement in the fishery, typically used capital from other sources to purchase vessel interests in the fisheries.

As shown in Table 4-2, the transfer of LLP licenses to new entrants following implementation of the LLP was limited.³⁹ There were a number of reasons for the small volume of transfers. First, entry to the crab fisheries was costly because it required the purchase of an LLP license and a properly configured vessel from which to fish. Secondly, the continuing overcapitalization situation, together with the historically low GHs for the Bering Sea snow crab fishery, made the crab fisheries economically unattractive for potential new entrants. Moreover, as the economic benefits derived from the fisheries declined, it became more difficult to acquire financing for the purchase of licenses and vessels.

Table 4-2 Number of license transfers under LLP (2002 through 2004)

Year	Number of Transfers							
	Total	BBR	BSS and BST	PIK	SMB	AIR	AIG	CP
2002	1	1	1	0	1	0	0	0
2003	3	3	3	1	0	1	2	2
2004	1	1	0	0	0	0	0	0

Source: NMFS RAM LLP license file

Notes: Includes only transfers with change of named license holder.

4.2 Initial Allocations of QS by Sector and Region

When the program was implemented, NOAA Fisheries made initial allocations of owner QS to persons holding LLP licenses. Since many licenses were held by corporations or LLCs, aggregation by owner name typically will not reflect actual common control of QS holdings. Complex corporate ownership patterns prevented a complete assessment of changes over time in the level of concentration of ownership beyond relying on the primary named QS holder for the data in Table 3-4 and Table 4-4 displaying initial allocation holdings, and Table 4-7 and Table 4-8 displaying current holdings. Section 4.3 presents a more detailed analysis of concentration of ownership of harvesting privileges through both direct and indirect ownership interests in QS holding entities, but the presentation is limited to the current (as of the 2014/15 crab season) pool of QS holdings and does not measure change in concentration over time.

³⁹ The reported volume of LLP license transfers may be an underestimate because NOAA Fisheries Restricted Access Management recorded only those transfers in which the named license holder changed.

Table 4-3 shows a summary of the initial owner quota share allocations to harvesters in the different program fisheries. The Aleutian Island fisheries, which have the least participants, were the most concentrated. In all fisheries, the largest initial allocation exceeded the individual QS use cap. In the Western Aleutian Island golden king crab and Western Aleutian Islands red king crab fisheries the largest initial allocation was in excess of 4 times the share cap; in the Bristol Bay red king crab, Bering Sea snow crab, Bering Sea Tanner crab, Eastern Aleutian Islands golden king crab, and Saint Matthew Island blue king crab fisheries, the largest initial allocation was more than double the individual use cap.⁴⁰ Notwithstanding these large allocations, the median allocation in all fisheries, except the Eastern Aleutian Islands golden king crab fishery, was less than half the individual use cap. The regional distribution of shares differed with landing patterns that arose from the geographic distribution of fishing grounds and processing activities.

In the Bering Sea snow crab fishery, almost half of the catcher vessel owner QS are designated for landing in the North region, while in excess of two-thirds of the catcher vessel owner pool is designated for landing in the North region in both the Saint Matthew Island blue king crab and Pribilof red and blue king crab fisheries.

⁴⁰ As described in Section 2.3.2, those that exceed the individual use caps at initial allocation, are grandfathered in at this level of QS; however, they are prohibited from transferring more above this level.

Table 4-3 Initial allocation of owner quota shares by fishery

Fishery	Share holdings by region						Across regions			
	Region/CP	QS holders	% of owner QS in fishery pool	Mean holdings (as a % of owner QS in fishery)	Median holdings (as a % of owner QS in fishery)	Max holdings (as a % of owner QS in fishery)	QS holders	Mean holdings (as a % of owner QS in fishery)	Median holdings (as a % of owner QS in fishery)	Max holdings (as a % of owner QS in fishery)
BBR	North	28	2.4%	0.1%	0.1%	0.2%	251	0.4%	0.4%	2.2%
	South	241	93.0%	0.4%	0.3%	2.1%				
	CP	13	4.5%	0.3%	0.4%	1.0%				
BBS	North	205	42.6%	0.2%	0.2%	1.2%	241	0.4%	0.4%	2.4%
	South	214	48.4%	0.2%	0.2%	2.1%				
	CP	14	9.1%	0.6%	0.7%	1.2%				
BST	Undesignated	248	93.3%	0.4%	0.3%	2.4%	258	0.4%	0.3%	2.4%
	CP	14	6.7%	0.5%	0.4%	1.0%				
EAG	South	13	95.2%	7.3%	6.6%	20.4%	15	6.7%	6.0%	20.4%
	CP	2	4.8%	2.4%	2.4%	4.1%				
PIK	North	84	67.1%	0.8%	0.6%	3.1%	112	0.9%	0.5%	3.4%
	South	76	32.4%	0.4%	0.3%	2.8%				
	CP	1	0.5%	0.5%	0.5%	0.5%				
SMB	North	121	76.7%	0.6%	0.6%	3.4%	135	0.7%	0.6%	4.4%
	South	83	21.3%	0.3%	0.1%	3.8%				
	CP	5	2.0%	0.4%	0.3%	0.9%				
WAG	Undesignated	13	26.9%	2.1%	1.0%	11.0%	15	6.7%	1.8%	45.7%
	West	9	26.9%	3.0%	1.3%	13.5%				
	CP	2	46.2%	23.1%	23.1%	45.7%				
WAI	South	29	61.0%	2.1%	0.6%	13.5%	30	3.3%	0.6%	45.2%
	CP	2	39.0%	19.5%	19.5%	37.8%				

Source: NMFS Restricted Access Management QS database, initial allocation

Table note: These share holdings are publicly available and non-confidential.

Crew quota share were allocated to captains based on their individual catch histories. In addition, only individuals are permitted to acquire and hold C shares. Consequently, concentration of C share holdings is accurately reflected in the following discussion and tables.

The initial crew quota share allocations showed a similar pattern across the program fisheries (see Table 4-4). Since fewer persons qualified for initial allocations, the initial C share QS holdings were more concentrated than initial owner QS holdings. Yet, in most cases, the initial allocations of C share QS were more evenly distributed among initial recipients. In most fisheries, the largest initial allocations of C share QS are a smaller percentage of the C share QS pool. Also, since C share use caps are double owner share caps, few initial allocations of C share QS exceeded the applicable use cap. Initial allocations of C share QS exceeded the use cap in only the Western Aleutian Island golden king crab and Western Aleutian Islands red king crab fisheries, where very few persons qualified for an allocation. With the exception of the Bering Sea Tanner crab fishery, in each fishery catcher vessel QS is a larger share of the pool of C share QS than catcher vessel owner QS. No catcher processor C share QS exists in the Eastern Aleutian Island golden king crab, Saint Matthew Island blue king crab, and the Pribilof red and blue king crab fisheries.

Table 4-4 Initial allocation of crew quota shares

Fishery	Share holdings by operation type						Share holdings across operation types			
	Operation type	QS holders	% of owner QS in fishery pool	Mean holdings (as a % of C shares in fishery)	Median holdings (as a % of C shares in fishery)	Max holdings (as a % of C shares in fishery)	QS holders	Mean holdings (as a % of C shares in fishery)	Median holdings (as a % of C shares in fishery)	Max holdings (as a % of C shares in fishery)
BBR	CV	178	96.5%	0.5%	0.5%	1.1%	181	0.6%	0.5%	1.2%
	CP	8	3.5%	0.4%	0.4%	1.2%				
BBS	CV	152	94.1%	0.6%	0.6%	1.3%	155	0.6%	0.6%	1.6%
	CP	8	5.9%	0.7%	0.7%	1.6%				
BST	CV	170	91.8%	0.5%	0.5%	1.7%	176	0.6%	0.5%	1.7%
	CP	15	8.2%	0.5%	0.4%	1.5%				
EAG	CV	13	100.0%	7.7%	8.2%	12.8%	13	7.7%	8.2%	12.8%
PIK	CV	40	100.0%	2.5%	2.4%	4.8%	40	2.5%	2.4%	4.8%
SMB	CV	72	100.0%	1.4%	1.4%	3.1%	72	1.4%	1.4%	3.1%
WAG	CV	8	57.5%	7.2%	5.6%	21.7%	9	11.1%	6.2%	41.7%
	CP	2	42.5%	21.3%	21.3%	41.7%				
WAI	CV	4	86.4%	21.6%	14.3%	49.5%	4	25.0%	20.8%	49.5%
	CP	1	13.6%	13.6%	13.6%	13.6%				

Source: NMFS Restricted Access Management QS database, initial allocation

Table note: These share holdings are publicly available and non-confidential.

4.3 The Structure of QS Holding Entities

QS holding entities include individuals, CDQ groups and other community groups, and a variety of business structures. The analysis of changes in harvest QS holdings over time provided thus far in this review, as in previous reviews and discussions of CR Program QS holdings, presents a simple description of changes in the number of QS holding entities over time (by QS holder name) and movement of QS. What is more difficult to describe are changes (or lack thereof) in the underlying population of investors, beneficiaries, and other participating individuals that ultimately own and control QS holdings.

As is common practice in the fishing industry, businesses participating in the CR Program structure ownership in capital assets, including fishing vessels and QS holdings, using limited liability partnerships and other corporate structures. Among the population of individual owners of QS entities, it is common for individual investors to own equity in several QS entities, each with different sets of co-owners. While the various arrangements address the practical needs of holding major business assets jointly among multiple investors, the structuring of distinct entities for each separate asset is motivated in part to limit the liability exposure of each asset in the event of legal claims. As one common example, many individuals and entities will separate QS holdings from equity in a vessel for liability purposes. As a partial result of these factors, the ownership of QS holdings in the CR Program represents a network of interconnected business entities with overlapping equity interests in different QS entities. Participants have provided anecdotal examples describing how some those changes in business structures were propagated specifically due to the CR Program and the creation of harvesting QS.

Compared to other catch shares programs in Alaska fisheries that include more stringent active participation requirements, CR Program participants have considerable flexibility in the division or aggregation of QS by a QS holding entity. QS movement may occur through a “true transfer” of QS from an existing holder to another existing holder, or to a new entrant. In this case the buyers and sellers would submit a transfer application to NOAA Restricted Access Management (RAM). QS movement may also occur indirectly through a change in the ownership of some or all equity interest in an existing non-individual QS entity. Provided the entity itself remains intact after the change in ownership (i.e., is not dissolved), a transfer application may not be required in this case.

Additionally, in the case of an indirect transfer, if the entity was ‘grandfathered in’ with initial issuance of QS (based on their eligible history) and thus exempt from an applicable QS ownership cap (see Section 2.3.2), it may continue to retain the associated QS under the new ownership. In contrast, if the QS were directly transferred, the new recipient would not be exempt from applicable QS ownership cap provisions and may not be eligible to receive the full amount of QS held by the original entity. The benefit associated with retaining grandfather exemptions may be significant, but it is not clear to what extent this incentive has influenced the market for QS or the underlying ownership structure of QS holding entities over the course of the CR Program.

Examining changes at the level of individual stakeholder equity in QS holding entities, could provide for improved understanding of changes in ownership of QS holdings over time. AFSC and AKFIN analysts have undertaken a project to differentiate QS holdings for each individual investor or beneficiary with interest in one or more crab QS/PQS holding equity, using the database of administrative records comprised of annual IFQ and IPQ permit applications. When applying for annual IFQ/IPQ issuance, non-individual QS/PQS holding entities are required to provide the names of all persons, to the individual level, holding an ownership interest in the entity and the percentage ownership each person and individual holds in the QS entity submitting the IFQ application. These data are collected to support enforcement of QS/PQS use caps, which limit excessive consolidation of quota holdings (50 CFR 680.4(f)(iii) and 680.42(a)), and are organized primarily for the administrative purpose of confirming that an individual QS holder will not exceed the use cap in the event of a QS transfer rather than for measuring changes in the constitution of QS ownership interests in aggregate over time.

Analysis of these data, enables the disaggregation of each QS entity's ownership structure (as of completion of the pre-season application process on June 30) to identify each individual equity holder's share of the entity's total QS. For each individual equity shareholder, the derived QS shares are then aggregated over all distinct QS entities through which the individual holds ownership interest to derive the individual's total QS shares. In most cases, ownership interest in QS entities can be fully differentiated to the individual (i.e., human) persons. In some cases, however, the most disaggregate level identifiable is a partnership, estate or trust, CDQ group, or in a small number of cases, a corporation.

Further analysis of the database to identify changes over time in the structure of QS entities relative to initial issuance represents significant additional effort and is being pursued outside the 10-year review. Nonetheless, the results shown in Table 4-5 provide a substantially more detailed

representation of the current (as of the June 30, 2014) distribution of QS holdings than is possible based solely on primary QS holding entities and wholly owned subsidiaries later shown in Table 4-7.

Table 4-5 displays summary statistics of vessel owner QS holdings for 2014/15 (pooling CVO and CPO QS), differentiated by individual and non-individual QS holders. The results demonstrate that approximately 72% of active QS holdings in the Bristol Bay red king crab fishery, Bering Sea snow crab, Eastern and Western Bering Tanner crab fisheries can be associated with individual owners (417 and 376 in the Bristol Bay red king crab and Bering Sea snow crab fisheries, respectively, and 406-407 in the BST fisheries), and an additional 6 to 8% identified with some 36-39 named partnerships, estates or trusts (of which trusts are the largest group). This is in contrast to counts of un-deconstructed QS entities shown in Table 4-6 indicate only 248, 262, and 239 distinct QS holders are identified, respectively.

Maximum individual QS holdings are approximately 2.1% in the Bristol Bay red king crab fishery and slightly less than 2.4% in the snow and Tanner crab fisheries, compared to 9.2% and 13.8% in the Western Aleutian Islands golden king crab and Eastern Aleutian Islands golden king crab fisheries, respectively (the latter reflects QS share holdings received at initial allocation). Slightly less than 70% of the owner QS holdings are held by 31 distinct individuals in the Eastern Aleutian Islands golden king crab fishery. This is in contrast to the Western Aleutian Island golden and red king crab fisheries in which CDQ groups (including their subsidiaries, partnerships and joint ventures) hold the majority of the owner harvesting QS (further discussion of CDQ group participation in CR Program fisheries and holdings of QS is provided in Section 8 of the review). In the Pribilof Islands red and blue king crab fisheries, individuals hold more than 80% of the owner QS.

Table 4-5 Deconstruction of 2014/15 Owner QS holdings by individual shareholder and entity type

Fishery	Entity Type	Unique QS Holders	Percent of pool held by entity type	Mean holding %	Median holding %	Maximum holding %
BBR	CDQ	6	20.6	3.43	3.98	5.01
	Corporation	6	0.79	0.13	0.05	0.53
	Individual	417	71.56	0.17	0.09	2.09
	Partnerships, Estates, and Trusts	38	7.06	0.19	0.14	0.8
	All entity types	467	100	0.21	0.1	5.01
BSS	CDQ	6	21.83	3.64	4.17	5
	Corporation	4	0.66	0.17	0.06	0.54
	Individual	376	71.08	0.19	0.11	2.37
	Partnerships, Estates, and Trusts	36	6.42	0.18	0.1	0.75
	All entity types	422	100	0.24	0.11	5
EAG	CDQ	3	30	10	5	20
	Corporation	1	0.53	0.53	0.53	0.53
	Individual	31	69.47	2.24	1.44	13.77
	All entity types	35	100	2.86	1.63	20
EBT	CDQ	6	19.19	3.2	3.3	5
	Corporation	6	0.53	0.09	0.05	0.31
	Individual	406	72.39	0.18	0.09	2.39
	Partnerships, Estates, and Trusts	39	7.89	0.2	0.13	0.94
	All entity types	457	100	0.22	0.09	5
PIK	CDQ	5	16.14	3.23	2.19	6.96
	Corporation	4	0.05	0.01	0.01	0.02
	Individual	203	81.04	0.4	0.15	2.63
	Partnerships, Estates, and Trusts	34	2.78	0.08	0.06	0.23
	All entity types	246	100	0.41	0.12	6.96
SMB	CDQ	6	21.08	3.51	4.12	5.97
	Corporation	4	0.21	0.05	0.05	0.1
	Individual	226	72.46	0.32	0.15	4.49
	Partnerships, Estates, and Trusts	33	6.25	0.19	0.1	0.49
	All entity types	269	100	0.37	0.15	5.97
WAG	CDQ	4	61.19	15.3	7.13	45.73
	Corporation	1	0	0	0	0
	Individual	18	38.81	2.16	0.73	9.18
	All entity types	23	100	4.35	1.07	45.73
WAI	CDQ	5	52.49	10.5	1.59	45.16
	Corporation	1	0.01	0.01	0.01	0.01
	Individual	79	47.43	0.6	0.13	8.75
	Partnerships, Estates, and Trusts	4	0.07	0.02	0.02	0.03
	All entity types	89	100	1.12	0.13	45.16
WBT	CDQ	6	19.19	3.2	3.3	5
	Corporation	6	0.53	0.09	0.05	0.31
	Individual	407	72.39	0.18	0.09	2.39
	Partnerships, Estates, and Trusts	39	7.89	0.2	0.13	0.94
	All entity types	458	100	0.22	0.09	5

Source: NMFS Restricted Access Management QS database and Alaska Fisheries Information Network (AKFIN)

4.4 Transfers of QS

Transfers are administered by NOAA Fisheries Restricted Access Management (RAM) Office. In the first 3 years of the program, all transfers were by written application. These paper transfers are usually processed by RAM within 2 or 3 days of receipt of a complete application, but can take up to 10 days. A system of electronic transfers now allows for real time transfers through the Internet.

Table 4-6 shows the number of QS transfers and units transferred by operation type, share type, and fishery. With a few exceptions, Table 4-6 demonstrates a lower percentage of the QS pool being transferred in the last 5 years of the program compared to the first 5 years. For CVO QS in both the Bristol Bay red king crab and Bering Sea snow crab fisheries transfer rates peaked in 2006 (NPFMC 2010a). For CVC QS in the Bristol Bay red king crab and Bering Sea snow crab fisheries transfer rates were the highest in 2005 and 2006 (NPFMC 2010a). The transfers of C shares near the beginning of the program may be a reflection of persons who are no longer employed in the fisheries divesting of their shares. Similarly, due to the consolidation of the fishery, relatively more transfers of CVO in the 2nd year of the program is not surprising.

As with other data concerning share holdings, transfer data can be misleading. In some cases, transfers are changes in the name of the holder. In other cases, the transfer might reflect a change in structure of the QS holding entity (such as the addition of a new partner or a change in corporate ownership). In addition, if ownership structure changes while the entity holding shares remains unchanged, it is possible that no transfer will be reflected in the data. In addition, some portion of these totals include shares that have traded more than once (resulting in the percentage of QS pool transferred being greater than 100%). Future research could deconstruct QS holder down to the individual level (as exemplified for one year in Table 4-5), which may another way to understand the movement of QS among entities overtime.

Table 4-6 Transfers of harvesting QS by share type and fishery (2005 through 2015)

Fishery	Sector	2005 -2010			2011-2015			Total 2005 - 2015		
		Transfers	Number of units	% of sector QS pool	Transfers	Number of units	% of sector QS pool	Transfers	Number of units	% of sector QS pool
BBR	CPC	3	68,038	16%	1	8,090	2%	4	76,128	18%
	CPO	9	6,884,789	39%	7	3,834,587	22%	16	10,719,376	61%
	CVC	87	4,530,664	39%	35	1,780,007	15%	122	6,310,671	55%
	CVO	228	122,075,331	33%	79	46,087,727	12%	307	168,163,058	45%
BSS	CPC	3	294,103	17%	2	272,297	15%	5	566,400	32%
	CPO	14	50,799,833	57%	22	20,252,102	23%	36	71,051,935	80%
	CVC	119	10,374,125	36%	45	3,335,459	12%	164	13,709,584	48%
	CVO	312	279,287,384	32%	184	107,266,996	12%	496	386,554,380	44%
BST	CPC	2	19,854	4%				2	19,854	4%
	CPO	1	1,570,469	12%				1	1,570,469	12%
	CVC	22	745,696	14%				22	745,696	14%
	CVO	23	11,870,494	6%				23	11,870,494	6%
EBT	CPC	0	0	0%	4	59,901	12%	4	59,901	12%
	CPO	7	4,054,291	31%	10	5,654,278	43%	17	9,708,569	74%
	CVC	39	1,106,535	20%	21	483,648	9%	60	1,590,183	29%
	CVO	120	50,768,949	28%	67	21,975,040	12%	187	72,743,989	40%
EAG	CPO	1	396,848	85%	6	541,424	115%	7	938,272	200%
	CVC	12	177,011	59%	4	60,095	20%	16	237,106	79%
	CVO	14	5,562,205	60%	11	1,114,897	12%	25	6,677,102	72%
PIK	CVC	9	131,351	15%	6	51,367	6%	15	182,718	20%
	CVO	60	6,210,470	21%	36	3,574,043	12%	96	9,784,513	34%
SMB	CPO	0	0	0%	8	342,259	59%	8	342,259	59%
	CVC	34	242,970	27%	19	137,755	15%	53	380,725	42%
	CVO	126	7,995,021	28%	65	4,718,118	16%	191	12,713,139	44%
WAG	CPC	1	9,257	2%	0	0	0%	1	9,257	2%
	CPO	2	192,503	1%	1	190,857	1%	3	383,360	2%
	CVC	5	209,090	30%	2	100,418	15%	7	309,508	45%
	CVO	13	6,570,815	31%	7	6,254,114	30%	20	12,824,929	61%
WAI	CVO	10	2,424,855	7%	14	14,113,580	40%	24	16,538,435	47%
WBT	CPC	0	0	0%	4	59,901	12%	4	59,901	12%
	CPO	7	4,054,291	31%	10	5,654,278	43%	17	9,708,569	74%
	CVC	39	1,106,535	20%	20	440,062	8%	59	1,546,597	28%
	CVO	121	51,090,935	28%	67	22,007,380	12%	188	73,098,315	40%

Source: NMFS Restricted Access Management Division, QS transfer database

Table notes: Table includes all QS transfers, even QS that were transferred more than once. Hence, a transfer of 200% of the QS pool means that some QS has changed hands more than once over the course of the program. The % of the sector QS pool is based off of the average QS units between 2006 and 2015, for all fisheries but BST. The QS pool for BST is based off of the 2005 QS pool. These share holdings are publicly available and non-confidential.

4.5 Current Holdings

When compared with the initial allocation of share holdings, current holdings do not demonstrate a clear trend in the number of owner QS holders or in median holdings (Table 4-7). However, some concentration of shares can be understood by the increase in maximum share holdings in all fisheries, with the exception of Eastern Aleutian Islands golden king crab, Western Aleutian Islands golden king crab, and Western Aleutian Islands red king crab. These 3 fisheries have maximum share holdings that exceed all (included CDQ) QS caps. In each case, entities were “grandfathered-in” to the CR Program with holdings in excess of the use caps.

Table 4-7 Current owner quota share holdings by regional share distribution

Fishery	Share holding by region						Across regions and sector			
	Region/CP	QS holders	% of owner QS in fishery pool	Mean holdings (as a % of owner QS in fishery)	Median holdings (as a % of owner QS in fishery)	Max holdings (as a % of owner QS in fishery)	QS holders	Mean holdings (as a % of owner QS in fishery)	Median holdings (as a % of owner QS in fishery)	Max holdings (as a % of owner QS in fishery)
BBR	North	31	2.4%	0.1%	0.0%	0.3%	248	0.4%	0.3%	5.0%
	South	243	93.0%	0.4%	0.3%	4.7%				
	CP	9	4.6%	0.5%	0.4%	1.0%				
BBS	North	227	42.5%	0.2%	0.1%	1.5%	262	0.4%	0.2%	5.0%
	South	222	48.3%	0.2%	0.1%	3.2%				
	CP	21	9.1%	0.4%	0.1%	2.2%				
EBT	Undesignated	235	93.3%	0.4%	0.3%	4.3%	239	0.4%	0.3%	5.0%
	CP	9	6.7%	0.7%	0.7%	2.5%				
EAG	South	20	95.2%	4.8%	3.4%	20.0%	24	4.2%	1.9%	20.0%
	CP	5	4.8%	1.0%	0.4%	2.4%				
PIK	North	87	66.7%	0.8%	0.5%	3.5%	112	0.9%	0.5%	7.0%
	South	81	32.8%	0.4%	0.2%	3.5%				
	CP	1	0.5%	0.5%	0.5%	0.5%				
SMB	North	122	76.6%	0.6%	0.5%	3.4%	132	0.8%	0.5%	5.0%
	South	87	21.4%	0.2%	0.1%	2.5%				
	CP	2	2.0%	1.0%	1.0%	1.1%				
WAI	South	36	61.0%	1.7%	0.6%	11.5%	37	2.7%	0.6%	45.2%
	CP	2	39.0%	19.5%	19.5%	37.8%				
WAG	Undesignated	11	26.9%	2.4%	0.9%	11.0%	13	7.7%	1.8%	45.7%
	Western	8	26.9%	3.4%	1.0%	13.5%				
	CP	3	46.2%	15.4%	0.5%	45.7%				
WBT	Undesignated	236	93.3%	0.4%	0.3%	4.3%	240	0.4%	0.3%	5.0%
	CP	9	6.7%	0.7%	0.7%	2.5%				

Source: NMFS Restricted Access Management QS database

Table note: These share holdings are publicly available and non-confidential.

Contrasting the initial allocation of C shares (Table 4-4) with Table 4-8 demonstrates larger changes consolidation of shares. Again, C shares can only be held by individuals, so changes in C share ownership is also more straight-forward to illustrate with these data compared to owner shares. Although active participation requirements did not apply for the first three years of the program and the exemption of cooperative members from the requirements continues to apply, C share holders may have divested as they lost their connection to the fisheries. C share holders might also be more likely to divest of their share holdings, since those holdings are a relatively small portion of the overall QS pool, limiting the annual income that might be derived from those shares.

Table 4-4 and Table 4-8 demonstrate that both the number of CVC and CPC QS holders has gone down, relative to initial allocation in every fishery except Western Aleutian Islands golden king crab and Western Aleutian Islands red king crab. Additionally, both median share holdings and maximum share holdings have risen in most fisheries. Approximately 53 fewer people hold Bristol Bay red king crab C shares than at initial allocation. Consolidation in C shares has slowed in the last 5 years, however. Maximum share holdings have only risen slightly in Pribilof Island red and blue king crab and St Matthew’s blue king crab (0.2% of the C share pool in both fisheries).

Table 4-8 Current C share quota share holdings by operation type

Fishery	Share holdings by operation type						Share holdings across operation types			
	Operation type	QS holders	% of owner QS in fishery pool	Mean holdings (as a % of C shares in fishery)	Median holdings (as a % of C shares in fishery)	Max holdings (as a % of C shares in fishery)	QS holders	Mean holdings (as a % of C shares in fishery)	Median holdings (as a % of C shares in fishery)	Max holdings (as a % of C shares in fishery)
BBR	CV	125	96.5%	0.8%	0.6%	2.0%	128	0.8%	0.6%	2.0%
	CP	9	3.5%	0.4%	0.4%	1.2%				
BBS	CV	118	94.1%	0.8%	0.7%	2.0%	120	0.8%	0.7%	2.0%
	CP	7	5.9%	0.8%	0.7%	2.0%				
EBT	CV	133	91.8%	0.7%	0.6%	2.0%	138	0.7%	0.6%	2.0%
	CP	16	8.2%	0.5%	0.4%	1.5%				
EAG	CV	9	100.0%	11.1%	10.8%	20.0%	9	11.1%	10.8%	20.0%
PIK	CV	36	100.0%	2.8%	2.8%	5.0%	36	2.8%	2.8%	5.0%
SMB	CV	62	100.0%	1.6%	1.5%	3.5%	62	1.6%	1.5%	3.5%
WAG	CV	8	57.5%	7.2%	5.1%	21.7%	9	11.1%	6.3%	41.7%
	CP	2	42.5%	21.3%	21.3%	41.7%				
WAI	CV	4	86.4%	21.6%	14.3%	49.5%	4	25.0%	20.8%	49.5%
	CP	1	13.6%	13.6%	13.6%	13.6%				
WBT	CV	133	91.8%	0.7%	0.6%	2.0%	138	0.7%	0.6%	2.0%
	CP	16	8.2%	0.5%	0.4%	1.5%				

Source: NMFS Restricted Access Management QS database

Table note: These share holdings are publicly available and non-confidential.

5 HARVEST SECTOR

The following section reviews conditions within the crab harvest sector in terms of a broad scope of management concerns and economic drivers of outcomes under rationalized management of the fishery. The Council had conservation, management, social, economic, and safety program goals for the harvest sector. The economic goals for the harvest sector, focused around promoting stability and efficiency, in part by reducing excess harvesting capacity.

(1) *[Promote] resource conservation, utilization, and [address] management problems;*

(5) *[Reduce] excess harvesting and processing capacity, as well as [discouraging a system that promotes] low economic returns;*

(6) *[Promote] economic stability for harvesters, processors and coastal communities;*

(7) *Promote efficiency in the harvesting sector;*

(8) *[Promote] equity between the harvesting and processing sectors, including healthy, stable, and competitive markets.*

Profound changes in the structure and economic function of the fleet occurred in the transition to the rationalized fishery, as documented in the Council's previous reviews of the CR Program. Large-scale structural changes have largely stabilized since the early transitional period. The last

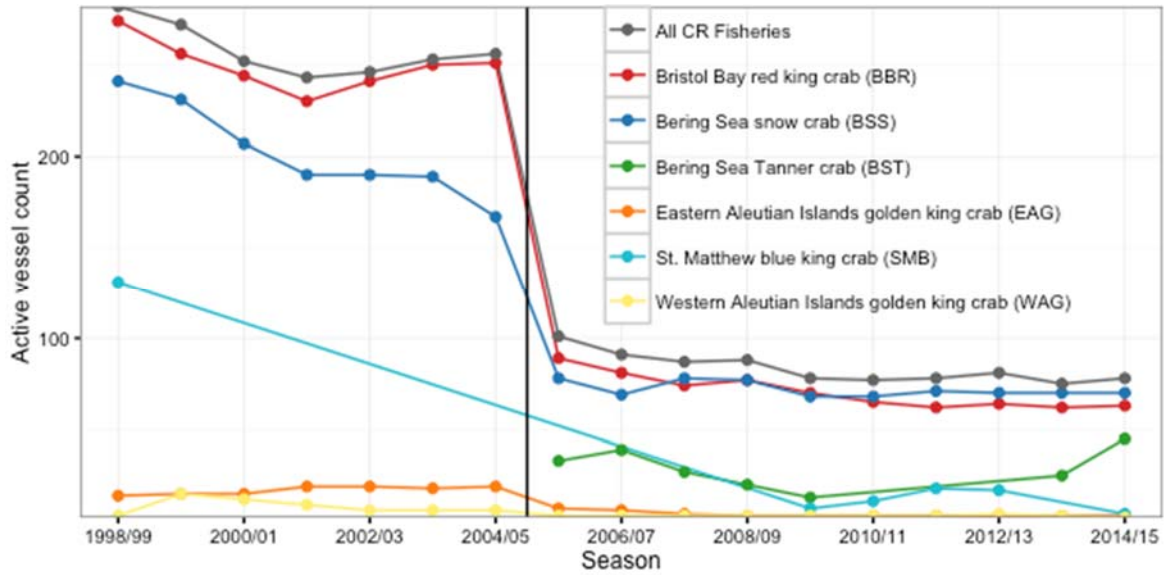
several years have nonetheless exhibited a variety of trends. Some of those trends which are more incremental continuations of earlier structural changes prompted by the initial transition, while other trends within the sector are less directly attributable to the initial transition and are likely more adaptive to new management concerns that have emerged subsequent to implementation of the CR Program, as well as ordinary economic adjustments to changing market conditions external to the fishery.

This section of the review is broken into subsections examining the following economic dimensions of the harvest sector: physical composition and capacity of the fleet and participation of fishing vessels in the rationalized crab fisheries and other fisheries in Alaska; the structure and function of harvest cooperatives and IFQ transfers in the distribution of catch among the active fleet; operational changes in effort and timing of vessel activity within the crab season; vessel operating costs, profitability, and distribution of earnings between vessel owners, crew, and QS holders; a more detailed examination of crew employment and remuneration; and general composition and trends in demographic characteristics of active participants in the harvest sector.

5.1 Fleet Capacity and Participation

Consolidation in the crab fleet occurring immediately during the first year under rationalization has been well documented. As shown in Figure 5-1 and Table 5-1 the fleet participating in CR Program fisheries declined from 256 vessels during the 2004/05 season (which included 9 catcher/processors) to 91 vessels (5 catcher/processors) during the 2006/07 season. The number of vessels active in the Bristol Bay red king crab and Eastern Aleutian Islands golden king crab fisheries both contracted to approximately one-third their previous numbers, while other CR fisheries that were open during the 2005/06 season were reduced to approximately one-half the previous number of participating vessels. As illustrated in Figure 5-2 and Figure 5-3, fleet contraction during the initial year of the program coincided with a substantial increase in allowable catch of both the Bristol Bay red king crab and Bering Sea snow crab and the reopening of the Bering Sea Tanner crab fishery which had been closed since 1997. Increased catch allocations combined with fleet reduction compounded to result in sharp increases in average catch per vessel across all program fisheries opened to fishing, in the range of 75% to 230% increases over average vessel catches during the prior season.

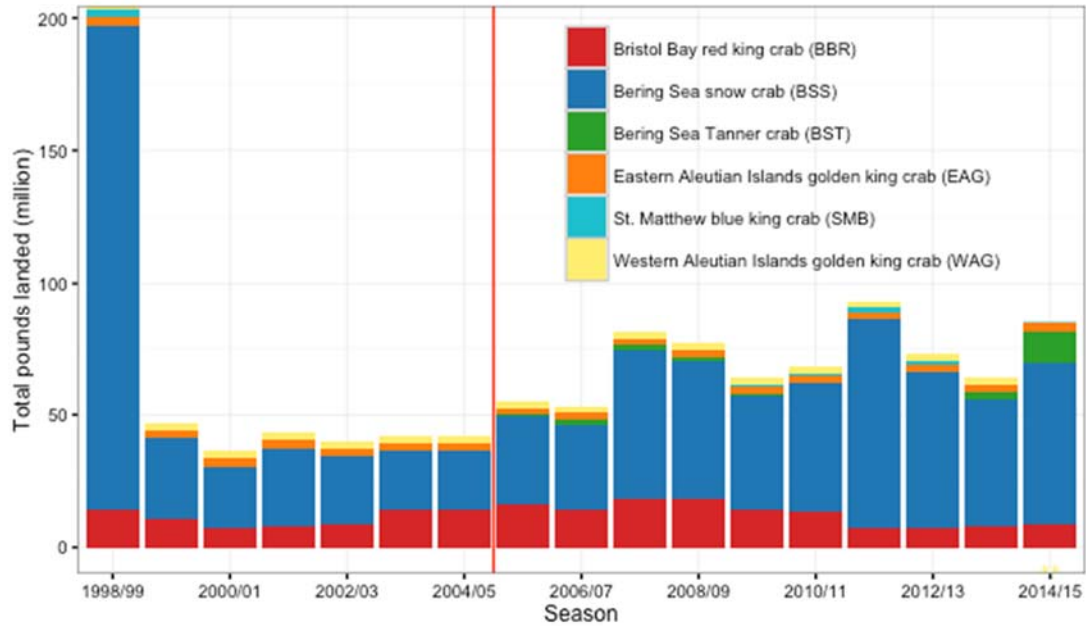
Figure 5-1 Fleet size by fishery, counts of distinct vessels (CV and CP inclusive)



Source: NMFS AKRO RAM Division IFQ accounting database.

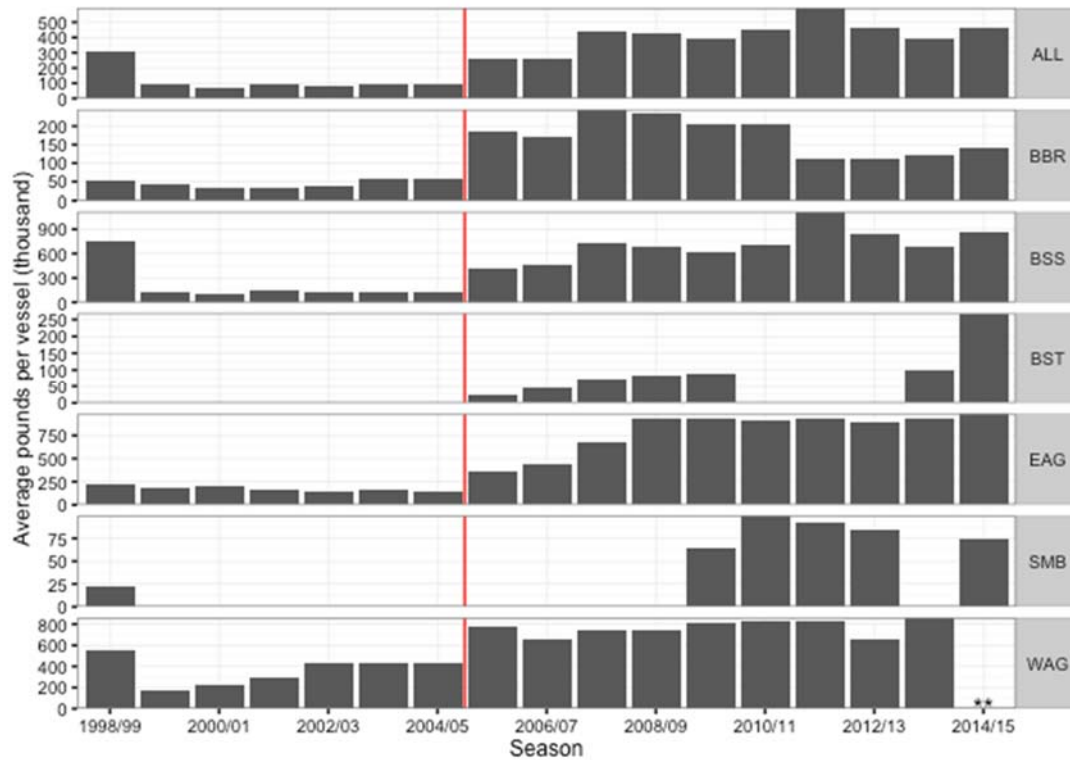
In subsequent years, the aggregate number of participating vessels has varied between 75 and 88 vessels, with marginal increases in some years, but continuing a general declining trend. The smallest active fleet of 75 vessels occurred in 2013/14, concurrent with the lowest aggregate catch of 63.75 million pounds across all fisheries since 2009/10 season. Of the five catcher/processors participating in the CR Program fisheries during the first three seasons, two currently remain in the active fleet, operating exclusively in the Bristol Bay red king crab, Bering Sea snow crab, and Bering Sea Tanner crab fisheries; the sole catcher/processor operating in the Aleutian Islands golden king crab fisheries since 2005 was converted to a catcher vessel in 2013.

Figure 5-2 Total fleet IFQ catch, by season and fishery - 1998/99 to 2014/15



Source: NMFS AKRO RAM Division IFQ accounting database

Figure 5-3 Average IFQ catch per vessel, by season and fishery - 1998/99 through 2014/15



Source: NMFS AKRO RAM Division IFQ accounting database

Table 5-1 IFQ catch and vessel participation: All fisheries, BBR and BSS

Fishery	Season	Total Catch	Catch - percent of total		Count of active vessels		
			Catcher vessels	Catcher/processors	All vessels	Catcher vessels	Catcher/processors
All CR Fisheries	1998-1999	205,620,781	94.1	5.9	288	276	12
	1999/00	46,758,956	93.61	6.39	272	263	10
	2000/01	36,057,384	88.34	11.66	252	244	9
	2001/02	43,114,091	93.44	6.56	243	235	9
	2002/03	40,053,454	95.05	4.95	246	237	9
	2003/04	42,188,291	95.25	4.75	253	244	9
	2004/05	42,030,913	95.2	4.8	256	247	9
	2005/06	54,989,398	92.07	7.93	101	96	5
	2006/07	52,710,941	91.63	8.37	91	86	5
	2007/08	81,151,858	92.41	7.59	87	82	5
	2008/09	76,954,675	93.07	6.93	88	83	5
	2009/10	63,788,640	95.26	4.74	78	75	3
	2010/11	68,125,561	94.65	5.35	77	74	3
	2011/12	93,344,221	95.25	4.75	78	75	3
	2012/13	72,933,874	95.74	4.26	81	78	3
2013/14	63,748,931		100	75	73	2	
2014/15	87,142,703		100	78	76	2	
BBR	1998-1999	14,176,962	94.5	5.5	274	263	11
	1999/00	10,949,856	94.52	5.48	256	248	8
	2000/01	7,468,240	96.84	3.16	244	237	7
	2001/02	7,681,106	95.93	4.07	230	224	6
	2002/03	8,770,348	96.6	3.4	241	234	7
	2003/04	14,236,346	95.22	4.78	250	242	8
	2004/05	13,889,001	95.66	4.34	251	243	8
	2005/06	16,384,641	96.29	3.71	89	85	4
	2006/07	13,944,582	96.61	3.39	81	78	3
	2007/08	18,158,200	96.86	3.14	74	71	3
	2008/09	18,200,760	96.95	3.05	77	74	3
	2009/10	14,199,566		100	70	68	2
	2010/11	13,224,462		100	65	63	2
	2011/12	7,004,977		100	62	60	2
	2012/13	7,100,793		100	64	62	2
2013/14	7,661,187		100	62	60	2	
2014/15	8,877,058		100	63	61	2	
BSS	1998-1999	182,878,757	94.54	5.46	241	231	10
	1999/00	30,316,274	95.54	4.46	231	222	9
	2000/01	22,925,761	86.16	13.84	207	200	7
	2001/02	29,609,702	94.36	5.64	190	182	8
	2002/03	25,410,122	96.84	3.16	190	185	5
	2003/04	21,939,493	96.97	3.03	189	183	6
	2004/05	22,655,777	97.14	2.86	167	161	6
	2005/06	32,932,854	92.1	7.9	78	74	4
	2006/07	32,273,094	91.47	8.53	69	65	4
	2007/08	56,215,804	92.36	7.64	78	74	4
	2008/09	52,078,544	93.13	6.87	77	73	4
	2009/10	42,710,701		100	68	66	2
	2010/11	48,534,614		100	68	66	2
	2011/12	79,353,470		100	71	69	2
	2012/13	59,125,092		100	70	68	2
2013/14	48,228,902		100	70	68	2	
2014/15	60,599,290		100	70	68	2	

Source: NMFS AKRO RAM division IFQ accounting database

Table 5-2 IFQ catch and vessel participation: BST, EAG, WAG, PIK, SMB, and WAI

Fishery	Season	Total Catch	Catch - percent of total		Count of active vessels		
			Catcher vessels	Catcher/processors	All vessels	Catcher vessels	Catcher/processors
BST	2005/06	773,418	100		33	31	2
	2006/07	1,869,363	100		39	37	2
	2007/08	1,885,678	100		27	26	1
	2008/09	1,646,594	100		20	19	1
	2009/10	1,178,938	100		13	12	1
	2013/14	2,488,684	100		25	24	1
	2014/15	12,097,908	100		45	44	1
EAG	1998-1999	3,049,625	100		14	13	1
	1999/00	2,873,394	100		15	14	1
	2000/01	2,950,072	100		15	15	0
	2001/02	3,128,409	100		19	19	0
	2002/03	2,765,436	100		19	19	0
	2003/04	2,900,247	100		18	18	0
	2004/05	2,842,881	100		19	19	0
	2005/06	2,543,919	100		7	6	1
	2006/07	2,659,339	100		6	5	1
	2007/08	2,668,937	100		4	3	1
	2008/09	2,799,656	100		3	3	0
	2009/10	2,803,817	100		3	3	0
	2010/11	2,763,855	100		3	3	0
	2011/12	2,812,608	100		3	3	0
	2012/13	2,672,154	100		3	3	0
2013/14	2,784,039	100		3	3	0	
2014/15	2,949,238	100		3	3	0	
WAG	1998-1999	1,664,497	100		3	2	1
	1999/00	2,619,432	100		15	14	1
	2000/01	2,713,311	100		12	11	1
	2001/02	2,694,874	100		9	8	1
	2002/03	2,605,236	100		6	5	1
	2003/04	2,637,161	100		6	5	1
	2004/05	2,643,254	100		6	5	1
	2005/06	2,354,566	100		3	2	1
	2006/07	1,964,563	100		3	2	1
	2007/08	2,223,239	100		3	2	1
	2008/09	2,229,121	100		3	2	1
	2009/10	2,445,243	100		3	2	1
	2010/11	2,504,531	100		3	2	1
	2011/12	2,503,670	100		3	2	1
2012/13	2,603,518	100		4	3	1	
2013/14	2,586,119	100		3	3	0	
2014/15	2324011	100		2	2	0	
PIK	1998-1999	995,466	100		57	57	0
SMB	1998-1999	2,849,574	100		131	129	2
	2009/10	450,375	100		7	7	0
	2010/11	1,098,099	100		11	11	0
	2011/12	1,669,496	100		18	18	0
	2012/13	1,432,317	100		17	17	0
2014/15	295,198	100		4	4	0	
WAI	1998-1999	5900	100		1	0	1
	2002/03	502,312	100		33	31	2
	2003/04	475,044	100		30	28	2

Source: NMFS AKRO RAM division IFQ accounting database

Table 5-3 reports numbers of vessels that participated in the CR Program during the initial season (2005-2006) that have subsequently left the fishery, and Table 5-4 provides counts of new vessels that have entered the fishery. Of the original 101 unique vessels that participated in CR Program fisheries during 2005/06, 63 remained active in one or more CR fishery as of the 2013/14 season (a decrease of 37 vessels), with one initial participant that did not participate in the 2013/14 re-entering for the 2014/15 season. The Bristol Bay red king crab fishery accounts for the largest number of exiting initial vessels, with 39 no longer participating in the fishery as of 2014/15 (including the two catcher/processors that have exited). Entrants to the active fleet since the 2005/06 season are largely comprised of vessels that were active prior to rationalization, but were part of the large fleet contraction during the initial season, and have returned to active participation to some degree in more recent years. A total of 13 vessels (19% of the fleet) active during the 2014/15 Bering Sea snow crab fishery were not part of the fleet that prosecuted the CR fisheries during the initial 2005/06 season, three of which entered during the most recent season. The recent reopening and expansion of the Bering Sea Tanner crab fisheries has resulted in a relatively large expansion of the fleet active in that fishery, with 22 vessels entering the fishery between 2013/14 and the 2014/15 season. In all, 15 vessels have entered the CR fleet since the initial season, 13 of which harvested crab in the BSAI prior to the transition to the CR Program and two new vessel entrants with no prior activity in the CR fisheries have entered in recent years.

Table 5-3 CR Program initial vessel participants remaining in program

Fishery	Sector	Initial CR season vessel participants remaining in program			Number of initial CR vessels exiting program fisheries as of 2014/15 season ^a	
		2005/06	2013/14	2014/15	Since 2005/06	Since 2013/14
BBR	CP	4	2	2	-2	0
	CV	85	50	49	-36	-1
BSS	CP	4	2	2	-2	0
	CV	74	50	50	-24	0
BST	CP	2	0	0	-2	0
	CV	31	0	0	-31	0
EAG	CP	1	0	0	-1	0
	CV	6	3	2	-4	-1
SMB	CP	1	0	0	-1	0
	CV	2	2	2	0	0
All CR Fisheries	All vessels	101	63	64	-37	1

Source: NMFS AKRO RAM division IFQ accounting database

Notes: ^a Negative values reflect net count of initial CR season vessels exited from fishery since 2005/06 and 2013/14; positive value (1) in bottom row reflects re-entry of one initial season vessel since 2013/14 season.

Table 5-4 New catcher vessel entry to CR Program fisheries

Fishery	Number of new vessel entrants to CR program - by fishery and overall			
	Since 2005/06		Since 2013/14	
	Entered	Entered CRP	Entered fishery	Entered CRP
BBR	12	7	2	0
BSS	18	13	3	3
BST	26	11	22	2
EAG	1	1	1	0
SMB	4	1	4	0
All CR Fisheries		15		4

Source: NMFS AKRO RAM division IFQ accounting database

Notes: No new catcher/processors have entered the CR Program fisheries to date.

Table 5-5 provides further illustration of trends in crab fishery diversification among crab vessels. This table demonstrates variation over time in numbers of vessels operating in different portfolios of CR fisheries. Until recently, the majority of CR Program vessels' portfolio was comprised of the Bristol Bay red king and Bering Seas snow crab fisheries (portfolio BBR:BSS; 57 of the total 101 vessels in the 2005/06 season, and 47 of 75 vessels during 2013/14), but as of 2014/15, 33 vessels incorporated expanded fishing in the Bering Sea Tanner fisheries in addition (BBR:BSS:BST). While to some degree this activity was incidental to snow crab targeted fishing, vessels with Tanner crab landings of less than 5% or their annual catch were not identified with this portfolio. Smaller numbers of vessels limit their crab operations to single CR fisheries (e.g., BSS, BST, EAG, WAG, and SMB). A notable trend is the steady decline in the number of vessels that fish exclusively in the Bristol Bay red king (BBR) crab fishery -- 84 vessels in 2004/05, declining to 18 by 2006/07, and one in 2014/15. The number of vessels harvesting exclusively Bering Sea snow crab has varied somewhat consistently with the catch level in the fishery, and has not exhibited a directional trend similar to the Bristol Bay fishery. While a general trend among crab fishing vessels toward greater diversification across CR fisheries is evident, this is in part driven by recent reopening of Bering Sea Tanner and Saint Matthew blue king fisheries and variation in catch levels. Further analysis is required to draw any strong conclusions with respect to the relative role of efficiency gains in the sector driven by improved management by firms and coordination of fleet operations through the harvesting cooperative structure.

Table 5-5 Crab vessel CR Program fishery portfolios

Portfolio	Season										
	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
BBR	84	19	18	4	9	5	4	2	3	2	1
BBR, BSS	148	57	47	58	60	56	55	52	51	47	27
BBR, BSS, BST	-	7	13	10	7	6	-	-	-	12	33
BBR, BSS, EAG	13	4	3	1	1	1	1	1	1	1	-
BBR, BSS, EAG, WAG	3	-	-	-	-	-	-	-	-	-	-
BBR, BSS, SMB	-	-	-	-	-	1	5	3	5	-	-
BBR, BST	-	2	-	1	-	1	-	-	-	-	-
BBR, EAG	3	-	-	-	-	-	-	-	-	-	-
BBR, SMB	-	-	-	-	-	-	-	-	1	-	-
BSS	2	6	2	6	5	1	3	11	7	5	5
BSS, BST	-	2	3	1	2	1	-	-	-	3	3
BSS, EAG	-	1	1	1	1	1	1	1	-	-	2
BSS, EAG, WAG	-	-	-	1	1	1	-	-	-	-	-
BSS, SMB	-	-	-	-	-	-	2	3	6	-	-
BSS, WAG	1	-	-	-	-	-	-	-	-	1	-
BST	-	-	1	2	-	-	-	-	-	1	2
BST, SMB	-	-	-	-	-	1	-	-	-	-	2
EAG	-	-	-	-	-	-	-	-	1	1	1
EAG, WAG	-	1	1	1	-	-	1	1	1	1	-
SMB	-	-	-	-	-	1	3	2	2	-	-
WAG	2	2	2	1	2	2	2	2	3	1	2
Unique vessels - All CR Fisheries	256	101	91	87	88	78	77	78	81	75	78

Source: NMFS AKRO RAM division Quota Share and Processor Quota Share holder files and IFQ accounting database Notes: Vessels were identified as participating in a crab fishery if the vessel's landings in the fishery were at least 5 percent of total crab landings during the season; vessels with only incidental landings were not counted as participating in a fishery for the purpose of identifying portfolio activity.

Table 5-6 provides an overview of summary statistics describing physical characteristics of the active fleet. No systematic data are available to gauge capital improvement in the fleet, and general vessel registry data regarding vessel year of construction and age, length overall (LOA), gross and net tonnage, and engine horsepower are the principal source of information on the capital stock of the fleet. The range (minimum-maximum) and median value statistics shown in Table 5-6 indicate little change in the general physical characteristics of the fleet. Median and range values for year built, LOA, and net- and gross- tonnage have remained essentially constant since the 2005/06 season, and both in the fleet overall, as well as at the individual fishery level. Statistics on engine horsepower have been more variable since 2005/06. Although engine replacement occurs on a regular cycle, fleet-level statistics do not indicate a trend in engine capacity and are more likely indicative of intermittent participation of individual vessels. The relative distribution of size classes in the active fleet has not changed to a large degree. Approximately one-half of the fleet is comprised of vessels in the 100-125 foot LOA size Class, ranging from 39-42 vessels during the three most recent seasons, compared to 75-81 vessels in total. The 20 vessels in the 125-150 foot LOA class comprise approximately one-quarter of the active fleet, followed by the 10 vessels in the 85-100 foot LOA class in the most recent seasons. Only one vessel in the less-than 85 foot LOA class remains active, compared to 22 in 2004/05 and 3 in 2005/06. The most notable indication of change in these data is the entry of one recently constructed vessel as of 2013/14, built in 2012.

Table 5-6 Crab vessel physical characteristics, participating vessels in 2004/05, 2005/06, and 2010/11 to 2014/15 seasons

Fishery	Season	Vessels by size class						Year built		Length Overall		Net Tonnage		Gross Tonnage		Horsepower	
		All	<85	85-100	100-125	125-150	>150	Range	Median	Range	Median	Range	Median	Range	Median	Range	Median
All CR Fisheries	2004/05	256	22	46	113	47	30	1932-2002	1978	58-184	110	10-879	134	82-920	195	270-4000	850
	2005/06	101	3	14	51	23	10	1944-2002	1978	77-180	115	49-879	135	94-909	197	450-4000	905
	2010/11	77	1	10	41	20	5	1942-2002	1979	81-180	115.5	49-879	134	150-909	197	500-2000	940
	2012/13	81	1	11	42	20	7	1942-2002	1978	81-180	115	49-879	134	150-909	197	500-2000	1000
	2013/14	75	1	10	39	20	5	1942-2012	1978	81-180	115	49-879	134	150-909	197	500-2000	922.5
	2014/15	78	1	10	41	20	6	1942-2012	1978	81-180	115	49-879	134	150-909	197	500-2000	940
BBR	2004/05	251	21	45	111	45	29	1932-2002	1978	58-184	109	10-879	134	82-920	195	270-4000	850
	2005/06	89	3	12	46	19	9	1945-2002	1978	77-180	110	49-879	135	94-909	197	450-4000	850
	2010/11	65	1	8	33	18	5	1942-2002	1978	81-180	115	49-879	135	150-909	197	500-2000	940
	2012/13	64	1	9	31	19	4	1942-2002	1978	81-180	115	49-879	134	150-909	196	500-2000	940
	2013/14	62	1	7	31	19	4	1942-2012	1978	81-180	115	49-879	134	150-909	197	500-2000	940
	2014/15	63	1	8	31	19	4	1942-2012	1978	81-180	115	49-879	134	150-909	197	500-2000	922.5
BSS	2004/05	167	7	25	83	35	17	1932-1998	1978	77-180	110	48-793	134	93-909	195	270-3000	850
	2005/06	78	2	8	39	21	8	1944-1998	1978.5	77-180	115	54-879	134.5	98-909	197	500-2000	905
	2010/11	68	1	9	34	19	5	1942-1998	1978	81-180	115.5	49-879	134	150-909	197	500-2000	940
	2012/13	70	1	10	34	19	6	1942-1998	1978	81-180	115	49-879	134	150-909	196.5	500-2000	940
	2013/14	70	1	10	35	19	5	1942-2012	1979	81-180	114.5	49-879	134	150-909	196.5	500-2000	905
	2014/15	70	1	10	34	19	6	1942-2012	1978.5	81-180	115	53-879	134	150-909	197	500-2000	1000
BST	2004/05	33	2	2	16	10	3	1970-1998	1979	77-180	116	73-879	138	164-907	198	500-1800	860.5
	2013/14	25	1	2	14	6	2	1942-1991	1978	81-180	111	49-879	134.5	166-907	197	580-1600	877.5
	2014/15	45	1	4	26	11	3	1942-2012	1979	81-180	114	49-879	134	150-907	197	500-1750	922.5
EAG	2004/05	19	0	6	6	3	4	1944-1991	1978	86-180	108	119-196	135	175-488	196	400-3000	900
	2005/06	7	0	1	3	2	1	1944-1991	1978	97-166	117	122-175	135	180-455	198	850-1700	1125
	2010/11	3	0	0	3	0	0	1978-1979	1978	108-124	117	122-140	135	180-199	198	850-1125	1000
	2012/13	3	0	0	3	0	0	1978-1979	1978	108-124	117	122-140	135	180-199	198	850-1200	1000
	2013/14	3	0	0	3	0	0	1978-1979	1978	108-124	117	122-140	135	180-199	198	850-1200	1000
	2014/15	3	0	0	3	0	0	1978-1978	1978	108-117	116	109-135	132	176-199	195	850-1700	1200
SMB	2010/11	11	0	0	8	3	0	1974-1991	1979	103-126	113	49-160	134	166-252	197	660-1350	850
	2012/13	17	0	1	10	5	1	1969-1991	1979	90-156	114	49-371	134	166-499	197	700-1350	950
	2014/15	4	0	0	2	2	0	1974-1991	1978.5	103-126	115	131-160	134.5	185-197	195	750-1125	828
WAI	2004/05	6	0	0	3	1	2	1965-1979	1978	107-166	121.5	115-135	130	170-199	191.5	850-2000	1120
	2005/06	3	0	0	1	2	0	1978-1979	1979	116-127	126	115-134	132	170-199	195	1000-1700	1125
	2010/11	3	0	0	2	1	0	1978-1979	1979	116-127	124	115-140	132	170-198	195	1000-1700	1000
	2012/13	4	0	0	2	1	1	1944-1979	1978.5	116-177	125.5	115-172	136	170-455	196.5	1000-1700	1100
	2013/14	3	0	0	2	1	0	1978-1979	1979	116-127	124	115-140	132	170-198	195	1000-1700	1000
	2014/15	2	0	0	1	1	0	1979-1979	1979	124-127	125.5	115-140	127.5	170-198	184	1000-1000	1000

Source: Alaska Fisheries Information Network

Considering the CR Program fleet as a whole, the distribution of catch among vessels of different size classes has changed somewhat since the initial season, but remained fairly stable over the most recent five seasons (Table 5-7, which includes vessels and catch by size class, for Bristol Bay red king crab, Bering Sea snow crab, and Bering Sea Tanner crab fisheries, and aggregated across all CR fisheries; note that data by vessel size class for the Eastern Aleutian Islands golden king crab, Western Aleutian Islands golden king crab and Saint Matthew blue king crab fisheries cannot be shown due to confidentiality limitations). The initial consolidation had the effect of shifting the catch to proportionally larger vessels and reducing the number of vessels smaller than 85 feet in the fleet, across all CR fisheries, to just three (falling to one during the most recent seasons). The share of total catch declined from 2004/05 to 2005/06 for all size classes with the exception of the 125-150 foot class, which consolidated to 23 vessels from 47, but with the share of total catch among the remaining vessels increasing from 23% to nearly 39% of the total catch. The 100-125 foot size class remains the largest component of the fleet overall, at nearly half of the current fleet, and has increased its share of total catch from 39% in 2005/06 to 46 percent. The share of catch in the 85-100 foot class has also increased since the initial season, from 8.4% to 12.5 percent. As a result, the share of total catch landed by the two largest vessel size classes has declined over the course of the program, from a combined share of nearly 54% in 2005/06 to less than 40% in the 2014/15 season. The proportional shift in catch is somewhat different between the Bristol Bay red king crab and Bering Sea snow crab fisheries than in the fleet over all, with the reduced share of catch in the 125-150 foot size class attributable to the Bering Sea snow crab fishery, whereas the share landed by this vessel class in the Bristol Bay red king crab fishery has increased somewhat relative to the initial season. Consistent across both fisheries, however, is the relative reduction in catch landed by the largest vessel size class, by approximately half compared to the initial season, and the increase in the proportion of catch landed by the 85-100 foot class to approximately the same level as the last season prior to rationalization. As such, apart from the attrition of vessels less than 85 feet, the initial shift toward consolidation of catch on the largest vessels has not been a consistent and continued effect over the ten year period since program implementation, and has reversed to some degree, particularly in the Bering Sea snow crab fishery. It is unclear whether this is an incidental effect of variation in ownership and condition of the current fleet or a systematic shift toward vessels in the medium size classes due to operational efficiencies or other advantages compared to the largest vessel class. Improved information on capital investment in the fleet could provide some insight, and a more focused analysis on efficiencies exhibited by vessels within the size class could be undertaken to assess possible changes to be expected in fleet capacity in the next several years.

Table 5-7 Catch by vessel size class, BBR, BSS, and BST fisheries, and all CR Program fisheries in aggregate

Season	All CR fisheries			BBR			BSS			BST		
	vessels	pounds (million)	percent of total catch	vessels	pounds (million)	percent of total catch	vessels	pounds (million)	percent of total catch	vessels	pounds (million)	percent of total catch
Vessel length: Less than 85 feet LOA												
2004/05	22	1.22	2.9	21.0	0.6	4.6	7.0	0.6	2.6	--	--	--
2005/06	3	1.13	2.1	3.0	0.4	2.5	2.0	*	*	2.0	*	*
2010/11	1	*	*	1.0	*	*	1.0	*	*	--	--	--
2011/12	1	*	*	1.0	*	*	1.0	*	*	--	--	--
2012/13	1	*	*	1.0	*	*	1.0	*	*	--	--	--
2013/14	1	*	*	1.0	*	*	1.0	*	*	1.0	*	*
2014/15	1	*	*	1.0	*	*	1.0	*	*	1.0	*	*
Vessel length: 85 feet to less than 100 feet LOA												
2004/05	46	5.79	13.8	45.0	2.0	14.6	25.0	3.0	13.3	--	--	--
2005/06	14	4.62	8.4	12.0	1.5	9.3	8.0	2.5	7.5	2.0	*	*
2010/11	10	6.41	9.4	8.0	1.3	9.6	9.0	5.1	10.6	--	--	--
2011/12	10	10.65	11.4	8.0	0.8	12.0	9.0	9.8	12.3	--	--	--
2012/13	11	8.27	11.3	9.0	0.9	13.0	10.0	7.4	12.4	--	--	--
2013/14	10	7.73	12.1	7.0	0.9	11.6	10.0	6.8	14.0	2.0	*	*
2014/15	10	10.93	12.5	8.0	1.2	13.0	10.0	8.8	14.6	4.0	1.0	7.9
Vessel length: 100 feet to less than 125 feet LOA												
2004/05	113	18.99	45.2	111.0	6.2	44.6	83.0	11.0	48.6	--	--	--
2005/06	51	21.41	38.9	46.0	6.7	41.0	39.0	12.1	36.8	16.0	0.5	59.5
2010/11	41	30.47	44.7	33.0	5.6	42.3	34.0	19.6	40.3	--	--	--
2011/12	41	40.39	43.3	29.0	2.7	38.4	36.0	32.1	40.4	--	--	--
2012/13	42	32.13	44.1	31.0	2.6	36.9	34.0	24.5	41.5	--	--	--
2013/14	39	28.88	45.3	31.0	2.9	38.4	35.0	19.8	41.1	14.0	1.8	71.9
2014/15	41	40.28	46.2	31.0	3.5	39.0	34.0	25.1	41.5	26.0	7.4	60.8
Vessel length: 125 feet to less than 150 feet LOA												
2004/05	47	9.7	23.1	45.0	3.1	22.0	35.0	5.6	24.6	--	--	--
2005/06	23	19.68	35.8	19.0	5.3	32.5	21.0	12.3	37.4	10.0	0.2	20.7
2010/11	20	23.45	34.4	18.0	4.8	36.2	19.0	17.6	36.3	--	--	--
2011/12	21	31.51	33.8	19.0	2.8	39.3	20.0	27.6	34.7	--	--	--
2012/13	20	24	32.9	19.0	3.0	41.7	19.0	19.8	33.5	--	--	--
2013/14	20	20.31	31.9	19.0	3.0	39.7	19.0	15.9	33.0	6.0	0.3	12.5
2014/15	20	27.5	31.6	19.0	3.4	38.8	19.0	20.4	33.7	11.0	2.4	20.0
Vessel length: 150 feet LOA or larger												
2004/05	30	6.34	15.1	29.0	2.0	14.1	17.0	2.5	11.0	--	--	--
2005/06	10	8.14	14.8	9.0	2.4	14.7	8.0	5.3	16.2	3.0	0.1	15.5
2010/11	5	6.83	10	5.0	1.3	9.8	5.0	5.6	11.4	--	--	--
2011/12	5	9.47	10.1	5.0	0.6	8.4	5.0	8.8	11.1	--	--	--
2012/13	7	7.54	10.3	4.0	0.5	6.5	6.0	6.6	11.1	--	--	--
2013/14	5	5.84	9.2	4.0	0.6	7.3	5.0	5.1	10.5	2.0	*	*
2014/15	6	7.18	8.2	4.0	0.6	6.9	6.0	5.3	8.8	3.0	1.3	10.4

Source: eLandings

* Withheld for confidentiality; -- indicates no data available (fishery closed).

5.2 Leasing and Harvest Cooperatives

Transferability of harvest QS and short-term annual quota share permits (IFQ) is the principal element of the CR Program contributing to fundamental changes in the structure of the fishery. The formation and management of harvest cooperatives provides a critical framework through which IFQ is consolidated and its use distributed to active vessels. While CR Program rules include provisions for IFQ transfers (i.e., leasing) between permit holders outside of the structure of harvest cooperatives, there are significant constraints in terms of amount transferred and eligibility of parties to transfer or receive IFQ outside of the cooperative structure. As a result, over the course of the program, the role of cooperatives has become increasingly encompassing, such that, since the 2009/10 crab season, virtually all IFQ has been managed within the framework of the harvest cooperatives, with only minor exceptions. The following section of the review presents information and statistics regarding the effect of cooperative IFQ consolidation on catch distribution within the fleet. In addition, information on IFQ lease activity, volume and value of lease transfers, average prices for IFQ of different categories, and the effect of leasing on the distribution of benefits within the fishery are presented.

The harvest cooperative structure provides a framework for optimizing the allocation and timing of fishing effort, under which a fluid, and potentially highly efficient, quota lease market is possible. In addition to these advantages, other provisions of the program provide incentives for harvest cooperative formation and membership. Vessels harvesting cooperative IFQ are exempted from vessel IFQ use caps specified for each fishery, which limit the volume of landings of any vessel operating outside of a cooperative to maximum proportion of the total catch allocation in a given fishery (see Table 2-3). Also, IFQ held by an individual that is not assigned to a cooperative may not be leased to any member of a cooperative, or landed by a vessel that is authorized to make landings on a cooperative IFQ permit.

Combined with lease rates that commonly exceed 50% of the ex-vessel value per pound in the Bering Sea snow crab fishery and 65% the Bristol Bay red king crab fishery, access to the lease market among cooperative members provides a powerful incentive for both vessel operators and QS holders, mutually reinforcing the consolidation of IFQ and harvesting operations within the cooperative structure.

Apart from the role harvest cooperatives have played in facilitating the consolidation of the fleet and concentration of catch, cooperative managers and other representatives have played an increasingly important role as mediators between industry sectors and fishery managers. The influential role of harvest cooperatives within the CR Program potentially provides an alternative mechanism for pursuing collective management objectives through non-regulatory means, and cooperative managers have in recent years been increasingly important to facilitating communication between industry and the Council.

In a February 2013 motion, the Council requested that the CR Program harvest cooperatives voluntarily provide annual reports to the Council, principally with the intent of monitoring and assessing the effectiveness of measures undertaken within the cooperatives in pursuit of Council management objectives. In particular, the Council identified measures intended to promote increased QS holdings among cooperative members who are active in the prosecution of the fishery, including as active crew members and as vessel owners, and measures intended to address concerns about high lease rates for IFQ and associated effects on crew compensation.

The specific initiatives undertaken by the harvest cooperatives during the most recent two or three crab seasons include voluntary limits on lease rates and incorporation of Right of First Offer (ROFO)⁴¹ provisions into cooperative membership agreements. The annual cooperative reports submitted to the Council since 2013 provide information on the specific terms of measures undertaken and compliance with these initiatives among members of the cooperatives. Rather than a specific analysis of measures undertaken by the cooperatives focused on assessing behavioral changes in cooperative membership as a result, a more general attempt is made in the following discussion to provide empirical information from available data sources relevant to the objectives of the CR Program and the Council's ongoing oversight that can be provided by summary-level metrics and pro-rata indices rather than statistical models and hypothesis tests. Further analyses may be undertaken subsequent to this review based on guidance from the Council regarding specific questions to be investigated.

5.2.1 Cooperative Formation and IFQ Management.

As described previously, prior to the crab season opening, QS holders are required to apply to NMFS Restricted Access Management (RAM) for issuance of annual IFQ permits, denominated in pounds of crab that the permit holder is permitted to land, or transfer to another authorized harvester.⁴² QS holders that elect to join a harvest cooperative, in applying for IFQ issuance, direct RAM to assign the IFQ pounds they are qualified to receive to the harvest cooperative. The result is the consolidation of IFQ issued by RAM to a cooperative's members onto the cooperative's IFQ permits (with separate permits associated with each IFQ sector, region, and Class). Once assigned to a cooperative permit, the intra-cooperative management of IFQ use by crab vessels is conducted under terms of the cooperative's membership agreement, and leasing arrangements between operators of harvesting vessels and QS holders within the cooperative is conducted under terms of private contracts between lessors and lessees.

Apart from catch accounting and monitoring IFQ permit balances, and deductions associated with IFQ landings and assignment of IFQ to vessels, lease arrangements between members and distribution of IFQ use among harvesting vessels within cooperatives is conducted without further administrative involvement or reporting to NMFS. Following annual issuance and assignment of member IFQ to each cooperative, subsequent intra-cooperative transfers may be conducted, which results in further distribution and consolidation of IFQ within the largest cooperatives. Inter-cooperative transfers require authorization by RAM and administrative reporting by transferee and transferor cooperatives, and are largely conducted by cooperative managers online via RAM's eFish account portal. These transfers do not require disclosure of financial or other details beyond identification of IFQ permits and IFQ balances being transferred.

During the first year of rationalization, 23 distinct crab harvesting cooperatives were formed by vessel owner and QS holder entities, and a rapid shift toward pooling of IFQ within cooperatives occurred in response to incentives noted above. Consolidation of the harvest cooperative structure itself has followed, with formation of the Inter-Cooperative Exchange (ICE) harvest cooperative prior to the 2009/10 crab season. During the 2012/13 season, members of ICE represented 65% of the QS pool across all CR fisheries, with the remaining IFQ assigned to eight other cooperatives.

⁴¹ See the Entry Opportunities of the review more information on ROFO program initiated by the ICE cooperative in 2013.

⁴² See Section 12, Management, Monitoring, and Enforcement for more information on RAM Division's role in managing the crab fisheries.

The Alternative Crab Exchange (ACE) harvest cooperative was formed for the 2013/14 season out of concerns regarding ICE membership compliance with the Fishermen's Collective Marketing Act of 1934 (FCMA; 15 U.S.C. § 521 et seq.), and the membership of the two have held approximately 31.5 and 34% of the total QS pool respectively, aggregated over all CR Program fisheries. Nine other harvest cooperatives that participated over the course of the CR Program represent smaller QS pools, between 1.7 and 7.9% of the total allocation during recent seasons.

A summary of harvest cooperative IFQ holdings and membership is provided in Table 5-8 for seasons 2005/06 through 2010/11 and for the most recent five seasons in Table 5-9. Harvest cooperatives span multiple CR fisheries, and the counts of distinct cooperatives and individuals shown for each fishery are not mutually exclusive (see Table 5-10 below for a summary of cooperative membership and IFQ holdings for the CR Program as a whole). These figures represent IFQ pools assigned by members to their respective cooperatives, and do not reflect additional aggregation occurring through inter-cooperative transfers. The consolidation of most IFQ within cooperatives occurred during the initial season, with 80 to 90% of IFQ in the CR fisheries allocated to 13 cooperatives in Bristol Bay red king crab, Bering Sea snow crab, and Bering Sea Tanner crab fisheries, and 3 in the Aleutian Island golden king crab fisheries, but with a large number of individual IFQ holders receiving permits for the balance of IFQ not assigned to the cooperatives.

By the 2008/09 season, the number of individual holders was reduced to less than 10 in each fishery and greater than 98.5% of IFQ was allocated to cooperatives across all fisheries but remained distributed between as many as 18 separate cooperatives. In the smaller and more concentrated Eastern Aleutian Islands golden king crab and Western Aleutian Islands golden king crab fisheries, with four and three cooperatives, respectively, the largest consolidation represented nearly 48% of the Western Aleutian Islands golden king crab IFQ in a single coop. Across other fisheries, the largest cooperative represented 21% of the Bristol Bay red king crab IFQ pool assigned by 81 members, and 71 members contributing 18% of the Bering Sea snow crab IFQ.

With formation of the ICE cooperative in 2009, the largest cooperative holding increased to over 70% in both the Bristol Bay red king crab and Bering Sea snow crab fisheries, with a total of 296 members assigning Bristol Bay red king crab IFQ and 275 assigning Bering Sea snow crab IFQ to the cooperative. As noted above, with formation of the ACE harvest cooperative in 2013, membership of the two larger cooperatives separately represented 31 to 36% of the total IFQ pool in the Bristol Bay red king crab and Bering Sea snow crab fisheries.

Table 5-8 Cooperative IFQ holdings and membership, 2005/05 through 2010/11

Season	Fishery	Number of IFQ holders (all)	Number of Cooperative IFQ holders	Number of cooperative members (all)	Percent of IFQ allocated to cooperatives	Maximum cooperative IFQ holding (% of TAC)	Largest cooperative membership
2005	BBR	89	13	329	83.3%	18.2%	75
	BSS	79	13	304	83.5%	15.6%	65
	BST	111	13	298	81.1%	15.4%	70
	EAG	7	3	23	90.9%	57.9%	12
	WAG	3	3	19	90.2%	47.3%	12
2006	BBR	37	16	377	97.6%	21.5%	88
	BSS	31	16	343	97.7%	19%	75
	EBT	54	15	341	95.3%	17.7%	76
	WBT	55	16	326	95%	17.7%	76
	EAG	5	4	24	99.6%	58.3%	12
	WAG	4	3	19	92.2%	47.3%	10
2007	BBR	28	17	376	98.6%	21.6%	86
	BSS	25	18	346	99.2%	19.1%	74
	EBT	29	13	351	98.2%	17.7%	75
	WBT	32	16	348	98.2%	17.7%	75
	EAG	5	4	25	99.9%	41.9%	11
	WAG	4	3	19	92.2%	47.8%	9
2008	BBR	25	18	375	99.5%	21.2%	81
	BSS	24	18	347	99.7%	18.1%	71
	EBT	26	16	342	99.4%	17.3%	71
	WBT	27	17	336	99.3%	17.3%	71
	EAG	4	3	25	99.9%	37%	8
	WAG	5	4	21	98.6%	47.8%	10
2009	BBR	14	9	379	99.8%	71.5%	296
	BSS	13	9	352	99.7%	70.3%	275
	EBT	21	8	330	99.2%	60.2%	226
	EAG	3	3	24	100%	68%	13
	WAG	2	2	21	98.7%	47.8%	14
	SMB	11	4	197	98.8%	71.2%	159
2010	BBR	10	8	384	99.9%	70.7%	293
	BSS	10	8	351	99.8%	70.2%	275
	EAG	2	2	28	100%	72.1%	14
	WAG	2	2	21	98.7%	48.8%	15
	SMB	8	2	197	98.5%	72.7%	160

Source: NMFS AKRO RAM division Quota Share and Processor Quota Share holder files and IFQ accounting database

Table 5-9 Cooperative IFQ holdings and membership, 2011/12 through 2014/15

Season	Fishery	Number of IFQ holders (all)	Number of Cooperative IFQ holders	Number of cooperative members (all)	Percent of IFQ allocated to cooperatives	Maximum cooperative IFQ holding (% of TAC)	Largest cooperative membership
2011	BBR	10	8	376	99.8%	68.6%	290
	BSS	11	8	358	99.8%	67%	277
	EAG	2	2	27	100%	46%	12
	WAG	2	2	21	98.7%	47.8%	12
	SMB	11	4	195	99%	72.3%	159
2012	BBR	9	8	377	99.9%	68.8%	292
	BSS	9	8	359	99.8%	67.1%	279
	EAG	3	3	27	100%	46%	12
	WAG	3	3	20	98.7%	47.8%	12
	SMB	7	3	198	99.1%	72.1%	159
2013	BBR	10	9	375	99.9%	33.6%	153
	BSS	10	9	362	99.8%	31.7%	143
	EBT	12	6	339	99.3%	32.1%	145
	WBT	12	6	342	99.4%	32%	145
	EAG	2	2	26	100%	31.5%	7
	WAG	2	2	20	98.7%	44.4%	10
2014	BBR	10	9	365	99.9%	35.4%	148
	BSS	10	9	353	99.8%	33.3%	144
	EBT	13	7	350	99.7%	34.1%	141
	WBT	13	7	349	99.7%	34%	141
	EAG	2	2	33	100%	42.3%	13
	WAG	1	1	20	98.7%	44.4%	12
	SMB	10	6	189	99.3%	36.5%	87
2015	BBR	9	9	356	99.9%	35.4%	143
	BSS	9	9	354	99.8%	32.4%	140
	EBT	14	8	351	99.7%	34%	138
	WBT	14	8	349	99.7%	33.8%	138
	EAG	2	2	32	100%	41.9%	11
	WAG	2	2	20	98.7%	44.4%	11
	SMB	9	6	178	98.5%	36.2%	86

Source: NMFS AKRO RAM division IFQ accounting database

Finally, Table 5-10 presents aggregate statistics for harvest cooperatives pooled across all CR fisheries from 2005/06 through current. Harvest cooperatives span multiple fisheries, but not all cooperatives participate in all CR fisheries. In total, 10 harvest cooperatives have been formed in each of the last three seasons, collectively representing approximately 460 distinct members, the largest of which represented 184 members during the most recent season.

Table 5-10 Cooperative IFQ holdings and membership over all CR fisheries

Season	Number of IFQ holders (all)	Number of Cooperative IFQ holders	Number of cooperative members (all)	Percent of IFQ allocated to cooperatives	Maximum cooperative IFQ holding (% of TAC)	Largest cooperative membership
2005	147	13	360	84.1%	16.1%	82
2006	70	18	415	97.5%	19.4%	95
2007	41	19	425	99%	20.5%	96
2008	33	19	428	99.8%	19.9%	93
2009	26	10	438	99.9%	69.4%	336
2010	15	9	436	99.9%	69.6%	335
2011	18	9	442	99.9%	65.8%	339
2012	13	9	448	100%	65.4%	345
2013	16	10	455	100%	31.4%	183
2014	16	10	460	100%	33.3%	188
2015	16	10	464	100%	32.6%	184

Source: NMFS AKRO RAM division IFQ accounting database

Reflecting the consolidation of IFQ holdings within cooperatives, consolidation of harvest on vessels fishing for cooperatives has followed the same pattern (Table 5-11). In the Bristol Bay red king crab, Bering Sea snow crab and Bering Sea Tanner crab fisheries, harvest outside of cooperatives was significant during the first few years of the program, but has diminished to a single vessel operating intermittently in each of the Bristol Bay red king crab and BBS fisheries during the last three seasons, and harvest in both Bering Sea Tanner crab fisheries has been entirely consolidated within cooperatives since the 2008/09 seasons.

Vessel use caps in all of these fisheries limit vessels to less than 2% of the total IFQ allocations, respectively, and approximately one out of four vessels harvesting within cooperative have exceeded these cap levels. Consistent with the general trend of marginal but continuing reductions in the fleet harvesting Bristol Bay red king crab, average proportional share of the catch has increased from 1.2-1.4% during the first three years of the program, to 1.6 % during the last four seasons.

Comparatively, the few vessels operating outside of the cooperatives have harvested far below the cap level, generally averaging one-tenth of a percent of the catch or less. The Bering Sea Tanner crab fisheries have been wholly consolidated within the cooperative structure since the 2008/09 season. Due to instability in the fishery during the period when management was subject to MSA stock rebuilding requirements (2008/09 to 2011/12), and generally smaller allocations until the most recent season, the smaller number of and variation in intensity of targeted fishing among active vessels is indicated by the variability of average vessel catch statistics, both in average pounds landed and in terms of proportional averages, particularly in the Eastern component of the fishery, where the mean vessel catch as a percentage of total catch allocation has varied between 2.2% and 7.5%. Results shown for the Aleutian Island golden king crab fisheries in Table 5-12 show a more immediate shift to cooperative harvest, and a more highly concentrated fishery owing to the small number of vessels that comprise the fleet.

Table 5-11 Cooperative harvesting: BBR, BSS, and BST, 2005/06 through 2014/15 seasons

Fishery	Season	Cooperative harvest					Harvest outside of cooperatives		
		Vessels	Average vessel catch (pounds)	Average vessel catch as percent of total		Number of vessels exceeding cap	Vessels	Average vessel catch as percent of total	
				mean percent	median percent			mean percent	median percent
BBR	2005/06	71	192603	1.2	0.9	9	37	0.4	0.3
	2006/07	77	175860	1.3	1.1	15	15	0.1	<0.1
	2007/08	72	249033	1.4	1.2	13	6	0.2	<0.1
	2008/09	76	237560	1.3	1.1	11	5	0.1	<0.1
	2009/10	70	202884	1.4	1.4	13	4	<0.1	<0.1
	2010/11	65	203454	1.5	1.5	16	0	--	--
	2011/12	62	112940	1.6	1.5	16	1	*	*
	2012/13	64	109696	1.6	1.5	16	0	--	--
	2013/14	62	123568	1.6	1.4	14	0	--	--
	2014/15	63	140906	1.6	1.4	16	1	*	*
BSS	2005/06	63	439169	1.3	1	12	34	0.5	0.2
	2006/07	69	461521	1.4	1.2	12	12	0.1	<0.1
	2007/08	78	716573	1.3	1.1	12	7	0.1	<0.1
	2008/09	77	678100	1.3	1.1	12	5	<0.1	<0.1
	2009/10	68	627498	1.5	1.4	13	3	<0.1	<0.1
	2010/11	69	702011	1.4	1.4	16	2	<0.1	<0.1
	2011/12	71	1117033	1.4	1.3	16	3	<0.1	<0.1
	2012/13	70	845358	1.4	1.4	12	1	*	*
	2013/14	70	688806	1.4	1.4	11	1	*	*
2014/15	70	865483	1.4	1.3	13	1	*	*	
BST	2005/06	24	27191	1.9	0.8	7	11	0.8	0.7
EBT	2006/07	33	37184	2.2	0.3	12	3	0.6	<0.1
	2007/08	20	71186	2.3	1.1	5	0	--	--
	2008/09	16	96306	3.9	2.5	8	1	*	*
	2009/10	13	90687	7.5	6	10	1	*	*
	2013/14	20	65093	4.9	3.8	14	0	--	--
	2014/15	37	204141	2.7	2.5	20	0	--	--
WBT	2006/07	20	30772	3.1	2.2	12	0	--	--
	2007/08	18	25664	1.3	1.3	4	0	--	--
	2008/09	9	11745	0.8	0.1	1	0	--	--
	2013/14	19	62521	4.2	3.1	10	0	--	--
	2014/15	34	133666	2.2	1.7	15	0	--	--

Source: NMFS AKRO RAM division IFQ accounting database

* Withheld for confidentiality; -- indicates no data (fishery closed).

Table 5-12 Cooperative harvesting: EAG, WAG, and SMB, 2005/06 through 2014/15 seasons

Fishery	Season	Cooperative harvest				Harvest outside of cooperatives			
		Vessels	Average vessel catch (pounds)	Average vessel catch as percent of total		Number of vessels exceeding cap	Vessels	Average vessel catch as percent of total	
				mean percent	median percent			mean percent	median percent
EAG	2007/08	4	667328	24.7	20.7	2	0	--	--
	2008/09	3	935102	33	36.6	2	0	--	--
	2009/10	3	934516	33	36.7	2	0	--	--
	2010/11	3	921286	32.5	36.3	2	0	--	--
	2011/12	3	937535	33.1	39.9	2	0	--	--
	2012/13	3	968977	32.5	40	2	0	--	--
	2013/14	3	981018	32.9	37.4	2	0	--	--
	2014/15	3	983074	33	37.4	2	0	--	--
WAG	2005/06	3	784385	32.3	32.1	2	0	--	--
	2006/07	3	660806	27.2	22.9	2	0	--	--
	2007/08	3	741805	30.5	42.9	2	0	--	--
	2008/09	3	743039	29.1	36.9	2	0	--	--
	2009/10	3	815081	31.9	39.6	2	0	--	--
	2010/11	3	834844	32.7	36.4	2	0	--	--
	2011/12	3	834556	32.7	35.9	2	0	--	--
	2012/13	4	650869	24.3	22.2	3	0	--	--
	2013/14	3	862039	32.1	29.8	3	0	--	--
2014/15	2	*	*	*	2	0	--	--	
SMB	2009/10	7	64339	6.1	3.2	3	0	--	--
	2010/11	11	99827	6.9	5	8	0	--	--
	2011/12	18	92675	4.4	3.5	7	2	*	*
	2012/13	17	84254	5.7	5.7	10	0	--	--
	2014/15	4	73799	12.5	12.2	4	0	--	--

Source: NMFS AKRO RAM division IFQ accounting database

* Withheld for confidentiality; -- indicates no data (fishery closed).

5.3 IFQ Leasing

The following section provides information regarding lease transfer of IFQ and changes in the distribution of vessel use of IFQ based on information reported by vessel owners in the BSAI Crab Rationalization Economic Data Report (EDR) for the 2012 through 2014 calendar year CR fisheries. Data on IFQ lease activity is limited, as EDR data are collected at the vessel level, and are reported as annual aggregate quantity and cost of IFQ leased and landed by the vessel for each fishery and IFQ sector and Class. EDR lease data collected prior to 2012 have been previously determined to be unreliable and are not used in this or other analyses.⁴³ As indicated by the number of cooperative members and active vessels shown in the

⁴³EDR data collection for the 2012 calendar year implemented newly revised data collection protocols under Amendment 42 to the BSAI King and Tanner Crabs FMP ([78 FR 36122, June 17, 2013](#)); prior to the implementation of EDR revisions, data collected regarding EDR lease activity and costs did not differentiate between transfers of

previous sets of tables, however, the 75 to 80 vessels that have comprised the active fleet fishing for harvest cooperatives over the last several seasons collectively harvest IFQ for more than 450 cooperative members. As such, many vessels lease IFQ from multiple QS holders in a given fishery, although no information is available regarding the number of separate contracts under which a given vessel operator leases IFQ, and QS holders do not report any information on the quantity of IFQ they lease to vessel operators or royalty payments they receive. Lacking more detailed information at the level of individual IFQ lease agreements, quota lease quantities and costs reported in EDR data by a given vessel owner represent the aggregate of an unknown number of different lease agreements, which may vary considerably in their terms. In addition, because the ownership of crab vessels and that of QS holding entities overlaps, but with a varied and complex structure, it is unclear to what extent IFQ leases reported by vessel owners represent purely arm-length transactions. Lease data as reported in vessel EDR submissions are elicited as market value, negotiated price transfers, excluding transfers for nominal monetary or non-monetary payment. This does not explicitly exclude quota that is leased to the vessel for which the vessel owner receives indirect royalty compensation, and the degree to which this type of arrangement occurs is not well understood or quantified. With these caveats, the following analysis presents information at the most detailed level permissible under confidentiality limitations, in an effort to provide as much information about the variation in IFQ lease activity and royalty compensation over time, and between vessels participating in the distinct CR Program fisheries. The focus in the following is primarily in depicting the lease market; further discussion of lease expenditures in the context of vessel operating costs and net returns from fishing is presented in a later section.

Table 5-13 displays summary statistics for crab fishing quota lease volume (in pounds) and cost reported for crab vessels active in 2012 through 2014 calendar year CR fisheries, by fishing quota type category, with total quantities summed over all reporting vessels, and average values (both median and mean) for volume and cost of leased quota per vessel. Average lease price paid (\$US per pound) and average lease rate (lease price as percentage of ex-vessel price) per vessel are shown as well. Both median and arithmetic mean average value metrics are presented to provide information on the variation in reported values within each stratum, with the higher mean values shown indicate the presence of a subset of high-value data points in these data. Harvest IFQ types are categorized as the following: Catcher Vessel Owner Class A (CVO A) CVO Class B and Catcher/Processor Owner IFQ (CVO B + CPO) IFQ, and Catcher Vessel Crew and Catcher/Processor Crew (CVC + CPC) IFQ, or crew share.

quota between independent entities that were priced at competitive market rates from non-arms-length transactions (i.e., those between affiliated entities or other types of non-market transfers characterized by nominal prices or in-kind compensation). For this reason, EDR quota lease data collected previously for 2005-2011 fisheries was not deemed of sufficient quality to disseminate.

Table 5-13 Crab harvest quota lease activity, volume, cost, and average lease prices and rates; CR Program fisheries

Fishery	Year	IFQ Type	Vessels	Pounds leased (1000)			Lease Cost (\$1000)			Lease price (\$/pound)		Lease rate (percent of ex-vessel value)	
				Total	Median	Mean	Total	Median	Mean	Median	Mean	Median	Mean
BBR	2012	CVO A	50	3,619	65	72	\$18,397	\$315	\$368	\$5.33	\$5.48	64%	67%
		CVO B + CPO	42	539	8	12	\$3,009	\$43	\$67	\$5.51	\$5.90	63%	69%
		CVC + CPC	36	172	4	5	\$926	\$22	\$24	\$5.38	\$5.43	62%	63%
	2013	CVO A	51	4,425	79	87	\$20,596	\$349	\$404	\$4.56	\$4.71	64%	66%
		CVO B + CPO	45	778	10	16	\$3,761	\$48	\$75	\$4.82	\$4.72	63%	62%
		CVC + CPC	37	199	5	5	\$989	\$22	\$24	\$4.85	\$5.00	64%	66%
	2014	CVO A	50	5,229	88	105	\$22,263	\$374	\$445	\$4.21	\$4.24	62%	63%
		CVO B + CPO	43	854	12	17	\$3,731	\$55	\$76	\$4.37	\$4.36	64%	65%
		CVC + CPC	34	213	6	6	\$928	\$24	\$26	\$4.35	\$4.42	65%	68%
BSS	2012	CVO A	55	42,796	640	778	\$43,947	\$678	\$799	\$1.03	\$1.03	46%	46%
		CVO B + CPO	47	6,990	84	132	\$8,062	\$104	\$152	\$1.12	\$1.19	46%	50%
		CVC + CPC	39	1,880	48	46	\$2,071	\$52	\$52	\$1.13	\$1.15	46%	47%
	2013	CVO A	56	34,353	487	613	\$37,495	\$523	\$670	\$1.08	\$1.09	46%	46%
		CVO B + CPO	50	7,741	78	133	\$9,693	\$96	\$167	\$1.17	\$1.20	47%	48%
		CVC + CPC	41	1,767	35	40	\$2,114	\$41	\$48	\$1.15	\$1.25	46%	50%
	2014	CVO A	57	29,683	442	521	\$32,362	\$489	\$568	\$1.12	\$1.08	46%	45%
		CVO B + CPO	48	5,988	69	107	\$7,187	\$94	\$128	\$1.21	\$1.27	47%	52%
		CVC + CPC	37	1,258	29	31	\$1,465	\$34	\$38	\$1.22	\$1.23	46%	48%
BST	2013	CVO A	16	777	53	49	\$553	\$26	\$35	\$0.74	\$0.67	28%	28%
		CVO B + CPO	13	130	6	8	\$121	\$5	\$8	\$0.80	\$0.86	28%	40%
		CVC + CPC	10	42	1	3	\$32	\$1	\$2	\$0.80	\$0.76	28%	30%
	2014	CVO A	32	5,256	95	128	\$3,434	\$65	\$84	\$0.65	\$0.70	28%	28%
		CVO B + CPO	25	820	12	21	\$604	\$9	\$15	\$0.68	\$0.81	28%	33%
		CVC + CPC	24	428	3	11	\$182	\$2	\$5	\$0.69	\$0.80	28%	31%
SMB	2012	CVO A	4	*	*	*	*	*	*	*	*	*	*
		CVO B + CPO	4	*	*	*	*	*	*	*	*	*	*
		CVC + CPC	4	*	*	*	*	*	*	*	*	*	*
	2014	CVO A	17	1,149	49	68	\$1,681	\$68	\$99	\$1.42	\$1.65	32%	38%
		CVO B + CPO	10	144	12	11	\$214	\$19	\$16	\$1.47	\$1.52	33%	35%
		CVC + CPC	9	95	2	11	\$46	\$6	\$5	\$1.47	\$1.66	34%	38%
AIG	2012	CVO A	4	*	*	*	*	*	*	*	*	*	*
		CVO B + CPO	4	*	*	*	*	*	*	*	*	*	*
		CVC + CPC	4	*	*	*	*	*	*	*	*	*	*
	2013	CVO A	5	2,026	328	405	\$3,646	\$583	\$729	\$1.53	\$1.68	35%	39%
		CVO B + CPO	6	1,285	83	143	\$1,862	\$234	\$207	\$1.50	\$1.75	36%	42%
		CVC + CPC	5	151	27	25	\$311	\$45	\$52	\$1.89	\$1.92	41%	45%
	2014	CVO A	3	*	*	*	*	*	*	*	*	*	*
		CVO B + CPO	2	*	*	*	*	*	*	*	*	*	*
		CVC + CPC	2	*	*	*	*	*	*	*	*	*	*

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Lease data shown represent arms length lease transactions reported by quota purchasers in the EDR. Harvest quota types are categorized in this report as the following: CVO A (catcher vessel owner Class A IFQ), CVO B + CPO (catcher vessel owner Class B IFQ and catcher/processor owner IFQ), and CVC + CPC (catcher vessel crew IFQ and catcher/processor crew IFQ). Statistics reported represent results pooled over all quota types and/or regional designations within each category. Average lease price and lease rate statistics by fishery and quota type are calculated as the median and arithmetic mean, respectively, over all observations where both pounds and cost for one or more quota type within the respective category were reported as non-zero values. Lease rate for each quota type is calculated with respect to ex-vessel value of crab sold using the same quota type. As such, variation in lease price and lease rate in a given fishery may not be consistent between different quota types. * Withheld for confidentiality.

Average (median) lease prices and lease rates in the 2014 Bristol Bay red king crab fishery shown in Table 5-13 range from \$4.37 per pound for CVO-B and CPO allocation, representing a 63% lease rate as compared to ex-vessel value per pound,⁴⁴ to \$4.21 per pound (62% lease rate) for Bristol Bay red king crab CVO A Class allocation. Mean values were similar, with a slightly higher value for crew share allocation of \$4.42 per pound, a lease rate of 68 percent. In lease price per pound terms, these values reflect the decline in ex-vessel prices over the three year period shown, with median 2012 prices ranging between \$5.33-\$5.51 per pound. In lease rate terms, both median and mean values show only moderate change over the three years, although in each successive year, the mean lease rate for A Class IFQ has decreased, from 67% in 2012 to 63% in 2014, from 64% to 62% in median terms. This may be indicative of greater voluntary compliance with the 65% lease rate limit promoted by harvest cooperatives, but is difficult to assess with point value measures, and further analysis of the distribution of reported lease data is presented below. Median lease price and rate in the 2014 calendar year Bering Sea snow crab fishery (primarily the 2013/2014 season) shown in Table 5-13 ranged from \$1.22 for crew share allocation (49% of ex-vessel value) to \$1.12 per pound for Bering Sea snow crab CVO A Class IFQ (46% of ex-vessel), with mean values varying over a slightly wider range. Prices followed the ex-vessel price increase over the period (\$2.25 per pound weighted average during 2012, \$2.36 in 2013 and \$2.38 in 2014). In point-value terms no change in lease rates is discernible over the period; median values have remained nearly constant. Only limited results can be reported for the Saint Matthew blue king crab and Aleutian Island golden king crab fisheries due to the small number of participating vessels, but reportable results indicate that mean lease rates in both fisheries are in the range of 38 to 39% for A Class IFQ, and 28% in Bering Sea Tanner crab fisheries during the 2013 and 2014 seasons.

To provide greater detail, Figure 5-4 through Figure 5-7 display box plots of the distribution of lease price and lease rate values calculated from EDR lease data for Bristol Bay red king crab and Bering Sea snow crab fisheries. Data points are weighted by the quantity of leased pounds represented by the observed price and rate values to diminish the effect of small quantities of IFQ leased at high rates (e.g., as when 100% of ex-vessel may be paid on IFQ leased to cover an overage). Such leases are typically masked in the aggregate values reported in EDR data, but may appear as high outlying data points in some cases, particularly in IFQ B and crew share leases where the quantities leased are generally comparatively small and may reflect more irregular lease terms than the general Class A IFQ pool. Plots are shown for each IFQ type, as well as values pooled over leases of all IFQ types.⁴⁵ To avoid concerns regarding confidentiality, vessel level observations were ordered by value and binned into groups of five, and mean values of each metric within the vessel grouping are plotted. The figures show the median value as the black bar, with the lower and upper portions of the box indicating the interquartile range (IQR) between the 25th and 75th percentile of the distribution, respectively; where shown, lines extend to the lowest and highest observation within 1.5 times the width of the middle quartiles, and dots show grouped values extending beyond this range. In each lease rate figure, a horizontal line shown in red indicates the voluntary rate cap limit promoted by harvest cooperatives.

⁴⁴ See Table 5-13 footnote regarding calculation of lease rate.

⁴⁵ Vessel level EDR data may exhibit some inconsistency between IFQ ex-vessel landings data reported by IFQ type and quantities of IFQ leased by each type. Lease rate calculations use both pounds and value data for leases and ex-vessel sales reported in EDR data, and inconsistency between the leased and landed IFQ types reported for a vessel can result in greater variation in lease rates calculated for individual quota types; aggregating over IFQ types in calculations of vessel level lease rates corrects this, as indicated in the aggregated results show in Figure 5-5 and Figure 5-7 which exhibit somewhat narrower range of variation.

Figure 5-4 Lease price per pound, Bristol Bay red king crab fishery - weighted distribution

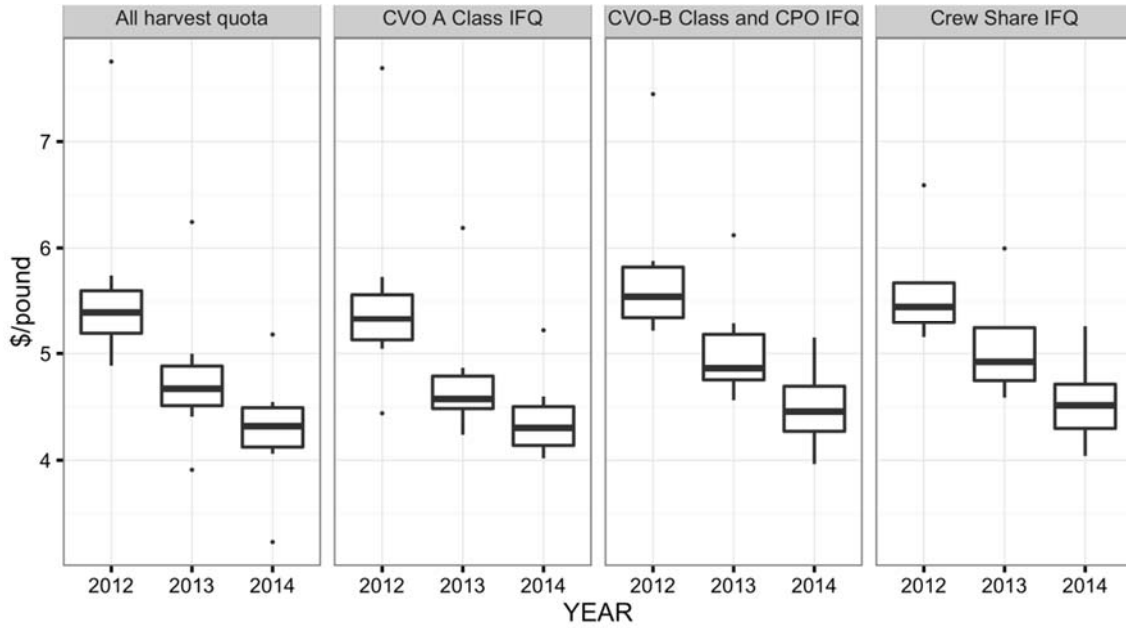


Figure 5-5 Lease rate (% of ex-vessel value, Bristol Bay red king crab fishery - weighted distribution)

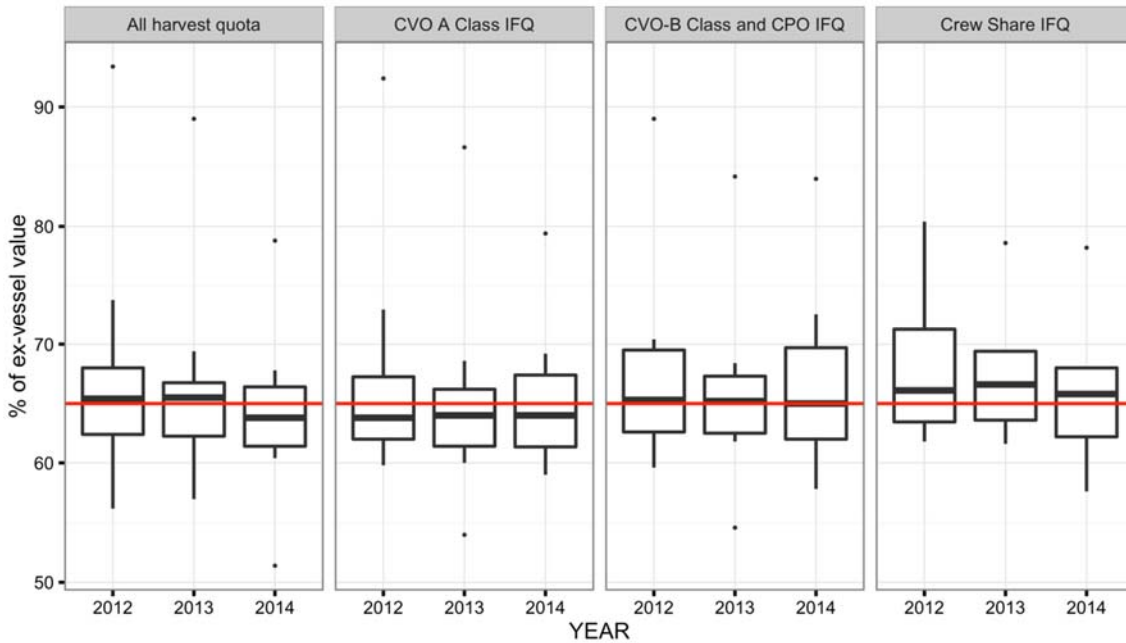


Figure 5-6 Lease price per pound, Bering Sea snow crab fishery - weighted distribution

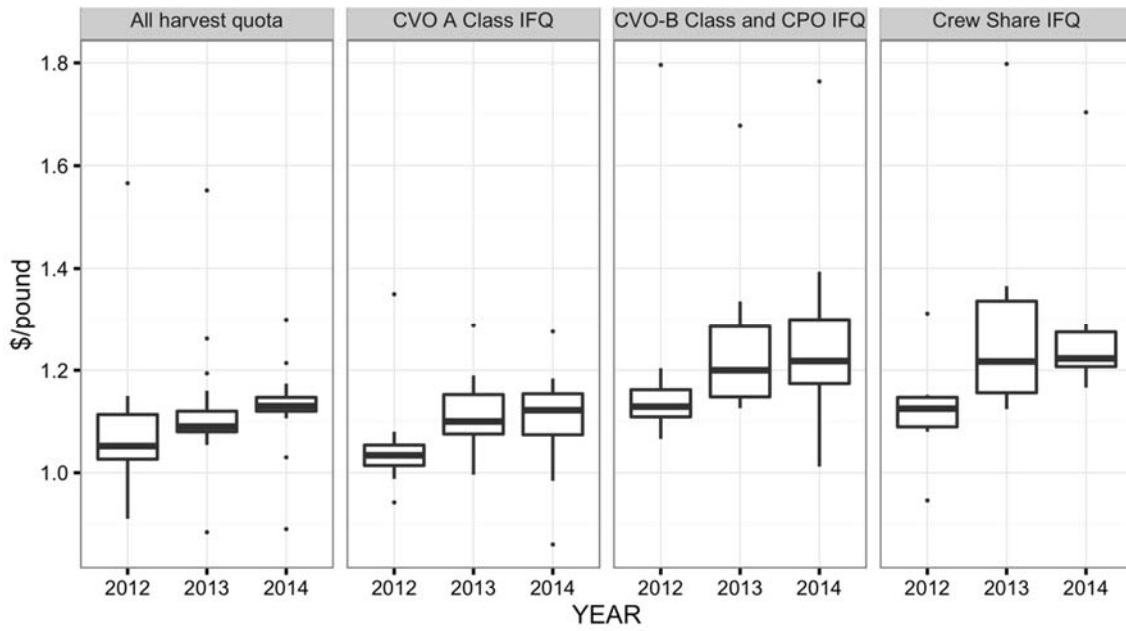
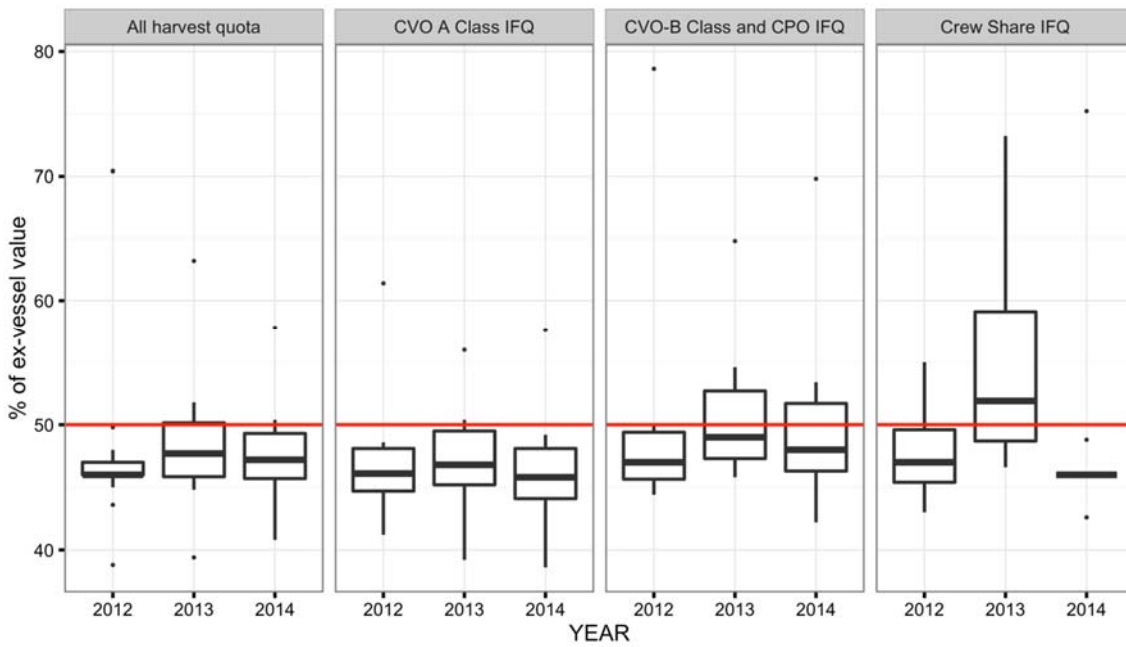


Figure 5-7 Lease rate (% of ex-vessel value), Bering Sea snow crab fishery - weighted distribution



In price per pound lease terms, the distributions for Bristol Bay red king crab IFQ leases indicate distinct change over the period, with little or no overlap of the IQR portion of the respective sets of data points for different IFQ types. This corresponds to the substantial decline in ex-vessel value per pound over the period. In contrast, lease rate values for the Bristol Bay red king crab fishery show little change over the three-year period with respect to the central portion of the distributions, and the range of variation appears to have narrowed in each successive year. For A Class IFQ, the median lease rate value has remained below 65% throughout the period and median B Class and CPO lease rates have remained consistent at that level, while the majority of crew share leased at rates exceeding 65 percent. For lease data pooled over IFQ type, the median lease rate shifted below the 65% level in the most recent season. While a significant portion of quota is leased at rates exceeding 65 percent, there is some indication that voluntary compliance may be increasing, and no clear indication of directional change toward higher rates.

Results shown for the Bering Sea snow crab fishery in

Figure 5-7 indicate a similarly consistent range of lease rates over the period, but with a 75% or more of reported leases below the 50% lease rate level in each of the three years. Again, while this does not confirm the effect of the voluntary limit, it does indicate that general compliance has occurred in each year since the initiative went into effect. Without a longer period over which to assess the variation in lease rates, it is unclear to what degree the 50% rate level is significantly less than would have otherwise occurred.

5.4 Vessel operations

As a well-known result of rationalization, season lengths in the CR Program fisheries increased sharply as management shifted from derby fishing conditions in years leading up to the program, with Bristol Bay red king crab season openings lasting as few as 4 days during the 2004/05 season, and 6 days in the 2005 Bering Sea snow crab season, to quota-based management under which season lengths have expanded to the full regulatory seasons during which the stocks can legally be targeted under State of Alaska fishery regulations. With fleet consolidation, vessel effort among the remaining fleet is necessarily extended over a longer time period. Active seasons since CR Program implementation have ranged in length in the Bristol Bay red king crab fishery from 26 days during 2013/14, to 92 during the 2008/09 and 2009/10 seasons. The longest season in the Bering Sea snow crab fishery occurred during 2011/12 at 231 days, with the shortest at 116 days in 2009/10. The Western Aleutian Islands golden king crab fishery occurs over the longest season, spanning 254 days during the 2014/15 season. Table 5-14 and Table 5-15 present data for the total number of days during which vessels in the crab fleet were active at sea, which varies in response to a variety of conditions, including the quantity of allowable catch, but also weather and sea ice conditions affecting fishing. Most variation has occurred in the Bristol Bay red king crab and Bering Sea snow crab fisheries, where there were an average 2,670 (2,611 for CV's and 52 for CPs) vessel days per season in the Bristol Bay red king crab fishery during the baseline reference years (1998, 2001, and 2004), and 1,056 vessel days during 2014. The largest shift in vessel days occurred between 2010 and 2011, when the total went from 2,023 days to 910, concurrent with reduction in the TAC from 14.8 million pounds to 7.83 million pounds. Active days in the Bering Sea snow crab fishery have ranged from 6,570 averaged over pre-rationalization reference years (239 days for CPs and 6,331 days for CVs), to 3,032 in 2010 (as reported in EDR data; CIF data indicate 2,812 days active during 2010, but both sources indicate a median of 41-42 active days per vessel). Days active in the 2014 Bering Sea snow crab fishery declined from an estimated 5,665 in 2012 to 4,581 in 2013 (with median days decreasing from 79 to 58).

Table 5-14 Harvest activity days, BBR, BSS, and BST fisheries

Fishery	Sector	Year	Vessels	Days active - total (median)		Days fishing - total (median)	
				EDR	CIF	EDR	CIF
BBR	CP	98/01/04	20 (9)	59 (7)	--	--	--
		2005	5	162 (23)	--	98 (19)	--
		2006	3	*	--	*	--
		2007	3	*	*	*	*
	CV	98/01/04	631 (250)	2611 (10)	--	--	--
		2005	85	2253 (25)	--	1374 (13)	--
		2006	79	1766 (21)	--	1062 (12)	--
		2007	71	2274 (30)	1930 (26)	1442 (19)	1230 (16)
	CVCP	2008	79	2556 (29)	2410 (28)	1780 (20)	1635 (19)
		2009	70	2126 (29)	1936 (27)	1408 (19)	1306 (18)
		2010	65	2321 (34)	2023 (30)	1604 (22)	1417 (22)
		2011	62	1151 (17)	910 (14)	701 (10)	538 (8)
		2012	64	*	843 (13)	*	499 (8)
		2013	63	*	947 (14)	*	587 (9)
2014		63	*	1056 (15)	*	660 (10)	
BSS	CP	98/01/04	18 (8)	239 (39)	--	--	--
		2005	6	189 (28)	--	80 (9)	--
		2006	4	*	--	*	--
		2007	4	*	*	*	*
	CV	98/01/04	522 (210)	6331 (25)	--	--	--
		2005	150	2710 (16)	--	1275 (7)	--
		2006	74	2927 (34)	--	1930 (22)	--
		2007	63	2321 (36)	2009 (31)	1491 (21)	1057 (15)
	CVCP	2008	78	3879 (49)	3483 (41)	2619 (33)	1941 (23)
		2009	77	3869 (49)	3602 (44)	2600 (32)	2111 (26)
		2010	68	3032 (42)	2812 (41)	2110 (29)	1718 (24)
		2011	68	3303 (46)	2878 (40)	2217 (31)	1734 (24)
		2012	72	*	5665 (79)	*	3391 (48)
		2013	71	*	4581 (58)	*	2998 (38)
2014		69	*	3802 (54)	*	2629 (35)	
BST	CP	2005	1	*	--	*	--
		2006	1	*	--	*	--
		2007	1	*	*	*	*
	CV	2005	4	*	--	*	--
		2006	25	416 (13)	--	283 (10)	--
		2007	24	555 (22)	445 (17)	410 (16)	295 (11)
	CVCP	2008	27	592 (18)	568 (19)	423 (11)	405 (13)
		2009	17	467 (22)	350 (17)	321 (15)	238 (12)
		2010	4	*	*	*	*
		2011	18	*	279 (12)	*	200 (9)
2012	38	*	1245 (28)	*	905 (21.5)		

See source and table notes for Table 5-15

Table 5-15 Harvest activity days, AIG and SMB fisheries

Fishery	Sector	Year	Vessels	Days active - total (median)		Days fishing - total (median)	
				EDR	CIF	EDR	CIF
AIG	CP	98/01/04	4 (2)	*	--	--	--
		2005	2	*	--	*	--
		2006	1	*	--	*	--
		2007	1	*	*	*	*
	CV	98/01/04	52 (22)	1203 (41)	--	--	--
		2005	10	589 (54)	--	411 (39)	--
		2006	6	571 (102)	--	410 (67)	--
		2007	6	471 (75)	439 (75)	349 (55)	289 (45)
	CVCP	2008	5	695 (124)	702 (116)	494 (83)	474 (76)
		2009	6	666 (105)	645 (109)	460 (68)	439 (69)
		2010	5	719 (105)	725 (146)	486 (77)	466 (80)
		2011	5	617 (107)	582 (131)	398 (76)	400 (82)
		2012	6	*	641 (104.5)	*	427 (73.5)
		2013	6	*	662 (104.5)	*	430 (67.5)
2014		5	*	676 (84)	*	449 (53)	
SMB	CV	2010	11	485 (36)	429 (36)	365 (23)	313 (27)
		2011	18	663 (33)	710 (36.5)	473 (26)	468 (24)
		2012	17	*	542 (33)	*	363 (19)
		2014	4	*	*	*	*
	CV	98/01/04	43 (43)	762 (15)	--	--	--

Source: NMFS AFSC BSAI Crab Economic Data. ADF&G Shellfish Observer Program, Confidential Interview Form Data and eLandings

Notes: Data shown by calendar year. Statistics shown for 98/01/04 are calculated as the annual average over the 1998, 2001, and 2004 calendar years; Vessels' for 98/01/04 shows count of vessels operating each year, summed overall years; numbers in parentheses show count of unique vessels participating within the three years. Total statistics for Days Active and Days Fishing columns for 98/01/04 shows total aggregate count of vessel activity days averaged across years for participating/reporting vessels. Starting in 2009, data are summarized over all harvesting sectors (CVCP) to preserve confidentiality. Days active and days fishing are shown as calculated from EDR reporting (1998-2011 for days active, 2005-2011 for days fishing) and ADF&G Shellfish Observer Program confidential interview form data (CIF) supplemented with eLandings data (2009 and later). EDR days active by fishery is calculated using reported days at sea in the 1998-2004 data and, for 2005 and later, the sum of days fishing and days travelling and offloading (vessel activity was not reported by days fishing and traveling/offloading in the 1998-2004 EDR). Note that the 1998-2004 and 2005 and later figures for both total and median days active are not directly comparable, as the pre-2005 data do not include days spent queuing and offloading at processors.

* Withheld for confidentiality; -- indicates no data available.

Crab vessels often make deliveries to multiple processors following a single fishing trip. Table 5-16 reports the total number of trips and deliveries per season, average deliveries per trip,⁴⁶ and average landings volume per delivery and per trip. Statistics for vessel trips (total and mean per vessel) in the Bristol Bay red

⁴⁶ Note that trip-based metrics in Table 5-16 are available only for the 2006/07 crab season and later, with limited information available from EAG and WAG fisheries. Also note that BST results shown include landings of BST crab that are caught as bycatch in the BSS fishery and do not solely reflect directed targeting, and effort statistics shown should be interpreted accordingly.

king crab fishery during the last seven seasons have ranged from 237 total trips (3.0 per vessel) during the 2008/09 season to a low of 99 total trips (1.8 per vessel) during the 2012/13 season. In the Bering Sea snow crab fishery, as discussed previously, total catch has been considerably more volatile and vessel-trips counts have varied more widely, from 215 total trips (3.1 per vessel) in 2006/07, the lowest TAC year (37 million pounds), to 636 total trips (8.8 per vessel) in 2011/12 when the TAC was 89 million pounds. Over this period, average landings per trip have varied between a high of 168 thousand pounds per trip in 2010/11 to a low of 140 thousand pounds per trip in 2011/12, moderating at 157 thousand pounds per trip in 2013/14.

Further information on active season lengths in the Bristol Bay red king crab and Bering Sea snow crab fisheries is summarized in Figure 5-8, depicting the length of fishing seasons (in terms of the period over which vessels delivered landings to processors), intensity of effort (number of vessels making landings in a week), and the cumulative proportion of total quota allocation landed by date, by allocation type (CVO A Class IFQ, CVO B Class and crew share IFQ, and all quota types combined). The shaded area in the curve indicates the number of vessels making landings during the week, and the lines indicate cumulative percentage of the TAC landed over the course of the season (with the solid line representing all IFQ and CDQ allocations, dotted lines representing A Class IFQ, and dashed lines indicating B Class and crew share IFQ). The 2012 Bristol Bay red king crab fishery was the shortest since 2005, with all crab being landed between October 15 and November 12. The 2011/12 Bering Sea snow crab season was unique in both the length of the season and discontinuity of vessel effort during the late part of the season. This occurred as a result of sea ice conditions that inhibited vessels from accessing northern district fishing grounds, requiring an extension of the fishing season by ADF&G from May 31 to June 15. During the 2013/14 and 2014/15 Bering Sea snow crab seasons, active fishing by several vessels began in early December, nearly a full month before the earliest significant landings occurred in previous years. As indicated by the lines showing cumulative proportion of fishing quota allocations landed over the course of the fishing season by type of quota, a consistent phenomenon across fisheries and seasons is that CVO A share quota (dotted line) is used somewhat earlier in the season than quota types that are not subject to share matching with processors holding IPQ (CVO B- and crew share IFQ, shown as the dashed line). This difference is most evident during the 2011/12 season, 20% of A-type IFQ remained to be landed as of the 28th week of the 35-week 2011/12 season, compared to 63% of B- and C-type IFQ, and the same relative distribution of landings by share type as of the first week of the 2012/13 season. During the 2014/15 Bering Sea snow crab season, 16% of CVO B- and crew share IFQ remained to catch as late as April 29.

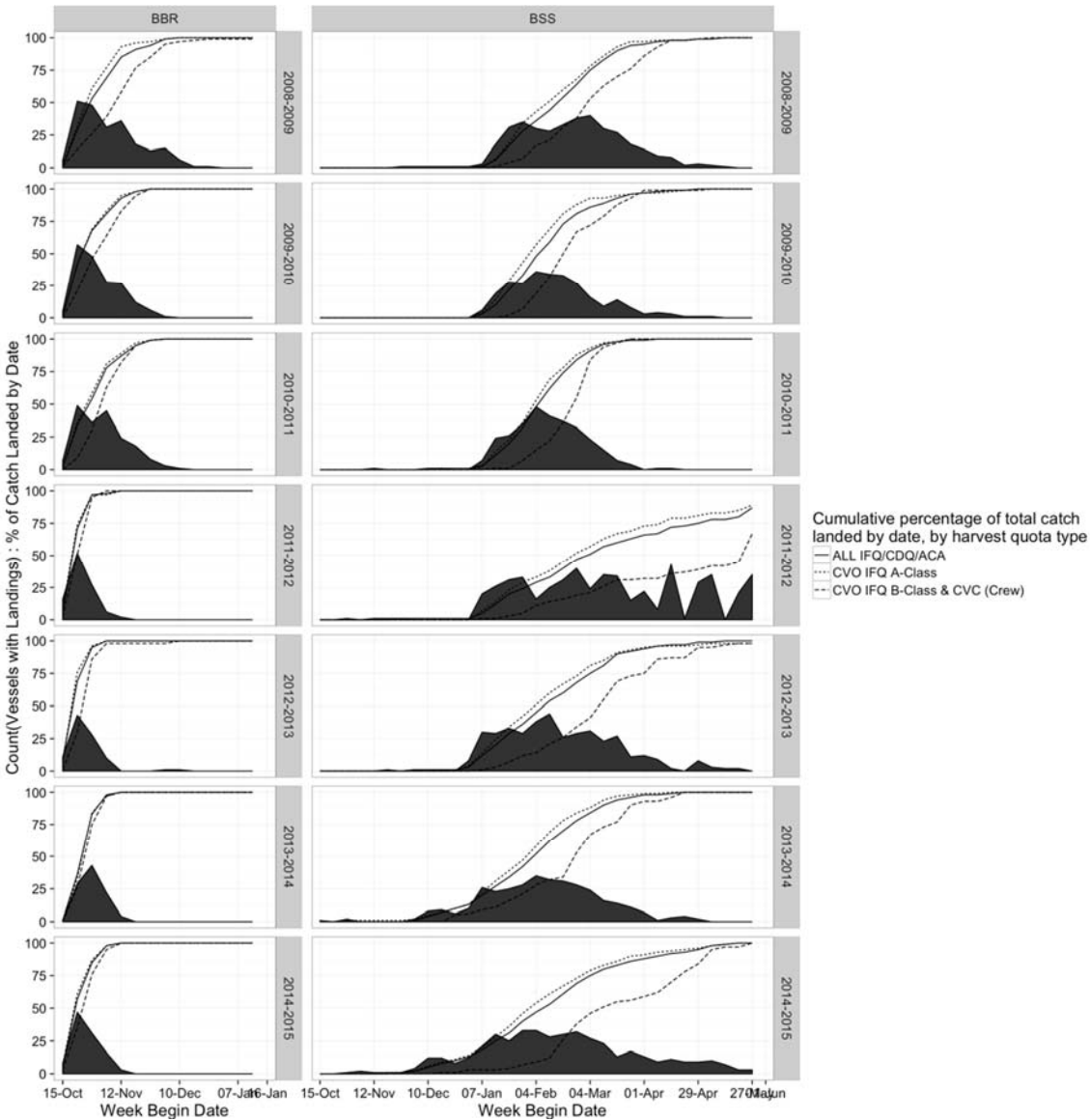
Table 5-16 Delivery and trip statistics

Fishery	Season	Vessels	Deliveries			Trips		
			Total	Average deliveries per vessel	Average landings per delivery	Total	Average trips per vessel	Average landings per trip (1000 lbs)
BBR	2005/06	89	261	2.9	69.8	--	--	--
	2006/07	81	187	2.3	82.8	156	1.9	100.1
	2007/08	74	247	3.3	81.7	207	2.8	98.4
	2008/09	78	263	3.4	76.5	237	3.0	85.8
	2009/10	70	211	3.0	74.8	198	2.8	80.5
	2010/11	65	213	3.3	69.0	201	3.1	73.8
	2011/12	62	124	2.0	62.8	114	1.8	68.1
	2012/13	64	118	1.8	66.1	101	1.6	77.7
	2013/14	63	119	1.9	71.6	105	1.7	81.9
BSS	2005/06	78	316	4.1	115.9	--	--	--
	2006/07	69	273	4.0	131.5	215	3.1	169.1
	2007/08	78	466	6.0	134.1	413	5.3	151.9
	2008/09	77	437	5.7	132.9	381	4.9	153.7
	2009/10	68	308	4.5	154.1	289	4.3	165.0
	2010/11	68	343	5.0	157.2	323	4.8	168.0
	2011/12	72	658	9.1	134.0	636	8.8	139.7
	2012/13	70	435	6.2	151.2	422	6.0	157.0
	2013/14	70	379	5.4	141.4	370	5.3	145.1
BST	2005/06	33	64	1.9	14.6	--	--	--
	2006/07	39	88	2.3	23.8	81	2.1	18.3
	2007/08	27	95	3.5	21.9	93	3.4	17.7
	2008/09	20	67	3.4	28.7	59	3.0	14.7
	2009/10	13	32	2.5	41.0	28	2.2	14.9
	2013/14	25	74	3.0	37.2	71	2.8	10.9
EAG	2005/06	7	34	4.9	83.5	--	--	--
	2006/07	6	28	4.7	105.6	22	3.7	136.0
	2007/08	4	35	8.8	84.8	28	7.0	106.8
	2008/09	3	*	*	*	*	*	*
	2009/10	3	*	*	*	*	*	*
	2010/11	3	*	*	*	*	*	*
	2011/12	3	*	*	*	*	*	*
	2012/13	3	*	*	*	*	*	*
	2013/14	3	*	*	*	*	*	*
SMB	2009/10	7	16	2.3	28.1	15	2.1	30.7
	2010/11	11	40	3.6	31.3	38	3.5	33.3
	2011/12	18	58	3.2	31.9	57	3.2	33.0
	2012/13	17	45	2.6	35.4	45	2.6	35.9
WAG	2005/06	3	*	*	*	--	--	--
	2006/07	4	33	8.3	67.6	29	7.3	77.7
	2007/08	3	*	*	*	*	*	*
	2008/09	3	*	*	*	*	*	*
	2009/10	3	*	*	*	*	*	*
	2010/11	3	*	*	*	*	*	*
	2011/12	3	*	*	*	*	*	*
	2012/13	4	32	8.0	90.5	27	6.8	109.4
	2013/14	3	*	*	*	*	*	*

Source: NMFS AKRO RAM division Quota Share and Processor Quota Share holder files and IFQ accounting database, and eLandings.

Notes: A delivery is counted as each unique day that a vessel landed crab and may include landings to multiple processors; a single fishing trip may result in multiple deliveries if crab was landed on multiple days. Includes landings on and by catcher/processors. * Withheld for confidentiality; -- indicates no data available (trip accounting data unavailable prior to 2006/2007 season).

Figure 5-8 Crab vessel landing activity and cumulative catch, by quota share class and week of season: BBR and BSS crab



Source: ADF&G fish tickets via eLandings; NMFS RAM Division, IFQ accounting database

Notes: The vertical axis indicates both count of vessels and percentage of quota share, and horizontal axis shows the ending date of each week during the Bristol Bay red king (BBR) and Bering Seas snow (BSS) crab fishing season. The filled area in the graph indicates the count of vessels making landings each week. Plotted lines show the cumulative percentage of fishing quota expended on landings over the course of the season: ALL IFQ/CDQ/ACA (solid line) includes all IFQ and CDQ programs quota landed by catcher vessels and catcher/processors; IFQ A-Class (dotted line) includes CVO Class A IFQ quota permits only; CVO IFQ B-Class & CVC (Crew) (dashed line) includes CVO B Class IFQ and CVC (crew) IFQ. CDQ landings are not shown separately due to confidentiality restrictions. BSS seasons normally open October 15 and

close May 31 of the next calendar year; the 2011/12 BSS season was extended until June 15 due to an extended period of sea ice cover which substantially delayed prosecution of the fishery.

5.5 Vessel Gross Earnings and Operating Costs

The following section summarizes measures of economic benefits generated by the harvesting sector of the CR crab fisheries, at the average vessel level, and for the fleet in aggregate. Gross revenue estimates for each vessel are based on ex-vessel sale information reported in EDR records, which provide the most complete accounting of post-season adjustments received by vessel owners in available data sources. In order to provide some degree of analysis of net benefits produced by vessels operating in the CR fisheries, the following uses the limited data available to account for labor and operating costs incurred by vessels to derive estimates of the residual earnings retained by the vessel operator after payment of onboard labor expenses, vessel operating costs (fuel, bait, and provisions), and harvesting quota lease expenses. Comprehensive reporting of capital investment costs and additional annual expense categories was suspended by revisions to crab EDR data collection in 2012, and due to data quality limitations in EDR data collected prior to 2012, fuel and IFQ lease costs are available only for the period 2012 to 2014, which prevents a more continuous analysis net earnings over the full period since the CR Program was implemented. As such, the following provides a limited analysis of gross and net earnings in the CR fisheries.

Available cost data are fragmentary for years prior to 2012, and are limited to bait, provisions, and onboard labor costs; these costs are reported in the tables below in terms of average annual expenditure, and as a percentage of gross ex-vessel revenue. Statistics reporting information available for crab vessel gross earnings and selected operating expenditures available for pre-rationalization reference years and 2005 through 2014 are summarized at the CR Program level over all fisheries and for the Bristol Bay red king crab and Bering Sea snow crab fisheries in Table 5-17, and Table 5-18 reports statistics for the BST, Aleutian Island golden king crab and St Matthew blue king crab fisheries. A more comprehensive representation of economic performance of the harvest sector is supported by more complete vessel-level cost data available for 2012 to 2014, which includes fuel expenditures and harvest quota lease royalty payments. Using these data, approximate estimates of net earnings are provided below for the Bristol Bay red king crab and Bering Sea snow crab fisheries, and in aggregate over all CR fisheries; Table 5-19 provides estimates at the level of the average vessel, and Table 5-20 provides aggregate fleet-level estimates. A more extensive analysis of crew employment and earnings in the Bristol Bay red king crab and Bering Sea snow crab fisheries is provided in the next section.

In aggregate, CR Program fisheries have produced gross revenues well in excess of \$200 million per year in six of the last 10 years, peaking in 2012 at \$291 million from landings of 103 million pounds. On a per-vessel basis, gross ex-vessel value of crab landings across all CR Program fisheries have ranged from \$1.27 million to \$3.51 million, exceeding the values earned by vessels on average during the 1998, 2001 and 2004 reference years prior to rationalization by over seven times. Labor earnings for captains and crew across the program consistently represent 19 to 21% of production value, generating labor earnings ranging from \$226 thousand to \$715 thousand per year. Average vessel earnings in the Bristol Bay red king crab fishery increased by a factor of three during the first year under rationalization, despite an 8% decline in average ex-vessel price, due to a combination of increased TAC and consolidation of IFQ catch on a much smaller

fleet. Ex-vessel price declined further during 2006, and combined with a reduced TAC, resulted in a 20% decline in average ex-vessel gross earnings to \$835 thousand per vessel, \$68 million in aggregate, and establishing the poorest year of earnings in the fishery over the subsequent period under rationalized management. In 2007, the fishery saw a 26% increase in TAC and 13% higher average ex-vessel price, combined with contraction of the fleet from 81 to 73 vessels, producing a 61% increase in average ex-vessel revenue to \$1.34 million.

Table 5-17 Vessel gross ex-vessel sales and selected operating costs, BBR and BSS fisheries, and all CR fisheries aggregated, 1998, 2001, 2004, and 2005 through 2014

Fishery	Year	Number of vessels	Ex-vessel pounds sold		Gross ex-vessel revenue		Ex-vessel price	Bait cost		Provisions costs		Crew and captain share costs	
			Total (\$Million)	Average (\$1000)	Total (\$Million)	Average (\$1000)	Average	Average (\$1000)	Percent of gross	Average (\$1000)	Percent of gross	Average (\$1000)	Percent of gross
							\$ per pound						
All CR fisheries	1998	221	201	908	205	926	1.02	35	3.73	16	1.77	351	37.9
	2001	223	31	139	104	467	3.35	18	3.90	9	1.96	176	37.6
	2004	245	40	163	150	613	3.77	17	2.74	9	1.44	227	37.0
	2005	173	46	266	154	893	3.35	14	1.60	8	0.93	226	25.3
	2006	101	59	582	129	1,273	2.18	19	1.49	9	0.70	260	20.5
	2007	87	61	706	181	2,078	2.94	22	1.05	9	0.45	423	20.4
	2008	96	89	925	253	2,632	2.85	27	1.02	16	0.61	542	20.6
	2009	89	80	897	189	2,119	2.36	31	1.46	10	0.48	421	19.9
	2010	78	69	886	212	2,715	3.07	35	1.27	14	0.51	506	18.6
	2011	76	68	892	265	3,490	3.91	34	0.97	11	0.32	694	19.9
	2012	83	103	1,246	291	3,508	2.82	36	1.02	22	0.64	715	20.4
	2013	81	84	1,037	250	3,082	2.97	36	1.18	16	0.51	618	20.1
2014	76	81	1,061	245	3,221	3.04	46	1.44	21	0.64	622	19.3	
BBR	1998	208	11	54	41	198	3.7	6	3.10	3	1.33	73	37.0
	2001	201	7	35	43	216	6.23	5	2.39	2	1.11	81	37.7
	2004	237	13	57	77	324	5.72	6	1.94	4	1.13	121	37.3
	2005	87	17	200	92	1,059	5.31	10	0.93	6	0.59	219	20.7
	2006	81	15	190	68	835	4.39	8	0.98	3	0.36	167	20.0
	2007	73	20	271	98	1,341	4.96	12	0.87	5	0.36	254	18.9
	2008	79	20	249	111	1,404	5.65	14	1.00	6	0.42	266	18.9
	2009	70	16	223	79	1,130	5.06	14	1.26	4	0.38	203	18.0
	2010	64	15	228	115	1,802	7.91	16	0.86	6	0.31	300	16.7
	2011	61	8	128	85	1,400	10.94	11	0.77	3	0.19	256	18.3
	2012	64	8	121	64	997	8.22	7	0.73	5	0.55	185	18.5
	2013	63	8	135	62	979	7.27	9	0.96	5	0.53	181	18.4
2014	63	10	156	65	1,034	6.64	10	1.00	6	0.62	184	17.8	
BSS	1998	178	183	1,026	144	811	0.79	26	3.18	13	1.62	309	38.1
	2001	178	19	106	38	212	2	8	4.02	6	2.91	83	39.1
	2004	179	21	119	53	296	2.49	7	2.44	6	1.98	108	36.5
	2005	156	24	154	48	310	2.01	7	2.19	4	1.45	109	35.1
	2006	76	37	491	48	628	1.28	9	1.40	7	1.11	140	22.2
	2007	67	34	511	66	978	1.91	8	0.78	5	0.54	218	22.3
	2008	78	61	787	117	1,496	1.9	10	0.68	10	0.64	338	22.6
	2009	77	56	728	89	1,150	1.58	12	1.08	7	0.60	247	21.5
	2010	67	47	698	65	965	1.38	13	1.31	8	0.81	202	21.0
	2011	67	52	777	140	2,094	2.69	13	0.64	7	0.35	433	20.7
	2012	72	88	1,223	196	2,728	2.23	24	0.87	17	0.63	560	20.5
	2013	71	69	971	163	2,293	2.36	21	0.94	10	0.46	467	20.4
2014	69	56	807	133	1,924	2.38	22	1.15	11	0.56	379	19.7	

Source: ADF&G fish ticket data, eLandings, CFEC ex-vessel pricing, ADF&G Commercial Operator's Annual Report, NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Data shown for all CR crab fisheries by calendar year. Data reflect total commercial volume and value across all management programs (LLP/open access, IFQ, CDQ, ACA) inclusive of all harvesting sector production; approximation of ex-vessel sale value of CP and catcher-seller volume is incorporated in revenue total by using weighted average ex-vessel sale price sourced from CV sector EDR data.

While prices remained below \$5.65 per pound between 2007 and 2009, increased TAC levels and additional consolidation produced average gross earnings of \$1.13 million to \$1.40 million until 2010, when the prices for red king crab exceeded \$7.91 per pound, producing average revenue of \$1.8 million, the highest on

record. Red king crab price surged during 2011 to a historic peak of \$10.94 per pound, concurrent with a sharp reduction in the TAC; the reduction in average catch from 228 thousand to 128 thousand pounds per vessel was mitigated by the strong market, producing the second highest gross annual earnings in the fishery at the average vessel level, at \$1.4 million, \$85 million in aggregate. With prices in decline since 2010, but still historically strong, average vessel earnings have remained close to or exceeded \$1 million per years during the last three years of the period. As examined in fuller detail in the next section, crew share earnings have ranged from 18 to 21% of gross revenue in the fishery since 2006. For the limited cost information available for the full time series, crew labor represents the principal cost. Bait costs in the fishery prior to rationalization consumed up to 3% of gross revenue, but has remained approximately 1% of gross during all 10 years of the program, at a maximum of 15,000 per vessel during 2010, and vessel provisions are relatively negligible cost to vessel operators, at a maximum average of \$6200 per vessel. Prices and gross earnings in the Bering Sea snow crab fishery have been more stable over the course of the CR Program than red king crab, with annual aggregate gross earnings ranging from \$42 million to \$188 million, and individual vessels grossing between \$575 thousand and \$2.7 million per season, consistently exceeding average vessel gross of \$462 thousand per year during the pre-rationalization period.

Table 5-18 Vessel gross ex-vessel sales and selected operating costs, BST, AIG, and SMB crab fisheries, 1998, 2004, and 2005 through 2014.

Fishery	Year	Number of vessels	Ex-vessel pounds sold		Gross ex-vessel revenue		Ex-vessel price	Bait cost		Provisions costs		Crew and captain share costs	
			Total (\$million)	Average (\$1000)	Total (\$million)	Average (\$1000)	Average \$ per pound	Average (\$1000)	Percent of gross	Average (\$1000)	Percent of gross	Average (\$1000)	Percent of gross
BST	2001	4	*	*	*	*	*	*	*	*	*	*	*
	2004	1	*	*	*	*	*	*	*	*	*	*	*
	2005	4	*	*	*	*	*	*	*	*	*	*	*
	2006	22	0.76	35	1.33	61	1.75	1.2	2.02	2.2	3.70	17.6	29.1
	2007	22	2.02	92	4.08	185	2.02	4.5	2.44	3.4	1.81	48.0	25.9
	2008	24	2.07	86	4.28	179	2.07	5.8	3.24	7.8	4.34	41.3	23.1
	2009	13	2.03	156	4.28	329	2.11	9.8	2.99	3.3	1.00	68.0	20.7
	2010	4	*	*	*	*	*	*	*	*	*	*	*
	2013	19	1.24	65	3.11	164	2.51	7.4	4.54	3.3	2.02	34.1	20.8
	2014	40	8.81	220	21.19	530	2.40	12.6	2.37	5.5	1.04	114.9	21.7
AIG	1998	15	3.99	266	10.55	703	2.64	68.1	9.69	19.3	2.7	303.5	43.2
	2001	20	5.11	255	22.04	1,102	4.31	74.3	6.75	21.9	2.0	380.6	34.5
	2004	21	5.04	240	19.97	951	3.96	63.3	6.66	11.5	1.2	347.9	36.6
	2005	11	4.39	399	13.56	1,233	3.09	48.5	3.94	16.3	1.3	275.2	22.3
	2006	7	5.38	769	11.86	1,695	2.20	79.8	4.71	10.3	0.6	254.1	15.0
	2007	7	5.44	777	13.33	1,904	2.45	63.2	3.32	6.2	0.3	378.0	19.9
	2008	5	5.68	1,137	20.77	4,154	3.65	108.1	2.60	27.7	0.7	742.8	17.9
	2009	5	5.69	1,137	15.15	3,029	2.66	121.9	4.03	6.0	0.2	612.4	20.2
	2010	5	6.13	1,227	24.59	4,917	4.01	132.0	2.69	22.5	0.5	1,016.4	20.7
	2011	5	6.14	1,227	29.62	5,924	4.83	147.9	2.50	23.0	0.4	1,250.1	21.1
	2012	6	5.97	995	23.92	3,987	4.01	92.7	2.32	24.4	0.6	989.2	24.8
	2013	6	5.36	893	22.08	3,680	4.12	113.2	3.08	24.1	0.7	815.8	22.2
2014	5	6.01	1,202	24.38	4,875	4.06	153.4	3.15	37.2	0.8	932.3	19.1	
SMB	1998	94	2.17	23	5.96	63	2.74	5.6	8.86	3.6	5.6	20.0	31.6
	2009	7	0.45	64	1.43	204	3.18	8.9	4.36	0.9	0.4	32.1	15.7
	2010	11	1.25	114	6.53	594	5.21	16.2	2.73	7.1	1.2	128.4	21.6
	2011	17	1.80	106	9.94	585	5.53	16.9	2.89	5.2	0.9	111.5	19.1
	2012	17	1.59	94	6.95	409	4.36	14.4	3.52	7.0	1.7	73.8	18.1
	2014	4	*	*	*	*	*	*	*	*	*	*	*

Source: ADF&G fish ticket data, eLandings, CFEC ex-vessel pricing, ADF&G Commercial Operator’s Annual Report, NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Data shown for all CR crab fisheries by calendar year. Data reflect total commercial volume and value across all management programs (LLP/open access, IFQ, CDQ, ACA) inclusive of all harvesting sector production; approximation of ex-vessel sale value of CP and catcher-seller volume is incorporated in revenue total by using weighted average ex-vessel sale price. Price results are sourced from CV sector EDR data were collected (1998, 2001, 2004, and 2005-2014 for CR Program fisheries) and secondarily from CFEC gross earnings estimates (1999-2000, 2002-2003 for CR fisheries).

Table 5-19 and Table 5-20 present vessel- and sector-level net earnings analyses using the most complete cost and earnings data available for vessels operating in the Bering Sea snow crab and Bristol Bay red king crab fisheries during 2012 through 2014, as well as aggregate results calculated over all CR fisheries. Results presented in the tables are intended to provide a relative index of profitability of vessels operating in the fishery during the 2012 to 2014 period, while recognizing that additional costs that are not accounted for are substantial. As such, the estimated net values do not represent direct measures of vessel operating profit. Lease royalty costs are included as an operating cost in the vessel-level analysis in order to represent the diversion of surplus generated by vessel landings from a vessel owner's balance sheet represented by quota lease costs, which are commonly paid to the quota holder as a share of gross ex-vessel value of the leased quota pounds, and share payments to crew and captain are typically paid on the basis of the gross residual revenue after lease royalty costs, with additional deductions for vessel and personal expenses. In

the context of gauging the benefits generated by the fishery, however, it should be understood that quota lease royalties do not represent operating costs in an economic sense, and to degree, lease payments accrue to captains, crewmembers and vessel owners who hold QS that is landed on their own or other vessels. As such, the harvest sector level analysis shown in Table 5-20 treats quota lease royalties as a distribution of net ex-vessel revenue (i.e. resource rent) to quota holders, with the operating cost of vessel harvesting activity comprised of labor and materials expenses.

Table 5-19 Vessel-level estimated operating costs, gross and net earnings, BBR, BSS, and all CR fisheries in aggregate, 2012 through 2014

	All CR Fisheries			BBR			BSS		
	2012	2013	2014	2012	2013	2014	2012	2013	2014
Number of vessels	83	81	76	64	63	63	72	71	69
Vessel mean pounds landed (million)	1.25	1.04	1.06	0.12	0.13	0.16	1.22	0.97	0.81
Vessel mean quota pounds leased (million)	0.83	0.75	0.8	0.07	0.1	0.11	0.81	0.71	0.61
percent of pounds landed	64%	67%	68%	57%	65%	63%	62%	66%	69%
Vessel mean costs and revenues (\$million)									
Gross ex-vessel revenue	\$3.51	\$3.08	\$3.22	\$1.00	\$0.98	\$1.03	\$2.73	\$2.29	\$1.92
Quota lease cost	\$1.16	\$1.15	\$1.20	\$0.38	\$0.46	\$0.48	\$0.86	\$0.81	\$0.69
percent of gross revenue	31%	33%	33%	37%	42%	40%	29%	31%	32%
Gross residual after lease cost	\$2.35	\$1.93	\$2.02	\$0.61	\$0.52	\$0.55	\$1.87	\$1.48	\$1.24
percent of gross revenue	69%	67%	67%	63%	58%	60%	71%	69%	68%
Total, non-labor operating cost	\$0.30	\$0.26	\$0.26	\$0.06	\$0.07	\$0.06	\$0.24	\$0.19	\$0.15
percent of gross revenue	10%	9%	9%	7%	7%	6%	10%	9%	9%
Provisions	\$0.02	\$0.02	\$0.02	\$0.01	\$0.01	\$0.01	\$0.02	\$0.01	\$0.01
Bait	\$0.04	\$0.04	\$0.05	\$0.01	\$0.01	\$0.01	\$0.02	\$0.02	\$0.02
Fuel	\$0.24	\$0.21	\$0.19	\$0.05	\$0.05	\$0.04	\$0.20	\$0.16	\$0.12
Gross operating residual (non-labor)	\$2.05	\$1.67	\$1.77	\$0.55	\$0.45	\$0.49	\$1.63	\$1.30	\$1.09
percent of gross revenue	59%	58%	58%	56%	51%	55%	61%	60%	59%
Labor cost	\$0.72	\$0.62	\$0.62	\$0.19	\$0.18	\$0.18	\$0.56	\$0.47	\$0.38
percent of gross revenue	22%	22%	21%	21%	20%	20%	22%	22%	22%
Total operating cost	2.169	2.028	2.074	0.63	0.705	0.726	1.655	1.464	1.217
percent of gross revenue	63%	64%	63%	65%	70%	65%	61%	62%	63%
Net operating revenue	\$1.34	\$1.05	\$1.15	\$0.37	\$0.27	\$0.31	\$1.07	\$0.83	\$0.71
percent of gross revenue	37%	36%	37%	35%	30%	35%	39%	39%	37%

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Data shown for all CR crab fisheries by calendar year. Vessel-level average monetary and percentage values are calculated as unweighted arithmetic mean across all included vessels. Data reflect total commercial volume and value across all management programs (LLP/open access, IFQ, CDQ, ACA) inclusive of all harvesting sector production; approximation of ex-vessel sale value of CP and catcher-seller volume is incorporated in revenue total by multiplying volume of retained catch by the weighted average ex-vessel sale price sourced from CV sector EDR data. Note that cost information reported in EDR excludes fixed and capital expenditures, and vessel operating costs are not comprehensive; operating net revenue shown in table represents an upper bound approximation of operating profit.

In aggregate, CR fisheries have generated gross ex-vessel revenues ranging from \$3.08 to \$3.51 million per vessel on average, and during 2014, the average vessel earned \$3.22 million in gross ex-vessel revenue across all CR Program fisheries in which it participated. Of the pounds landed, the average vessel leased 68 percent from QS holders, and paid \$1.2 million in lease royalties, 33% of the vessel's total gross landed

value, leaving a gross residual of \$2.02 million. Total non-labor operating costs averaged \$260 thousand per vessel, with fuel costs at \$190 thousand, bait costs totaling \$50 thousand, and provisions totaling \$20 thousand. Crew and captain share payments totaled \$620 thousand on average, bringing total operating costs, including lease royalties, to \$2.07 million. This represented 63% of gross revenue, with the remaining net operating revenue of \$1.15 million, at 37% of gross revenue, consistent in percentage terms with performance over the previous two years. Results shown for the Bristol Bay red king crab fishery indicate that on average over the period, economic performance of vessels in net revenue terms was below that of the Bering Sea snow crab fishery and CR fisheries overall. Labor and materials expenses, at approximately 20% and 7% of gross revenue respectively, were somewhat lower in proportional terms than in CR fisheries overall, and compared to 22% and 9% in the Bering Sea snow crab fishery. Although a smaller proportion of landed pounds in the Bristol Bay red king crab fishery were reported as leased in EDR data than in Bering Sea snow crab and CR fisheries overall (62% percent of pounds landed, compared to 66%), quota lease costs in the Bristol Bay red king crab fishery represented substantially greater costs as a percentage of gross at 40% on average over the period, compared to 31% in the Bering Sea snow crab fishery.

Table 5-20 Harvest sector estimated operating costs, gross and net earnings, BBR, BSS, and all CR fisheries in aggregate, 2012 through 2014

	All CR Fisheries			BBR			BSS		
	2012	2013	2014	2012	2013	2014	2012	2013	2014
Number of vessels	83	81	76	64	63	63	72	71	69
Total pounds landed, million	103.4	84.0	80.6	7.8	8.5	9.8	88.1	68.9	55.7
Quota pounds leased, million, (% of total pounds landed)	68.5 (66%)	61.1 (73%)	61.0 (76%)	4.7 (60%)	6.1 (72%)	7.1 (72%)	58.1 (66%)	50.3 (73%)	42.3 (76%)
Fleet costs and revenues, \$million, (% of gross ex-vessel revenue)									
Gross ex-vessel revenue	291.1	249.6	244.8	63.8	61.7	65.2	196.4	162.8	132.7
Total, non-labor operating cost	24.8 (9%)	20.9 (8%)	19.5 (8%)	3.9 (6%)	4.3 (7%)	3.6 (6%)	17.3 (9%)	13.4 (8%)	10.5 (8%)
Provisions	1.9 (1%)	1.3 (1%)	1.6 (1%)	0.4 (1%)	0.3 (1%)	0.4 (1%)	1.2 (1%)	0.7 (0%)	0.7 (1%)
Bait	3.0 (1%)	2.9 (1%)	3.5 (1%)	0.5 (1%)	0.6 (1%)	0.7 (1%)	1.7 (1%)	1.5 (1%)	1.5 (1%)
Fuel	20.0 (7%)	16.7 (7%)	14.4 (6%)	3.1 (5%)	3.4 (5%)	2.6 (4%)	14.4 (7%)	11.1 (7%)	8.2 (6%)
Gross operating residual (non-labor)	266.3 (91%)	228.7 (92%)	225.3 (92%)	59.9 (94%)	57.4 (93%)	61.6 (94%)	179.2 (91%)	149.4 (92%)	122.3 (92%)
Labor cost	59.3 (20%)	50.1 (20%)	47.3 (19%)	11.8 (19%)	11.4 (18%)	11.6 (18%)	40.3 (21%)	33.2 (20%)	26.2 (20%)
Total operating cost	84.1 (29%)	71.0 (28%)	66.7 (27%)	15.7 (25%)	15.7 (25%)	15.2 (23%)	57.6 (29%)	46.6 (29%)	36.6 (28%)
Net ex-vessel revenue	207.0 (71%)	178.6 (72%)	178.1 (73%)	48.1 (75%)	46.0 (75%)	50.0 (77%)	138.9 (71%)	116.2 (71%)	96.1 (72%)
Distribution of net, \$million (% of net revenue)									
Net returns to vessel sector	111.1 (54%)	85.4 (48%)	87.1 (49%)	23.5 (49%)	17.2 (37%)	19.5 (39%)	77.3 (56%)	58.8 (51%)	48.8 (51%)
Lease royalties (QS revenue)	95.9 (46%)	93.3 (52%)	90.9 (51%)	24.6 (51%)	28.8 (63%)	30.5 (61%)	61.6 (44%)	57.4 (49%)	47.4 (49%)

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Data shown for all CR crab fisheries by calendar year. Vessel-level average monetary and percentage values are calculated as unweighted arithmetic mean across all included vessels. Data reflect total commercial volume and value across all management programs (LLP/open access, IFQ, CDQ, ACA) inclusive of all harvesting sector production; approximation of ex-vessel sale value of CP and catcher-seller volume is incorporated in revenue total by multiplying volume of retained catch by the weighted average ex-vessel sale price sourced from CV sector EDR data. Note that cost information reported in EDR excludes fixed and capital expenditures, and vessel operating costs are not comprehensive; net revenue estimates shown in table represent upper bound approximations of operating profit.

Table 5-20 demonstrates an alternative perspective on harvest sector economic performance of CR Program fisheries, reported at the aggregate fleet level, treating quota lease royalties as a distribution of net revenues.

Over CR fisheries in aggregate, accounting for labor and materials operating costs captured in EDR data, net revenue ranged from \$178 million to \$207 million over the 2012-2014 period, representing 72% of gross value on average. Lease royalties paid ranged from \$91 million (51% of net revenue) to \$96 million (46% of net), with the percentage distribution averaging 50% each to the vessel and quota sectors, respectively, over the three years. Net revenue in the Bristol Bay red king crab fishery ranged from \$46 to \$50 million, averaging 76% of gross revenue; the percentage share of net accruing to QS owners was considerably higher, ranging from 51% to 63%, and 58% over the period as a whole. In the Bering Sea snow crab fishery, net revenue ranged from \$96 million to \$139 million over the period, 71% of gross revenue on average, with the share accruing to QS owners averaging substantially lower than in Bristol Bay red king crab and CR fisheries in aggregate, at 47% of net revenue. These distributional outcomes are consistent with the higher (approximately 65%) lease rate on BBR quota discussed previously (Table 5-13), compared to 45% for BSS quota.

5.6 Crew Employment and Remuneration

Consolidation in the crab-harvesting sector following rationalization in 2005/06 resulted in both a substantial reduction in the number of active vessels, and substantially longer active seasons and operating days for vessels remaining in the active fleet. Correspondingly, the number of crew positions was reduced and working conditions changed, resulting in longer periods of active work in the fisheries for a smaller number of crew members and captains. The effects of consolidation and IFQ leasing on crew earnings and the relative distribution of economic benefits between vessel owners, quota share holders, and active crews working in the crab fishery remain ongoing concerns for fishery managers. Identifying trends in crew earnings is complicated by the lay share system that is the predominant basis of crew compensation in commercial fisheries. Unlike typical labor market conditions, where prevailing wage rates are substantially stable from year-to-year, the value of crab crew pay settlements under the lay share system is substantially determined by the price and market value of landed crab, as well as prices of other factor inputs (e.g. fuel), both of which are exogenously determined by larger external markets. In addition, the quantity and royalty cost of IFQ leased by a vessel, and how lease costs and other deductible operating and crew-related expenses are treated in crew settlements, also have a large effect on vessel earnings, and crew earnings in turn.

Vessel-level data on crew employment and earnings, vessel revenues and costs, and operating conditions used in analysis of changes over time in crew compensation come from a combination of Economic Data Reports and eLandings. Changes in the availability and reliability of particular data elements in these sources over the 1998-2014 introduce uncertainty in the results over different periods. Prior analyses of crew compensation using these data, including Abbott et al. (2010) and the Five-Year Review, used data principally from the EDR prior to revision of the data collection in 2012, including crew share percentages and cost deductions applied in settlement calculations, vessel days operating (days fishing, and days travelling and offloading), and number of crew receiving share payments, all of which were directly reported in the EDR but were discontinued as of 2012. Alternate data sources on crew size and operating days used in the current review, which include the ADF&G crab observer program Confidential Interview Form (CIF) database and eLandings, were either not collected prior to 2005, or have undergone significant changes in data collection methods between 2005 and 2014. EDR data on IFQ lease costs prior to 2012 have been determined to be unreliable and were not used in those analyses, but data available from 2012 to 2014 are used in this review. As such, it is not possible to construct a complete dataset of all variables used in the analysis that is continuous and reliable through the entire period. Alternative assumptions regarding

the number of days to use in pro rata distribution of seasonal crew payment data in particular were the basis for some differences in conclusions between prior analyses, which are made more tenuous in the current review given the discontinuities in the data over the longer time period. Caveats are highlighted where they apply below regarding comparability of results from different time periods.

In the Five-Year Review of the CR Program, analysis of crew employment and earnings focused primarily on changes in crew employment and earnings in the transition to rationalization. As noted in the previous discussion, conditions for obtaining crew positions and working onboard crab vessels prior to rationalization were substantially different prior to rationalization. Particularly when derby fishing conditions were in effect, elevated physical risk to crew members as well as financial risk given the potential for poor catch rates likely contributed to substantial premium received by crew in higher negotiated share percentages than would otherwise have occurred. There have been few analyses of crew lay contract terms and compensation rates in Alaska fisheries generally, and it would be very difficult to assess how crab crew earnings and contract terms during the years prior to the CR Program compared to other Alaska fisheries, or under more typical conditions of labor demand for crew members. Vessel owners holding Limited License Program licenses endorsed for BSAI crab fisheries faced the added imperative to participate in active fishing as the rationalization program was in development. The elevated demand for crew members due to the larger fleet and intensive effort produced extraordinary hiring conditions that were in effect during the period. Given the exceptional inefficiencies that occurred in the race for fish generally, and the atypical demand for crew labor, a comparison of crew earnings before and after the transition to IFQ should first consider whether conditions that prevailed during the derby fishery are the standard against which crew compensation should be compared in ongoing program review. While crew employment and remuneration were clearly substantially changed following the transition to rationalized management, to what degree those changes were caused by the implementation of IFQ, per se, as opposed to the mitigation of overcapitalization generally, and of derby conditions specifically, is likely not possible to ascertain. The following discussion therefore provides a brief overview comparing pre-and post-rationalization crew employment and compensation statistics, before a more focused analysis of crew employment and compensation from program implementation forward.

A number of Council concerns were raised as a result of findings regarding crew compensation in the Five-Year Review and resulted in subsequent work on developing alternatives for regulatory measures to address these concerns. The Council ultimately elected to pursue measures coordinated by, and implemented through harvest cooperatives on a voluntary basis (Council motion on C-4(a)-(c), February, 2013). This resulted in the ICE harvest cooperative's development of initiatives to encourage QS holders to voluntarily limit the rate of compensation charged for leased crab IFQ (to 50% of ex-vessel value for Bering Sea snow crab, and 65% for red king crab) and promote transfers of QS to active crew members and equity owners of active fishing vessels. ICE's initiatives were subsequently adopted by other harvest cooperatives, as attested in cooperative reports submitted to the Council, and EDR lease cost data reported by vessel owners discussed in the previous section indicate that the majority of IFQ leased by vessels during 2013 and 2014 conforms to the lease rate limits described above. Only one year of lease data prior to the limits being initially implemented, and two years of data afterward, are available as of this review, however. In addition, variation among vessel owners in settlement terms with respect the deduction of lease costs and vessel operating costs in determining the net revenue basis for settlements, variation in share percentage applied, and lack of data on these factors, limit the precision with which analysis can quantify the linkage between

lease rates and crew compensation. Qualitative research investigating perceptions of crab fishery participants and industry members regarding harvest cooperative measures to limit lease rates and promote crewmember and active vessel owner access to QS acquisition was conducted during 2014 (Himes-Cornell 2015). Results of that study may provide further basis for interpretation of information presented below, but due to time constraints, is not integrated into the analysis.

5.6.1 Overview of Crew Employment and Compensation Changes

A summary of the most current crew employment and earnings data available for all CR Program fisheries in aggregate is presented in Table 5-21 and for the Bristol Bay red king crab and Bering Sea snow crab fisheries in Table 5-22. Values are presented for average number of crew positions per vessel, total number of crew positions in the fleet, mean pounds of crab landed per vessel, mean and median captain and crew member (per person) share payment, and mean crewshare payment per vessel (inclusive of all crew except the captain), for 1998, 2001, and 2004 through 2014 calendar year activity.⁴⁷ Table 5-21 presents fleet-level average values for all vessels crab fishing during each calendar year, pooling all by-fishery data together. As noted previously (Table 5-6), most vessels operate in multiple crab fisheries, most commonly in the Bristol Bay red king crab and Bering Sea snow crab fisheries jointly, and results in Table 5-22 are largely representative of vessels fishing this portfolio, but includes a small number of vessels that operate exclusively in fisheries other than Bristol Bay red king crab and Bering Sea snow crab (noting that almost one-fifth of the total crab fleet fished only in the Bristol Bay red king crab fishery during the first two CR seasons, but this has been much less common during subsequent years).

Significant open seasons in the St Matthew blue king crab, Western Aleutian Islands red king crab, and Pribilof Island red and blue king crab fisheries occurred during years prior to 2005, with 130 vessels fishing in the St Matthew blue king crab fishery during 1998, and smaller openers in the Western Aleutian Islands red king crab fishery during 2003 and 2004 with some 30 vessels active in each year. In addition to the Bristol Bay red king crab, Bering Sea snow crab and Aleutian Island golden king crab fisheries, the total number of CR Program qualifying vessels operating in CR fisheries in aggregate during the reference years ranged from 211 to 235, which declined by 60% to 101 by 2006 (the first year that all fisheries operated under CR Program management. Based on the number of paid crew reported in EDR records during each of the respective fisheries, the number of non-captain crew positions on vessels averaged some 1,300 over the three reference years (counting a single position as extending over all crab fisheries in which the vessel was active), which consolidated by half to an estimated 640 by 2006. Average vessel catch aggregated over

⁴⁷ Two primary data sources are used to compute employment statistics for the harvesting sector. The eLandings catch accounting system collects trip-level information on the size of the crew onboard a vessel at each landing, which is used to estimating the number of crew positions by vessel for 2005 and later; EDR data are the source for crew size data prior to 2005. The counts are approximately equivalent on a by-vessel basis, but the discontinuity should be noted. For each CR fishery, EDR data report the value of fishing crew contract settlement payments (net labor payment after deductions for shared vessel operating costs) to vessel captains and fishing crews at the fishery level for each vessel. In addition, EDR reporting of commercial fishing crew license data captures information on the number of unique individuals working as crew on crab fishing vessels as deckhands, vessel captains, and other positions in a given year (see Table 4.16 notes for details on crew license data). Note that 1998 to 2004 EDR data are available only for vessels associated with qualifying LLP licenses; crew employment and earnings data are not available for non-qualifying vessels. See Table 5-1 for inclusive counts of all vessels active during pre-rationalization seasons.

all fisheries during the reference period ranged from 1.02 million pounds during 1998 to 193 thousand pounds in 2004, a three-year average of 470 thousand pounds per vessel. This increased to 628 thousand pounds per vessel by 2006, due to the combined effect of fleet consolidation and increased TAC levels that year, and has exceeded the level of the 1998 season in five of the eight subsequent years, reaching 1.47 million pounds per vessel in 2012. Over the 2006-2014 period, average catch per vessel has been 1.047 million pounds, 123% higher than during the reference years. In comparison, total share payment to vessel crews increased by 110 percent, from \$176 thousand per vessel on average during the reference years, to \$370 thousand per vessel over the 2006 to 2014 period, and averaging \$422 thousand per vessel during the most recent five years in the series. On a per person basis, a crew member on a vessel during the pre-rationalization period crab boats averaged \$28,500 from one or more fisheries in a year, compared to \$57,000 per year from 2006 to 2014, and exceeding \$74 thousand per crew member during 2011.

Table 5-21 Crew employment and earnings, aggregated over all CR Program fisheries - 1998, 2001, and 2004 through 2014 calendar year fisheries

Fishery	Year	Number of vessels	Total crew positions	Mean crew size	Mean vessel harvest (pounds)	Mean days at sea	Captain pay (\$)		Mean crew pay (excluding captain)	Crewmember pay (\$)	
							Mean	Median		Mean	Median
All CR Fisheries	1998	212	1266	6.0	1,017,733	96	117,276	115,785	249,780	40,249	39,744
	2001	211	1251	5.9	199,825	52	61,540	40,973	123,271	19,936	14,625
	2004	235	1395	5.9	192,605	32	73,609	66,613	154,847	25,541	22,138
	2005	169	1007	6.0	320,039	37	78,770	55,911	152,893	25,903	20,264
	2006	101	640	6.3	628,448	68	86,828	75,006	174,865	28,204	26,858
	2007	86	572	6.7	758,928	68	134,958	129,146	283,763	45,274	42,429
	2008	94	632	6.7	1,069,194	90	175,376	175,115	383,915	59,896	56,582
	2009	88	588	6.7	947,489	82	130,190	128,226	284,227	44,260	42,796
	2010	77	493	6.4	999,199	96	162,080	154,244	349,985	55,129	50,619
	2011	76	500	6.6	1,040,932	86	218,737	218,875	485,532	74,306	70,103
	2012	83	564	6.8	1,467,050	93	227,378	223,413	494,148	73,933	71,940
	2013	81	542	6.7	1,248,407	78	196,037	199,614	428,422	65,232	62,077
2014	76	513	6.8	1,259,443	93	202,485	184,286	443,124	66,892	63,681	

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database, 2005 and later crew positions information from eLandings

Notes: Excludes vessels that did not report any payment to the captain for labor, and vessels for which the gross percentage share paid to crew was greater than 75 percent, based on EDR data. Data for 1998-2004 excludes vessels without qualifying history for CR Program initial allocation. In results aggregated over all CR fisheries, data for the year 2005 includes the 2005 Bering Seas snow crab fishery, which occurred prior to CR Program implementation. Gross share percentage for catcher/processor crew payment uses estimated ex-vessel value of catch based on average price of CV sector landings.

In the Bristol Bay red king crab fishery, fleet contraction was equivalent to CR fisheries overall, with a 60% reduction to 82 vessels as of 2006, and crew positions in the fishery reduced from an average of 1,200 during the 1998-2004 period, to 509 in 2006 (Table 5-22). Average pounds landed per vessel increased by over 300% to 208 thousand pounds per vessel by 2006. Including recent years with reduced TAC levels, catch has averaged over 222 thousand pounds from 2006 to 2014, a 337% increase compared to the reference period average. On a per vessel basis, crew share payments have increased from \$61,400 on average prior to rationalization, to greater than \$150,700 per vessel over the 2006 to 2014 period, peaking at \$205 thousand in 2010. On a per person basis, crew share payments have increased 133% from an average of \$10,400 to \$24,300 between the pre- and post-rationalization periods, and payments to captains have increased 140% from \$61 thousand to \$151 thousand per season on average.

Table 5-22 Crew employment and earnings, BBR and BSS crab fisheries - 1998, 2001, and 2004 through 2014 calendar year fisheries

Fishery	Year	Number of vessels	Total crew positions	Mean crew size	Mean vessel harvest (pounds)	Mean days at sea	Captain pay (\$)		Mean crew pay (excluding captain)	Crewmember pay (\$)	
							Mean	Median		Mean	Median
BBR	1998	200	1191	6.0	57,194	14	23,955	22,485	49,394	8,285	7,635
	2001	192	1064	5.5	35,968	12	27,333	23,593	52,791	9,471	8,118
	2004	227	1373	6.0	58,974	12	37,813	36,122	81,880	13,434	12,346
	2005	86	513	6.0	239,185	24	74,234	63,710	144,887	24,441	21,308
	2006	82	509	6.2	208,481	20	55,340	53,182	110,529	18,516	18,496
	2007	72	448	6.2	309,550	30	84,027	76,105	170,266	28,050	25,172
	2008	78	491	6.3	285,598	31	86,038	79,538	191,318	31,375	25,295
	2009	69	428	6.2	247,473	29	65,359	64,410	138,335	22,493	21,574
	2010	64	405	6.3	267,321	33	97,523	99,421	205,397	33,303	33,629
	2011	59	360	6.1	127,421	16	81,290	82,720	175,435	27,942	25,702
	2012	64	444	6.8	175,347	12	56,349	54,435	124,632	19,133	17,383
	2013	63	418	6.6	190,463	14	57,287	52,837	120,380	18,940	15,725
	2014	62	414	6.7	184,197	16	58,560	52,683	120,255	18,662	17,169
	BSS	1998	173	1123	6.5	1,091,940	67	100,038	95,630	213,063	32,528
2001		169	1059	6.3	134,280	26	25,186	20,919	54,292	8,287	6,590
2004		176	1015	5.8	131,412	18	35,762	32,522	72,348	12,501	11,695
2005		153	898	5.9	170,291	16	36,863	36,936	72,309	12,549	11,938
2006		78	517	6.6	505,235	40	44,857	38,759	93,824	14,186	12,703
2007		68	474	7.0	529,917	34	67,277	62,654	149,306	22,747	20,761
2008		77	544	7.1	863,886	47	105,718	104,608	222,627	33,827	32,533
2009		77	536	7.0	762,966	47	75,812	74,174	171,094	25,773	23,407
2010		68	444	6.5	705,638	43	62,687	59,142	139,637	21,414	20,489
2011		68	453	6.7	839,864	46	133,598	132,693	298,450	45,305	46,630
2012		72	502	7.0	1,403,663	77	171,702	176,541	378,569	56,710	57,249
2013		71	481	6.8	1,136,972	62	142,884	141,710	313,914	47,432	47,795
2014		69	476	6.9	947,493	51	115,344	109,844	257,001	38,477	38,293

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database, 2005 and later crew positions information from eLandings

Notes: Excludes vessels that did not report any payment to the captain for labor, and vessels for which the gross percentage share paid to crew was greater than 75 percent, based on EDR data. Data for 1998-2004 excludes vessels without qualifying history for CR Program initial allocation. In results aggregated over all CR fisheries, data for the year 2005 includes the 2005 Bering Seas snow crab fishery, which occurred prior to CR Program implementation. Gross share percentage for catcher/processor crew payment uses estimated ex-vessel value of catch based on average price of CV sector landings.

The Bering Sea snow crab fishery has realized similar changes, with the fleet contracting by 56% from 173 vessels to 78 vessels as of 2006, and average number of crew positions reduced from approximately 1,060 to 518 in 2006, and 492 on average over 2006 to 2014 (54% fewer than the reference period average). The vessel average of 850 thousand pounds over the 2006 to 2014 period overall is 88% greater than the comparable figure during the reference period. Crew compensation on active vessels during the reference seasons averaged approximately \$113 thousand per vessel, and \$17,800 per crew member, compared to \$225 thousand and \$34,000, respectively, over the 2006 to 2014 period, both approximately doubling, while captain earnings have increased 90% from \$53,700 to \$102,200. In contrast to the Bristol Bay red king crab fishery, where the proportional increase in per-vessel catch levels between pre- and post-rationalization has been more than twice that of crew compensation, crew and captain earnings in the Bering Sea snow crab fishery have increased to an equal or greater degree than average vessel landings.

5.6.2 Analysis of Changes in Crew Compensation

Assessment of changes in crew compensation over time is complicated by variability in several factors that determine final settlement value of crew share contracts. These include ex-vessel price and TAC levels and a variety of contract terms, including the base share percentage and the amounts and proportions of a range of vessel operating costs and deductions applied to arrive at the net revenue basis against which share percentage is applied. Most notably, the treatment of IFQ and royalty costs in share settlements is a primary factor, and although information is limited, appears to be quite variable in terms of the amount of IFQ different vessels aggregate through leasing and owner purchase of QS (with or without holdings received in initial issuance), and the amount for which royalties are charged against ex-vessel revenue in final settlements. These factors, as well as productive efficiency of the vessel and time at sea required to land the vessel's IFQ, result in variation in crew earnings over time and between vessels.

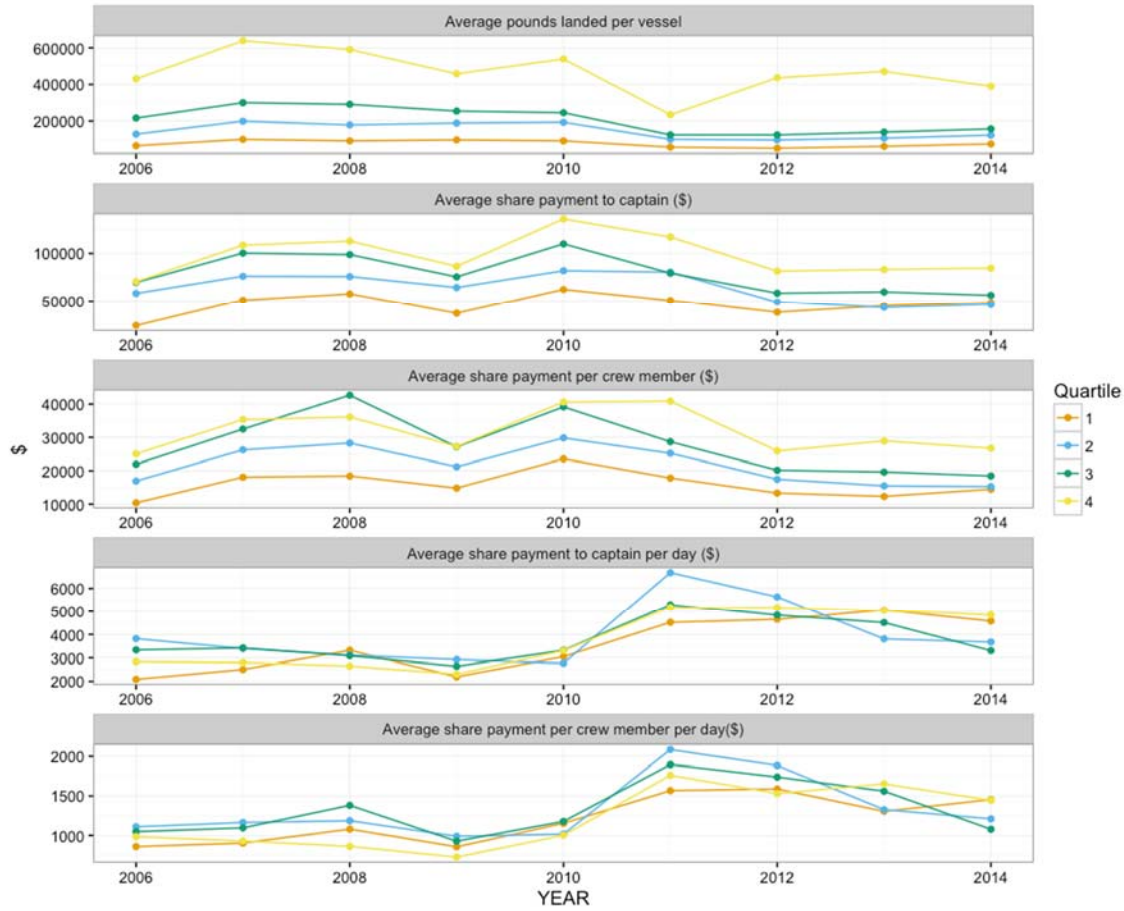
Figure 5-9 and Table 5-23 provide a comparison of catch and crew compensation metrics for captains and fishing crew members of vessels fishing in the Bristol Bay red king crab fishery during the 2006 to 2014 calendar years, stratified by quartile of landings volume. Results cannot be shown at the quartile level for other crab fisheries due to confidentiality limits. For each year from 2006 to 2014, the table displays the following information calculated for each quartile: number of vessels, mean crew size, mean pounds landed, mean days at sea, mean share payment amount paid to captains and the average paid per crew member, daily earnings for captain and per crew member, and the average gross share percentage paid to captain and per crew member. In addition, for the years 2012 to 2014 (where EDR lease data are available), two indices reflecting the amount and cost of IFQ leased (over all IFQ types) are presented: mean percent of pounds leased, which is calculated using the total quantity of IFQ pounds leased and total pounds landed by vessels, and mean gross residual percent, where "gross residual" is total gross ex-vessel revenue less total IFQ lease costs, then represented as a percentage of total gross revenue. Using these values, the percentage of gross residual represented by share payments is calculated for captains and per crewmember. It is common practice for vessels to deduct 100% of lease royalty payments "off the top", such that crew settlements are calculated based on the gross residual, adjusted for additional operating and crew-related deductible expenses. This is not universal, however,⁴⁸ and lease costs as reported by a vessel owner may differ from the amount used to derive the crew share settlement amounts reported in the EDR. Nonetheless, it provides an index of crew earnings relative to vessel and QS earnings at the fishery level.

Several findings are apparent in the quartile-level statistics. One is the relative disparities between volumes landed and crew share payments by vessels in each quartile. Vessels in the 4th (highest volume) quartile landed 465 thousand pounds on average, between 4 and 8 times the amount landed by vessels in the 1st quartile, which averaged 78 thousand pounds landed, between 2.5 and 4.5 times the amount landed by

⁴⁸ Based on harvest cooperative reports as well as comments included in submitted EDRs, the amount and cost of IFQ reported as leased by a given vessel owner may not be the same amount that is used in calculating the vessel's crew share settlements, and the lease rate applied to different quantities of the total IFQ leased may vary between categories of IFQ in share settlement calculations. EDR comments also indicate that some companies that operate multiple vessels apply various methods of pooling revenues and costs between vessels in calculating crew shares for their vessels, with the purpose of balancing payments to crew members across vessels to adjust for, e.g., higher costs incurred by a vessel that was required to northern deliveries, or higher average IFQ lease costs on some vessels than others. To the extent that different vessels operated by a an owner that employs revenue/cost pooling in crew settlements fall into different quartiles, there may be some distortion in the by-quartile crew earnings statistics. The effect is likely to be small, however.

vessels in the 2nd quartile (146 thousand pounds, on average), and between 2 and 3.5 times the amount landed by vessels in the 3rd quartile (206 thousand pounds, on average). While there is some inter-annual variation in relative distribution of landings, the general degree of concentration doesn't appear to have changed over the nine-year period. There are smaller disparities in crew and captain share payment amounts between quartiles, but the pattern is consistent in terms of relative ordering across all nine years. Captains and crewmembers in the 4th quartile have received approximately \$98,000 and \$32,000 in settlement earnings per season on average, which has varied between two and four times the comparable values of \$46,000 for captains and \$16,000 for crew members in the 1st quartile. The ratio has varied between 1.2 and 2.5 times the value of settlement earnings in the 2nd quartile (\$64,000 and \$22,000, respectively), and between 1 and 1.5 times as much as those in the third quartile (\$79,000 and \$28,000, respectively). Importantly, both captain and crew earnings appear to be more homogeneous in terms of earnings metrics that are standardized relative to landings volume. In daily earnings, the relative ranking in between quartiles in rates of crew and captain compensation is more variable: while vessels in the two highest volume quartiles tended to pay the least on a daily basis during the first four years, the ranking between quartiles has been more variable between 2010 and 2014. Across all quartiles, the trend in daily earnings over time follows the path of ex-vessel price. In gross share percentage terms, during the first five years of the CR Program, vessels in the two highest landings quartiles consistently paid both captain and crew members at lower rates than did vessels in the two quartiles with lower volumes of landings (between 5.9 and 7.3 percent, compared to 6.8 to 10.8% for captains, and 1.5 to 2.7% compared to 2.4 to 4.0% per crew member). In the most recent seasons, however, this has shifted in part, with vessels in the highest and lowest quartiles paying between 10.0 and 11.9% of gross revenue to captains, while crew member gross percentage shares continue to be highest (3.0 - 3.3 percent) on the vessels with smallest volume of landings, but nearly equal levels prevail across the other three quartiles (from 1.8 to 2.2 percent). Share payments considered as a percentage of the gross residual (gross revenue less IFQ lease payments) shown in Table 5-23 for 2012 to 2014 do not appear to exhibit a consistent ordering by quartile. Captains on average have received between 9.5 and 18.7% of the residual as calculated from EDR data, and crew members received between 2.8 and 5.3% of the residual on average, with no consistent ordering between quartiles over the three year period.

Figure 5-9 Captain and crew member share payment by quartile of vessel landings volume, Bristol Bay red king crab fishery - 2006 to 2014



Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Table 5-23 Crewmember pay and percent of gross vessel revenue and gross residual paid to crew, by quartile of pounds harvested - BBR fishery, 2006 through 2014

Fishery	Year	Landings Quartile	Number of vessels	Mean crew size	Mean vessel harvest (pounds)	Mean percent of pounds leased	Mean gross residual percent	Mean days at sea	Share payment (\$)		Share payment per day (\$)		Percent of gross vessel revenues as crew share		Percent of gross residual as crew share	
									Captain	Per crew	Captain	Per crew	Captain	Per crew member	Captain	Per crew member
BBR	2006	1	21	5	65,321	-	-	14	23,919	10,378	2,088	858	8.0%	4.0%	-	-
		2	20	5.3	128,641	-	-	17	58,173	16,922	3,821	1,110	10.1%	3.1%	-	-
		3	21	6	216,519	-	-	22	69,658	21,953	3,338	1,048	7.3%	2.3%	-	-
		4	20	8.5	430,200	-	-	26	70,464	25,044	2,840	983	6.8%	1.9%	-	-
	2007	1	18	5.2	100,003	-	-	22	50,979	18,094	2,507	902	10.8%	4.0%	-	-
		2	18	5.7	199,171	-	-	25	76,093	26,260	3,398	1,164	7.9%	2.7%	-	-
		3	18	5.9	300,374	-	-	32	100,386	32,495	3,422	1,096	6.8%	2.2%	-	-
		4	18	8.1	638,653	-	-	40	108,649	35,353	2,801	929	6.2%	1.7%	-	-
	2008	1	20	5.3	91,657	-	-	19	57,580	18,449	3,322	1,080	10.8%	3.5%	-	-
		2	19	5.8	178,646	-	-	28	75,794	28,300	3,114	1,187	7.4%	2.8%	-	-
		3	20	6	291,289	-	-	33	98,764	42,691	3,090	1,382	6.0%	2.7%	-	-
		4	19	8.2	590,708	-	-	45	112,843	36,145	2,653	861	6.3%	1.7%	-	-
	2009	1	18	5.4	97,146	-	-	19	36,837	14,807	2,196	855	8.2%	3.3%	-	-
		2	17	5.9	188,750	-	-	25	64,295	21,225	2,926	989	6.8%	2.3%	-	-
		3	17	6	254,534	-	-	32	75,452	27,125	2,646	927	5.9%	2.1%	-	-
		4	17	7.6	458,306	-	-	39	86,528	27,267	2,306	724	6.0%	1.6%	-	-
	2010	1	16	5.4	91,661	-	-	21	62,240	23,552	3,049	1,154	8.9%	3.5%	-	-
		2	16	5.8	193,089	-	-	33	81,858	29,842	2,770	1,017	5.3%	1.9%	-	-
		3	16	6	245,638	-	-	35	110,000	39,166	3,326	1,178	5.7%	2.0%	-	-
		4	16	8.1	538,895	-	-	44	135,994	40,653	3,308	1,003	6.9%	1.5%	-	-
	2011	1	15	5.5	57,366	-	-	13	50,625	17,828	4,524	1,568	9.4%	3.3%	-	-
		2	15	5.9	100,529	-	-	13	80,458	25,229	6,683	2,086	7.2%	2.2%	-	-
		3	15	6.1	124,518	-	-	16	79,336	28,687	5,295	1,897	5.8%	2.1%	-	-
		4	14	6.9	234,403	-	-	24	117,129	40,886	5,179	1,761	5.0%	1.7%	-	-
	2012	1	17	6.5	51,497	34.0%	75.7%	9	37,872	13,317	4,653	1,589	10.4%	3.3%	15.1%	5.3%
		2	16	6.0	96,878	60.7%	63.6%	11	48,894	17,456	5,639	1,885	6.1%	2.2%	9.5%	3.7%
		3	16	6.2	124,385	63.2%	60.6%	12	58,330	20,187	4,837	1,740	5.9%	2.0%	10.4%	3.6%
		4	16	8.7	436,371	65.6%	30.8%	17	81,455	25,935	5,176	1,531	10.9%	1.9%	11.5%	3.0%
	2013	1	16	5.7	61,957	58.2%	64.8%	10	44,873	12,321	5,060	1,306	10.6%	3.1%	9.9%	2.8%
		2	16	6.2	106,696	62.4%	59.8%	14	43,032	15,489	3,810	1,328	5.6%	2.0%	9.6%	3.7%
		3	16	6.1	139,583	57.9%	63.4%	15	59,628	19,639	4,513	1,561	6.0%	2.0%	9.7%	3.1%
		4	15	8.6	471,162	79.2%	30.1%	19	83,236	28,935	5,037	1,654	10.2%	2.0%	12.3%	3.9%
	2014	1	16	5.8	75,197	42.9%	74.7%	11	48,198	14,478	4,577	1,455	10.0%	3.1%	15.6%	4.4%
		2	15	6.1	123,246	60.1%	62.1%	14	46,145	15,255	3,674	1,211	5.4%	1.8%	9.3%	3.1%
		3	16	6.4	157,354	66.6%	57.2%	19	56,106	18,475	3,306	1,079	5.4%	1.8%	9.5%	3.1%
		4	15	8.5	390,047	78.9%	48.1%	20	84,644	26,729	4,845	1,445	11.9%	1.9%	18.7%	4.6%

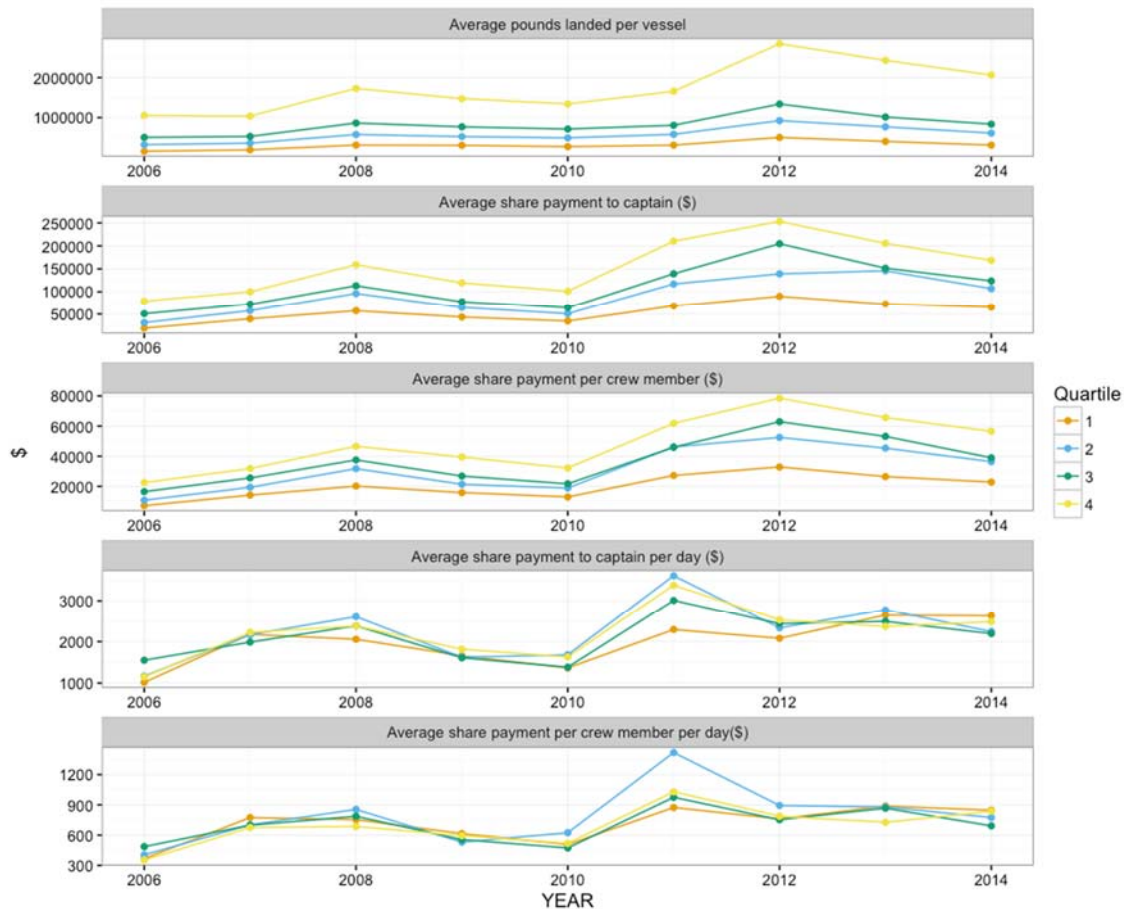
Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database; ADF&G Shellfish Observer Program, Confidential Interview Form (CIF) database; eLandings.
 - indicates data are not available.

Notes: Excludes vessels that did not report any payment to the captain for labor, and vessels for which the gross percentage share paid to crew was greater than 75 percent, based on EDR data. Data for 1998-2004 excludes vessels without qualifying history for CR Program initial allocation. In results aggregated over all CR fisheries, data for the year 2005 includes the 2005 Bering Seas snow crab fishery, which occurred prior to CR Program implementation. Gross share percentage for catcher/processor crew payment uses estimated ex-vessel value of catch based on average price of CV sector landings.

Figure 5-10 and Table 5-24 report information as described above for the Bering Sea snow crab fishery. The pattern of relative distribution of Bering Sea snow crab catch volume and captain and crew share payments between vessels stratified by quartile of landings volume is similar to that of the Bristol Bay red king crab fishery. Catch is concentrated in the highest volume quartile, with average vessel landings ranging from 1.03 to 2.84 million pounds over the 2006-2014 period, by a factor of approximately five to one in comparison to the lowest volume quartile, three to one compared to the second quartile, and two to one

compared to the third quartile. Relative comparisons of average captain and crew share payments between quartiles display greater consistency over time than in the Bristol Bay red king crab fishery. With the exception of 2006, when the disparity was greater than in subsequent years, average payments to captains in the highest volume quartile were 2.5 to 3 times that of average captain pay in the lowest volume quartile, and slightly closer for crew member pay; relative factors comparing share payments in the highest volume quartile to averages for the second and third quartile range from 1.4 to 2 and 1.2 to 1.6 respectively. Daily compensation rates are not systematically different between quartiles. Comparisons between quartiles in average gross share percentages for captain and crew in the Bering Sea snow crab fisheries have also been quite consistent over time. Vessels making smaller volumes of landings have varied inter-annually between 8.0 to 10.5% of gross revenue paid to captains and 2.9 to 3.8% paid per crew member, compared to 6.1 to 7.1% paid to captains on average, and 1.7 to 2.0% paid per crew members, on average, by vessels making the largest volume of landings. Results shown for 2012 - 2014 regarding captain and crew earnings in terms of percentage of gross residual range from 10 to 14% paid to captains, and 3.7 to 4.0% paid per crew member for vessels making the smallest volume of landings and leasing the smallest proportion of IFQ, compared to 15 to 44% paid to captains and 3.1 to 4.8% paid per crew member by vessels making the largest volume of landings, leasing as much as 80% on average of the total landings made by the vessel.

Figure 5-10 Captain and crew member share payment by quartile of vessel landings volume, BSS fishery - 2006 through 2014



Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Table 5-24 Crewmember pay and percent of gross vessel revenue and gross residual paid to crew, by quartile of pounds harvested - BSS fishery, 2006-2014

Fishery	Year	Landings Quartile	Number of vessels	Mean crew size	Mean vessel harvest (pounds)	Mean percent of pounds leased	Mean gross residual percent	Mean days at sea	Share payment (\$)		Share payment per day (\$)		Percent of gross vessel revenues as crew share		Percent of gross residual as crew share	
									Captain	Per crew	Captain	Per crew	Captain	Per crew member	Captain	Per crew member
BSS	2006	1	20	5	157,504	-	-	23	19,241	7,184	1,018	367	10.1%	3.8%	-	-
		2	19	6.8	322,907	-	-	29	31,261	10,822	1,169	405	7.9%	2.7%	-	-
		3	20	5.6	505,046	-	-	36	50,857	16,501	1,551	486	7.9%	2.5%	-	-
		4	19	9.1	1,053,795	-	-	75	79,103	22,485	1,150	353	6.6%	2.0%	-	-
	2007	1	17	5.4	193,111	-	-	21	39,665	14,204	2,176	774	10.6%	3.9%	-	-
		2	17	5.6	360,904	-	-	30	57,585	19,363	2,170	702	8.4%	2.8%	-	-
		3	17	5.7	529,339	-	-	39	72,153	25,557	1,989	699	7.2%	2.6%	-	-
		4	17	11.1	1,036,316	-	-	45	99,707	31,864	2,225	676	6.7%	1.9%	-	-
	2008	1	20	5.7	313,352	-	-	29	57,400	20,164	2,058	754	10.5%	3.7%	-	-
		2	19	5.6	577,491	-	-	40	96,007	31,743	2,604	855	8.6%	2.9%	-	-
		3	19	6.2	864,315	-	-	50	112,950	37,533	2,381	787	6.9%	2.3%	-	-
		4	19	10.8	1,729,362	-	-	71	159,058	46,589	2,378	686	6.9%	1.8%	-	-
	2009	1	20	5.5	305,692	-	-	29	43,498	15,888	1,659	615	9.8%	3.6%	-	-
		2	19	5.9	526,330	-	-	43	64,603	21,387	1,623	531	7.9%	2.6%	-	-
		3	19	6.6	769,367	-	-	51	77,633	26,837	1,611	556	6.7%	2.3%	-	-
		4	19	9.8	1,474,542	-	-	68	119,216	39,502	1,817	595	6.1%	1.9%	-	-
	2010	1	17	5.6	273,902	-	-	28	34,783	12,978	1,365	507	10.1%	3.8%	-	-
		2	17	5.8	493,191	-	-	32	50,884	18,871	1,683	624	7.7%	2.9%	-	-
		3	17	6.1	714,742	-	-	46	64,090	21,653	1,383	473	6.5%	2.2%	-	-
		4	17	8.6	1,340,718	-	-	64	100,990	32,154	1,632	519	6.2%	1.8%	-	-
	2011	1	17	5.8	311,722	-	-	33	68,073	27,220	2,293	874	8.4%	3.3%	-	-
		2	17	5.9	582,321	-	-	34	116,822	46,198	3,607	1,419	7.8%	3.1%	-	-
		3	17	6.1	808,066	-	-	49	139,234	45,944	3,009	975	6.5%	2.1%	-	-
		4	17	8.9	1,657,347	-	-	67	210,262	61,857	3,378	1,030	7.1%	1.9%	-	-
	2012	1	18	5.8	503,832	49.7%	77.9%	48	89,750	32,874	2,082	761	8.0%	2.9%	10.1%	3.8%
		2	18	6.2	924,753	57.6%	73.8%	68	139,022	52,487	2,334	894	6.9%	2.6%	9.1%	3.5%
		3	18	6.4	1,338,572	66.4%	69.4%	88	204,736	62,917	2,436	753	6.7%	2.1%	10.2%	3.1%
		4	18	9.5	2,847,494	70.7%	63.6%	104	253,301	78,564	2,529	788	6.4%	1.7%	14.8%	3.1%
	2013	1	18	5.9	404,719	54.2%	76.6%	34	72,519	26,474	2,644	888	8.0%	2.9%	9.9%	3.7%
		2	18	6.1	769,814	57.7%	73.0%	55	145,685	45,371	2,776	879	8.0%	2.5%	11.3%	3.5%
		3	18	6.3	1,014,775	70.9%	67.6%	64	151,370	53,184	2,490	867	6.4%	2.2%	9.7%	3.4%
		4	17	9.0	2,430,441	77.6%	57.1%	97	205,436	65,714	2,369	727	6.1%	1.7%	21.7%	3.8%
2014	1	18	5.9	311,926	49.2%	78.2%	29	65,437	22,843	2,628	847	10.1%	3.2%	14.0%	4.0%	
	2	17	6.4	613,137	69.0%	67.8%	47	106,680	36,424	2,242	775	7.4%	2.5%	11.2%	3.8%	
	3	17	6.4	837,039	75.2%	65.0%	58	123,694	38,983	2,195	692	6.0%	1.9%	9.4%	3.0%	
	4	17	9.0	2,065,256	80.1%	56.6%	72	168,498	56,580	2,483	837	6.1%	1.7%	44.2%	4.8%	

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database; ADF&G Shellfish Observer Program, Confidential Interview Form (CIF) database; eLandings
 - indicates data are not available.

Notes: Excludes vessels that did not report any payment to the captain for labor, and vessels for which the gross percentage share paid to crew was greater than 75 percent, based on EDR data. Data for 1998-2004 excludes vessels without qualifying history for CR Program initial allocation. In results aggregated over all CR fisheries, data for the year 2005 includes the 2005 Bering Seas snow crab fishery, which occurred prior to CR Program implementation. Gross share percentage for catcher/processor crew payment uses estimated ex-vessel value of catch based on average price of CV sector landings.

In an effort to provide additional insight to ex-vessel price and catch volume and concentration as factors driving changes in crew earnings over the 2006 to 2014 period, additional analysis was performed to compare values for the crew compensation metrics discussed above during successive three-year periods over the last nine years. In order to frame variation of crew earnings over time relative to contemporaneous changes in these determining factors, additional indices of crew employment were used, extending the analytical approach employed in Abbott et al. (2010) to assess crew remuneration effects following the first

three years of CR Program management. For the sake of brevity, the following focuses on the Bristol Bay red king crab fishery, which has exhibited a greater degree of variability in measures of crew compensation than has the Bering Sea snow crab fishery. Figure 5-11 presents results visually for 2006 through 2012 by period, and summary statistics for values shown in the plots for the Bristol Bay red king crab fishery, as well as for the Bering Sea snow crab fishery, presented annually for the longer time frame (including pre-rationalization reference years and 2005 through 2014) in Table 5-25. For each variable referenced in the discussion, figures display the full distribution of data points for individual vessels using kernel density plots, which provide a convenient way to represent the empirical distribution of values within the fleet during each period for each variable. To highlight the general trend over the course of the CR Program, data are grouped into three periods: 2006 to 2008, 2009 to 2011, and 2012 to 2014; data for 2005 and earlier is not included in order to improve clarity and focus on the performance of crew compensation as it has evolved under the CR Program.

Figure 5-11 displays plots of vessel-level observed values for crew size and days at sea during the season in the upper row of panels (row A), and vessel-level landing volume in pounds of crab and the vessel's average price per pound received for crab landings in the second row (B). As these are primary determinants of the outcome of crew settlement payments, they are shown to provide context for comparisons between the different metrics of crew compensation shown in rows C-G. For each crew compensation metric, values in the left column of panels represent payments to crew at the vessel-level, inclusive of all crewmembers except for vessel captain, and values per crew member⁴⁹ are shown in the right hand column. Monetary values of total season-level share payments to crew are shown in the third row (C) and daily earnings⁵⁰ are shown in row D. Rows E - G display the distributions of three additional crew compensation indices calculated for each vessel. Each distinct index normalizes monetary values of crew pay with respect to different variable factors in order to decompose variation in monetary earnings into components driven by changes in price, effort, and catch volume, respectively. The weight-equivalent pay index (row E) measures the value of crew share payment in terms pounds of crab (calculated by dividing monetary payments by ex-vessel price per pound). By normalizing crew payments relative to price, the weight-equivalent index measures the quantity of physical output of the vessel that is directed to compensation of crew, and can indicate the degree to which price variation is proportionately reflected in monetary payments to crew, or is disproportionately absorbed by vessel owners. Dividing this index by days at sea (row F) normalizes with respect to variation in effort per unit of catch, and is an indicator of the relative impact of changes in vessel productivity on crew earnings. Gross revenue share (row G) is derived by dividing the crew payment amount by the vessel's gross revenue (equivalent to dividing the weight-equivalent index by pounds). This represents a piece-rate measure of crew earnings as a proportion of the market value from each pound of crab produced.

In the upper left panel of Figure 5-11 the distribution of crew size on vessels fishing in the Bristol Bay red king crab fishery is shown, indicating the largest mode at 6 (also the median in each period), and smaller

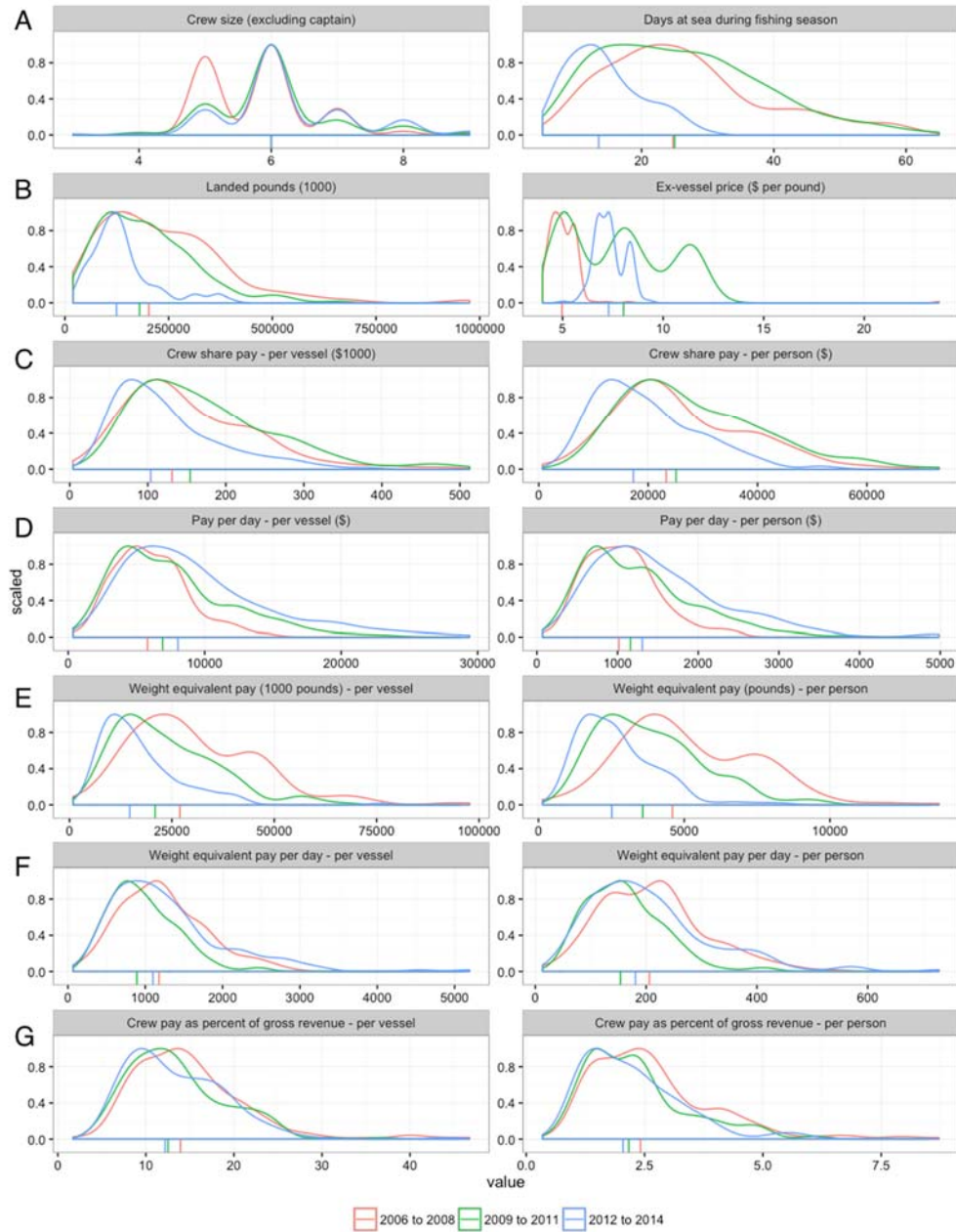
⁴⁹ Per-person values are calculated using the average crew size reported at the landing for each vessel (adjusted by one for the captain), sourced from the eLandings database.

⁵⁰ To provide the most consistent time series of vessel operating days for use in pro-rata calculations, vessel-level estimates of in-season days at sea were produced from a combination of trip days as reported at the landing in ADF&G fish tickets and fishing days reported by vessels at the landing and CIF days at sea collected by the ADF&G crab observer program.

modes at 5, 7 and 8. During the 2006 to 2008 period, a substantial fraction of the fleet operated with five member crews, but this has become less common in the fishery since 2009, and in the most recent period, more vessels have operated with 7 and 8 member crews than did during 2009-2011. As shown in the next panel, the number of vessel days at sea during the Bristol Bay red king crab fishery declined substantially in the latest period, as TACs have been reduced to the lowest level since 2002/03. The number of days at sea in the fishery prior to 2012 ranged widely between 5 and 60 days per vessel, with median value of 25 in both periods and distributions fairly even between 15 and 30 days, and a substantial portion of the fleet operating longer than 40 days. In the most recent years, the range of days at sea has contracted to fewer than 30 days, with a median of 13.5 days. In the plot of landed pounds per vessel (row B), the marked reduction in output volume per vessel in the most recent period (with median volume declining by 30% to 124 thousand pounds) resulted in a much narrower range of variation and landings being distributed more evenly between vessels than during previous periods. Ex-vessel price ranges were almost entirely distinct for the first and last period (\$4.97 and \$7.29 median values, respectively), but varied widely between 2009 and 2011, from \$5.06 per pound in 2009 to \$10.94 per pound in 2011.

Crew share payments (row C in Figure 5-11) on a per-vessel basis were lowest during the 2012-2014 period, declining to less than \$103 thousand for the majority of vessels, and less than \$17,300 on average for individual crew members. Share payments were highest during 2009-2011, when volume of catch was high relative to the following period, and price was high relative to the earlier period. On a vessel cost per day basis, mean crew share has ranged from \$5,800 to \$11,200 over longer term, and between \$900 to \$1,800 per crewmember. The median daily share payment was lowest during 2006-2008 (\$5,809 per vessel and \$1,016 per crew member), and highest during the most recent period overall (\$8,039 per vessel and \$1,305 per crew member), but from 2012 to 2014, daily pay has declined each year as market prices for red king crab have progressively declined from the historic peak reached in 2011.

Figure 5-11 Crew share settlement earnings per season and per day during three periods of CR Program management - BBR fishery



Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database; ADF&G Shellfish Observer Program, Confidential Interview Form (CIF) database; eLandings

Notes: Kernel estimates used the Gaussian kernel estimator in R with nrd0 default bandwidth setting. Directional differences identified as significant in the discussion of results were tested using one-sided Kolmogorov-Smirnov test and found to be significant the 0.05 level.

Table 5-25 Crew compensation indices, BBR and BSS fisheries, 1998, 2001 and 2004 through 2014

Fishery	Year	Number of vessels	Total crew positions	Mean crew size	Mean days at sea	Percent of gross vessel revenues paid to crew (including captain)		Crew pay per day Mean (\$)		Crab weight-equivalent pay Mean (Pounds)			
						Mean	Median	All crew	Per crew member	All Crew		Per crew member	
										per season	per day	per season	per day
BBR	1998	200	1191	6.0	14	36.0%	35.1%	4,868	814	14,256	1,394	2,349	185
	2001	192	1064	5.9	12	35.7%	35.3%	6,254	1,116	8,468	1,003	1,521	136
	2004	227	1373	5.9	12	35.8%	35.7%	9,637	1,568	14,364	1,685	2,355	225
	2005	86	513	6.0	24	26.3%	22.8%	6,449	1,133	57,098	1,954	6,113	205
	2006	82	509	6.3	20	24.8%	22.7%	5,851	999	37,242	2,159	4,793	238
	2007	72	448	6.7	30	23.9%	21.5%	6,032	1,023	60,793	1,891	6,859	197
	2008	78	491	6.7	31	24.0%	21.3%	6,650	1,130	61,770	1,733	6,850	201
	2009	69	428	6.7	29	20.8%	19.7%	5,257	874	40,591	1,361	5,020	152
	2010	64	405	6.4	33	20.3%	18.0%	6,544	1,088	49,656	1,277	5,111	145
	2011	59	360	6.6	16	20.8%	19.2%	11,191	1,829	15,974	1,016	2,540	167
	2012	64	444	6.8	12	24.6%	21.1%	10,786	1,685	52,736	5,214	4,145	199
	2013	63	418	6.7	14	23.1%	18.7%	9,184	1,459	54,925	4,289	4,506	179
	2014	62	414	6.8	16	22.7%	18.5%	8,296	1,296	40,087	3,396	3,992	180
BSS	1998	173	1123	6.5	67	35.9%	35.1%	3,400	520	265,140	4,229	41,166	580
	2001	169	1059	6.3	26	32.2%	31.9%	2,501	385	36,363	1,515	5,083	159
	2004	176	1015	5.8	18	36.0%	35.2%	4,732	815	33,318	2,095	5,477	296
	2005	153	898	5.9	16	34.8%	35.3%	5,139	902	39,630	2,694	6,618	378
	2006	78	517	6.6	40	24.6%	22.4%	2,403	403	82,387	1,980	11,561	307
	2007	68	474	7.0	34	25.9%	23.2%	4,528	713	95,383	2,884	12,628	379
	2008	77	544	7.1	47	25.2%	23.6%	4,857	770	146,200	3,049	19,148	414
	2009	77	536	7.0	47	24.1%	22.8%	3,665	575	121,308	2,571	16,968	351
	2010	68	444	6.5	43	23.9%	22.2%	3,338	530	105,068	2,492	15,768	378
	2011	68	453	6.7	46	23.8%	21.0%	6,789	1,074	140,957	2,974	18,562	406
	2012	72	502	7.0	77	22.1%	21.0%	5,187	799	211,826	2,714	26,941	343
	2013	71	481	6.8	62	22.1%	20.8%	5,400	842	181,448	2,988	22,217	354
	2014	69	476	6.9	51	22.5%	20.0%	5,112	788	140,382	2,569	17,734	316

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database, 2005 and later crew positions information from eLanding

Notes: Excludes vessels that did not report any payment to the captain for labor, and vessels for which the gross percentage share paid to crew was greater than 75 percent, based on EDR data. Data for 1998-2004 excludes vessels without qualifying history for CR Program initial allocation. In results aggregated over all CR fisheries, data for the year 2005 includes the 2005 Bering Seas snow crab fishery, which occurred prior to CR Program implementation. Gross share percentage for catcher/processor crew payment uses estimated ex-vessel value of catch based on average price of CV sector landings.

The distributions of the crab weight-equivalent index (shown in row E of Figure 5-11) generally follow the distributions of landed pounds during the contemporaneous periods, but comparison between the weight-equivalent index and crew share payments in row C indicate notable differences. Whereas monetary share payments were highest during 2009-2011, in weight-equivalent terms, payments to crew were highest during 2006 - 2009. This could indicate that ex-vessel price increases in the second period were partially absorbed by vessel owners as the increased value of the catch allowed a smaller portion of the physical production to be directed to crew payments. The peaks of the density curves of both landed pounds and share payment are closely matched during the two periods and variation is confined to the upper end of the respective distributions. In contrast, the mode of the distribution of the weight-equivalent index shifted to the left during 2009-2011 relative to 2006-2008, corresponding to the peak in ex-vessel price in 2011 and indicating that, for at least a portion of the fleet, crews may not have shared proportionately in the gains

produced by the surge in price. The daily pro-rated weight-equivalent index in row F presents a similar contrast with respect to 2006-2008 compared to the most recent period: whereas daily crew earnings in monetary terms have been highest on average during the 2012-2014 period (row D), earnings were higher during 2006-2008 in weight-equivalent terms, and lower production efficiency on average during 2009-2011 resulted in the lowest daily weight-equivalent earnings of the three periods. This decomposition of price effects is explanatory of the results shown in row G for gross revenue share, which was highest during the initial period, with a median of 13.9 percent, declining to 12.5% in the 2009-2011 period, to 12.2% most recently. Sufficient information on vessel-level share contract terms is not available to investigate how terms have changed over the period of analysis with respect to share percentages and deductions for IFQ leases and other costs. Nonetheless, the net effect of those changes on final settlement earnings seem likely to have been driven at least as much by the relative absorption of ex-vessel price variation by vessel and quota entities collectively, than by changes in the share of revenues directed to IFQ leases.

It should be noted that red king crab ex-vessel prices consistently declined each year from 2003 to 2006 when the average price bottomed at \$4.39 per pound. In comparing crew compensation effects of the transition to IFQs, Abbott et al. 2010 found that the crew earnings were higher during the initial three seasons under IFQs than would have been the case if they had followed the decline in ex-vessel price, indicating that crews were relatively insulated from the effect of falling ex-vessel price. As such, a balanced interpretation of the pattern described above is that vessel owners disproportionately absorbed the effects of low prices during 2005-2009 relative to crew, and that the recent shift toward retaining greater relative gains from increasing prices represents recovery toward a more equilibrium condition. In contrast to overall gains in crab prices subsequent to 2006, general inflation and wage rates in the US economy have been historically flat. Viewed in this context, the pattern of inter-period variation observed in crew compensation rates as shown in the different indices is not surprising. Rather, a counterfactual outcome, where crew earnings remained stable or increased by every measure, would indicate that crews working in the Bristol Bay red king crab fishery had been substantially insulated from exogenous economic conditions other than international red king crab markets, including ordinary labor market forces.

5.6.3 Crew Demographics

Using counts of individual captains and crew members identified by license or permit number in EDR records, it is estimated that 676 unique individuals worked on board during 2014 CR fisheries, a slight increase from 670 in 2013 (Table 5-26). Of the 584 commercial crew license holders participating in CR crab fisheries during 2014, 200 (34 percent), and 24 of 93 (25 percent) CFEC gear operator permit holders, were identified as Alaska state residents. Further detail changes in on crew member demographics and community level impacts of these changes are provided in the social impact assessment appendix to this review.

Table 5-26 Crab crew member participation by state of residence

Year	Gear Operator Permit holders					Crew License holders							Crew and captain total
	Non-Alaska resident		Alaska resident		Total gear operators	Non-Alaska resident		Alaska resident		Unknown		Total crew license	
	Count	percent of	Count	percent of	Count	Count	percent of	Count	percent of	Count	percent of	Count	Count
1998	243	70%	106	30%	349	-	-	-	-	-	-	-	-
1999	246	70%	105	30%	351	-	-	-	-	-	-	-	-
2000	208	70%	90	30%	298	-	-	-	-	-	-	-	-
2001	210	73%	78	27%	288	-	-	-	-	-	-	-	-
2002	204	73%	77	27%	281	-	-	-	-	-	-	-	-
2003	199	71%	82	29%	281	-	-	-	-	-	-	-	-
2004	197	71%	81	29%	278	-	-	-	-	-	-	-	-
2005	137	71%	56	29%	193	-	-	-	-	-	-	-	-
2006	96	73%	36	27%	132	331	62%	193	36%	10	2%	534	666
2007	74	74%	26	26%	100	337	64%	191	36%	2	0%	530	630
2008	90	76%	29	24%	119	414	66%	214	34%	3	0%	631	750
2009	83	75%	27	25%	110	380	67%	188	33%	1	0%	569	679
2010	71	72%	28	28%	99	344	67%	167	32%	4	1%	515	614
2011	68	73%	25	27%	93	346	65%	182	34%	2	0%	530	623
2012	82	73%	30	27%	112	402	66%	204	33%	5	1%	611	723
2013	70	74%	24	26%	94	374	65%	187	32%	15	3%	576	670
2014	69	75%	23	25%	92	380	65%	200	34%	4	1%	584	676

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database, ADF&G Fishing permit registry and CFEC Gear Operator Permit registry

-- indicates no data available.

5.7 Effects of the Fishing Capacity Reduction Program

Under section 312(b) of the Magnuson-Stevens Act, NMFS has the authority to conduct a fishing capacity reduction program if funds are provided and such a program is necessary to prevent or end overfishing, rebuild stocks of fish, or achieve measurable or significant improvements in the conservation and management of a fishery. A capacity reduction program must be consistent with any state and Federal fishery management plans in place for a fishery. Funding for such programs is authorized under section 312(c) of the Magnuson-Stevens Act and allows NMFS to obtain funding through specific appropriations from industry fee systems and public, private, or nonprofit sources. Under this authority, regulations implementing the BSAI King and Tanner Crab Fishing Capacity Reduction Program were effective on January 12, 2004 (68 FR 69331), and on January 19, 2005, funding was appropriated. Regulations governing the program are at 50 CFR part 600.1103 and part 600.1104. Under administration of the NMFS Financial Services Division (FSD), NMFS bought back 25 BSAI crab fishing vessels, associated fishery histories, and 62 licenses to achieve the maximum sustained reduction in BSAI crab fishing capacity at the least cost and in minimum time (70 FR 54652, September 16, 2005). Each bid submitted to NMFS offered to remove a vessel from all fisheries and relinquish all associated fishing privileges (including the assigned LLP licenses) and any future privileges arising out of the fishing history of the vessel. In the BSAI King and Tanner Crab Fishing Capacity Reduction Program, the FSD administers an industry-funded, 30-year loan of \$97,399,357.00 at a fixed rate of 6.54 percent.

Fees for repayment of the loan are authorized under section 312(d)(2)(C) of the Magnuson-Stevens Act and are to be paid on harvests of the CR Program crab species. Harvesters are required to pay the fee and all parties making the first ex-vessel purchase of the crab (“fish buyers”) are required to collect the fee based on the crab's full delivery value, and account for and forward the fee revenue to NMFS to repay the loan. By regulation, the fee rate may not exceed 5% of the delivery value. Table 5-27 shows the fee rates for each of the subloans, which are determined based on the need to repay the amortized principle and interest on the loan within the 30-year loan term.

Fee collection to repay the loan began on October 17, 2005. BSAI Crab Buyback Loan Fees are due by the 7th day of the month after the month in which landings occurred. Buyback fees received after that date are subject to a 1.5% per month (or portion thereof) late charge fee. NMFS may withhold annual crab permits if buyback fees are outstanding.

Table 5-27 shows the principle balance for each of the “subloans” allocated to each fishery by the BSAI King and Tanner Crab Fishing Capacity Reduction Program. Loan balances are current as of June 30, 2015. The Saint Matthew Island blue king crab fishery opened for the first time since the inception of this Program on October 15, 2009. The Western Aleutian Islands red king crab and Pribilof Islands king crab fisheries have remained closed since the start of the loans. By late June 2015, fishermen had reduced the original loan amount (\$97.4 million) to \$78 million, with an additional interest balance of \$4.2 million.

Table 5-27 Fishery loan status of the BSAI King and Tanner Crab Fishing Capacity Reduction Program, June 30, 2015

Crab Fishery	Original Loan Amount	Principal Balance	Interest Balance	Fee Rate
Bering Sea Snow Crab and Tanner Crab	\$66,410,767.20	\$59,981,218.03	\$0.00	5.00%
Bristol Bay Red King Crab	\$17,129,957.23	\$9,617,196.65	\$236,149.90	2.50%
Aleutian Islands Golden (Brown) King Crab	\$6,380,837.19	\$1,260,047.68	\$2,483.50	5.00%
St. Matthew Island Blue King Crab	\$5,668,991.10	\$5,668,991.10	\$2,726,672.88	5.00%
Pribilof Islands Red and Blue King Crab	\$1,571,216.35	\$1,571,216.35	\$1,073,746.01	5.00%
Aleutian Islands Red King Crab	\$237,588.04	\$237,588.04	\$162,364.15	5.00%
Total	\$97,399,357.11	\$78,336,257.85	\$4,201,416.43	

6 PROCESSOR SHARE HOLDINGS

The CR Program allocation of processing privileges in addition to harvester privileges, are unique in Alaska catch share programs. Prior to implementation of the program, processor entry to the crab fisheries was not exclusive. With the implementation of the program, participation in CR fisheries by processors became mostly limited by PQS and IPQ allocations yielded annually by those PQS. Processors may still enter the market by processing Class B or C shares without any corresponding processing privilege. However, under the program, Class A IFQ, representing 90% of the annual allocation of catcher vessel owner IFQ

(approximately 87.3% of the catcher vessel IFQ allocation in each fishery), must be matched with processor holding IPQ. This section of the paper summarizes the distribution of those processing privileges initially and over time.

6.1 Initial Allocation by Region

Initial allocations of processor quota shares were substantially more concentrated than harvester quota share allocations under the program because fewer processors than vessels were active in the fisheries during the qualifying period (see Table 6-1). Across all fisheries, there were 27 entities initially issued PQs for the 2005/2006 season, therefore there was overlap in some of the fisheries. As in the harvest sector, concentration of initial allocations of processing privileges varied across fisheries. The Aleutian Islands fisheries, which had the least participation during the qualifying period, were the most concentrated. The Bristol Bay red king crab, Bering Sea snow crab, and Bering Sea Tanner crab fisheries, which had the most participants during the qualifying period, were the least concentrated.

Regionalization of the fisheries is one measure of the CR Program intended to protect community interests. The regional distribution of shares differed with landing patterns that arose from the geographic distribution of fishing grounds and processing activities. In the Pribilof red and blue king crab fisheries, most historic processing occurred in the Pribilof Islands, resulting in over two-thirds of the processing allocations in those fisheries being designated for processing in the North region. Most processing in the Saint Matthew Island blue king crab fishery occurred on floating processors near the fishing grounds in the North region. The Bering Sea snow crab fishery allocations are split almost evenly between the North and South regions; while less than 5% of the Bristol Bay red king crab PQS is designated for North processing. All qualifying processing in the Eastern Aleutian Island golden king crab fishery occurred in the South region, resulting in all processing shares in that fishery (and in the Western Aleutian Islands red king crab fishery, which was based on the same history) being designated for processing in the South region. All processing allocations Western Aleutian Islands golden king crab fishery were split evenly with half required to be processed in the West region and half undesignated, which can be processed anywhere. Bering Sea Tanner crab processing shares are also undesignated.

The CR Program established PQS caps that apply individually and collectively to both the PQS holdings of an entity and IPQ used at an affiliated processing plant in a given year. Section 2.3.3 explains that the processing share cap prevents any person from holding or using in excess of 30% of the outstanding PQS in any program fishery the caps for different fisheries.⁵¹ The maximum allocation in each fishery was in excess of 20% of the pool. In the Western Aleutian Islands golden king fishery, the maximum allocation was in excess of 60% of the pool, double the share holdings cap. This entity was ‘grandfathered’ their allocation based on historical processing. In the Eastern Aleutian Islands fishery, one allocation of approximately 45% of the pool was in excess of one and one-half times the cap. In only one other fishery, the St. Matthews Island blue king crab fishery, did an initial allocation exceed the cap. In that fishery, slightly greater than 30% of the quota was allocated to one processing entity.

⁵¹ There are several exemptions for custom processing in certain fisheries. These are further explained in Section 2.3.3.

Table 6-1 Initial allocation of PQS (2005/ 2006)

Fishery	Shareholdings by region						Across regions			
	Region	Percent of total allocation	PQS holders	Mean holding	Median holding	Maximum holding	PQS holders	Mean holding	Median holding	Maximum holding
BBR	North	2.6%	3	0.9%	0.2%	2.3%	17	5.9%	1.6%	23.0%
	South	97.4%	17	5.7%	1.6%	20.7%				
BSS	North	47.0%	9	5.2%	5.4%	15.5%	20	5.0%	2.1%	25.2%
	South	53.0%	17	3.1%	0.4%	9.7%				
BST	Undesignated	100.0%	23	4.4%	0.8%	24.3%	23	4.4%	0.8%	24.3%
EAG	South	100.0%	8	12.5%	6.0%	45.9%	8	12.5%	6.0%	45.9%
PIK	North	67.5%	6	11.3%	12.0%	23.3%	14	7.1%	3.2%	24.5%
	South	32.5%	11	3.0%	1.0%	13.5%				
SMB	North	78.3%	6	13.1%	8.9%	29.9%	12	8.3%	5.1%	32.7%
	South	21.7%	9	2.4%	1.8%	7.8%				
WAG	Undesignated	50.0%	8	6.3%	0.4%	33.3%	9	11.1%	1.0%	63.0%
	West	50.0%	9	5.6%	0.5%	29.7%				
WAI	South	100.0%	9	11.1%	1.0%	63.0%	9	11.1%	1.0%	63.0%

Source: NMFS RAM Division IFQ database, Initial Allocation of PQS

Notes: These share holdings are publicly available and non-confidential

6.2 The Structure of PQS Holding Entities

As discussed previously in the discussion of harvest QS holdings in Section 4, PQS holdings are structured within various corporate entities, ranging from smaller limited liability partnerships up to large corporations. The underlying distribution of PQS holdings among individual shareholders is somewhat obscured by the complexity of corporate structures under which PQS is held. Effectively measuring changes in ownership of PQS over time is more difficult as a result. That is, movement of PQS may occur through a traditional transfer, in which a PQS transfer application is submitted to NMFS, identifying a quantity of PQS shares being transferred from one PQS-holding entity to an eligible buyer. If the transfer is between two business entities with identical ownership (e.g., two subsidiaries of the same parent owner), the transfer would nonetheless be registered as a change in PQS holdings. Alternately, as sometimes occurs in the case of QS holdings, a de facto change in PQS ownership may occur through the sale of some or all equity interest in a business entity that holds PQS. This type of transaction would not directly register as a transfer of PQS as long as the PQS-holding entity remains intact under the new ownership, and is not renamed or restructured to such extent as necessitates re-establishing eligibility to hold PQS by submitting an eligibility application to NMFS.

As described in Section 4.3 regarding QS holdings, the annual application for IPQ issuance submitted to NMFS requires non-individual PQS holding entities to provide the names and equity share percentages of all persons, to the individual level, with ownership interest in the entity submitting the IFQ application. This information is used by NMFS administratively to ensure enforcement of QS/PQS use caps, but is not readily available for straightforward description of changes in the underlying ownership of PQS that has occurred over time. To enable more effective monitoring of PQS ownership over time, it is necessary to deconstruct the underlying ownership structure of QS holding entities to identify the quantity of QS held by individual persons. Using methods and data sources described in the discussion of results shown for

harvest QS holdings in Table 4-5, Table 6-2 presents a summary of individual PQS holdings after PQS entities were disaggregated to individual equity holders using annual IPQ permit application data.

In contrast to current (2014/15) Bristol Bay red king crab fishery direct PQS holdings across 14 named entities shown in Table 6-4, a total of 25 distinct owners of PQS can be identified through both direct and indirect ownership, comprised of five CDQ groups, collectively holding 33% of PQS, three corporations holding nearly 44% of the pool, seven individual PQS holders with 9.3% of the pool, and the remaining 13.8% held under 10 partnerships, estates or trusts. Table 6-4 results indicate that the maximum holding of Bristol Bay red king crab PQS by any single PQS entity is 23.2%, however, by taking indirect ownership interest into account, it can be demonstrated that the largest aggregate stake, held by one of three corporations, is slightly greater than 30%. Similarly, in the Bering Sea snow crab fishery, a total of 28 distinct PQS owners can be identified (compared to 17 PQS entities), comprised of four CDQ groups holding 32.4% of the PQS pool collectively, five corporations holding 39.9% of the pool, nine individual PQS owners holding 10.7% of the pool, and another 17% of the pool held among 10 partnership, estates, and trusts. The Western Aleutian Islands golden king crab, Western Aleutian Islands red king crab, and Saint Matthew Island blue king crab fisheries indicate the highest percentage of PQS ownership among individual owners, with 23.7% of the Saint Matthew Island blue king crab pool held among 13 individual owners, 25% of the Western Aleutian Islands golden king crab PQS pool held among a total of 135 individual owners, and 63.4% of the Western Aleutian Islands red king crab pool held by a similar number of individual owners. In all three fisheries, 10 or fewer PQS entities are identified in the current holdings of Table 6-4.

Table 6-2 Deconstruction of 2014/15 PQS holdings by individual shareholder and entity type

Fishery	Entity Type	Unique QS Holders	Percent of pool held by entity type	Mean holding %	Median holding %	Maximum holding %
BBR	CDQ	5	33.01	6.6	5.31	12.39
	Corporation	3	43.91	14.64	13.62	30.13
	Individual	7	9.27	1.32	0.34	7.72
	Partnerships, Estates, and Trusts	10	13.81	1.38	0.27	3.81
	All entity types	25	100	4	0.7	30.13
BSS	CDQ	4	32.44	8.11	7.47	17.37
	Corporation	5	39.86	7.97	0.2	28.72
	Individual	9	10.68	1.19	0.14	9.53
	Partnerships, Estates, and Trusts	10	17.03	1.7	0.34	4.69
	All entity types	28	100	3.57	0.26	28.72
EAG	CDQ	2	16.21	8.11	8.11	9.28
	Corporation	4	66.05	16.51	14.82	36.39
	Individual	8	17.14	2.14	0.63	11.36
	Partnerships, Estates, and Trusts	10	0.6	0.06	0.01	0.17
	All entity types	24	100	4.17	0.15	36.39
EBT	CDQ	4	22.51	5.63	2.8	15.05
	Corporation	5	42.89	8.58	0.18	30.41
	Individual	13	19.06	1.47	0.01	9.43
	Partnerships, Estates, and Trusts	10	15.54	1.55	0.31	4.28
	All entity types	32	100	3.12	0.24	30.41
PIK	CDQ	2	15.93	7.96	7.96	13.44
	Corporation	4	44.36	11.09	9.72	24.75
	Individual	8	24.54	3.07	0.37	13.99
	Partnerships, Estates, and Trusts	10	15.17	1.52	0.3	4.18
	All entity types	24	100	4.17	0.61	24.75
SMB	CDQ	3	24.1	8.03	4.39	19.66
	Corporation	3	32.73	10.91	2.1	30.4
	Individual	13	23.65	1.82	0.48	10.92
	Partnerships, Estates, and Trusts	10	19.52	1.95	0.39	5.38
	All entity types	29	100	3.45	0.48	30.4
WAG	CDQ	2	31.4	15.7	15.7	30
	Corporation	3	42.72	14.24	12.71	30
	Individual	135	25.28	0.19	0.13	4.87
	Partnerships, Estates, and Trusts	10	0.61	0.06	0.01	0.17
	All entity types	150	100	0.67	0.13	30
WAI	Corporation	3	36.01	12	2.65	33.35
	Individual	133	63.38	0.48	0.22	27.07
	Partnerships, Estates, and Trusts	10	0.61	0.06	0.01	0.17
	All entity types	146	100	0.68	0.22	33.35
WBT	CDQ	4	22.51	5.63	2.8	15.05
	Corporation	5	42.89	8.58	0.18	30.41
	Individual	13	19.06	1.47	0.01	9.43
	Partnerships, Estates, and Trusts	10	15.54	1.55	0.31	4.28
	All entity types	32	100	3.12	0.24	30.41

Source: NMFS Restricted Access Management QS database and Alaska Fisheries Information Network (AKFIN)

6.3 Transfers of PQS

A substantial quantity of PQS was transferred in the first 3 years of the program, with less transfers occurring in the latter 7 years of the program (NPFMC 2010a). As with harvester shares, the extent to which these transfers represent actual market transfers is uncertain, as some restructuring of processing interests occurred. For example, in two instances between 2005 and 2009, merging of significant processing interests consolidated interests in that sector. In one case, the consolidation did not result in share transfers, but only affected the interests underlying share holdings. Therefore, this type of transfer would not be reflected in these data. In the other case, certain shares did change named holder, which explains a large part of the transfer of processing share interests shown in these data between 2005 and 2009 (Table 6-3). This consolidation, however, also resulted in the transfer of a substantial interest in Eastern Aleutian Island golden king crab PQS to a new entrant, as the merged entity was required to divest of shares in that fishery to comply with the processor share holding cap. In recent years, some CDQ groups, including their wholly owned subsidiaries and joint ventures have been involved in PQS transfers (see Section 8.2).

Table 6-3 Transfers of PQS by fishery (2005 through 2015)

Fishery	2005 -2009			2010-2015			Total 2005 - 2015		
	Transfers	Number of units	% of sector QS pool	Transfers	Number of units	% of sector QS pool	Transfers	Number of units	% of sector QS pool
BBR	10	91,420,986	23%	5	40,784,683	10%	15	132,205,669	33%
BSS	13	202,120,799	20%	5	121,758,655	12%	18	323,879,454	32%
BST	2	*	*	0	0	0%	2	*	*
EAG	5	2,068,542	20%	1	*	*	6	2,428,401	24%
EBT	8	23,752,214	12%	2	*	*	10	45,510,706	23%
PIK	3	4,893,835	17%	2	*	*	5	9,178,391	33%
SMB	7	4,169,060	14%	6	6,408,071	21%	13	10,577,131	35%
WAG	11	21,191,574	53%	0	0	0%	11	21,191,574	53%
WAI	5	37,492,387	62%	0	0	0%	5	37,492,387	62%
WBT	8	23,752,214	12%	2	*	*	10	45,510,706	23%

Source: NMFS Restricted Access Management Division, QS transfer database

In addition to the transfers of PQS, annual transfers of IPQ also occurs (i.e., IPQ leasing). Leasing of IPQ is distinct from custom processing of IPQ in that the RCR leasing the IFQ from the PQS holder acquires the right to purchase the matched IFQ crab, and thus retains ownership of the processed product and the right to sell to wholesale buyers directly. In contrast, in a custom processing arrangement, the PQS holder is an RCR permitted to have crab they have purchased from harvesters delivered to the custom processor, and retains ownership of the processed crab to supply their own buyers. Leases are reported to occur for a variety of reasons. In some instances, processors elect to exchange shares (without an exchange of money) to realize production efficiencies. In other cases, processors acquire leased IPQ to increase production or to serve specific markets. Large parent corporations may also choose to “lease” IPQ from one affiliated entity to another.

6.4 Current Holdings

As in the initial allocation, PQS holdings are currently substantially more concentrated than either catcher vessel owner or catcher vessel crew QS holdings (Table 6-4). Median PQS holdings have increased in all CR fisheries since program implementation. However, the total count of PQS holding entities has increased by 2 since program implementation (29 PQS holders in the 2014/ 2015 season). This is likely due to a few share holders with smaller holdings divesting over time. Since program implementation, some CDQ groups have become entry-level PQS holders. Additionally, Table 6-4 does not include affiliations between PQS holders, which could lead to a smaller number of unaffiliated PQS holders than presented in Table 6-4. For example, in October of 2007, a merger of two large processing companies linked the holdings of processors in Dutch Harbor and King Cove. These entities are still represented separately in Table 6-4.⁵² As a consequence, consolidation may be underreported by these data.

Table 6-4 Current holdings of PQS (2014/2015)

Fishery	Share holdings by region						Across regions			
	Region	Percent of total allocation	QS holders	Mean holdings	Median holdings	Maximum holdings	QS holders	Mean holdings	Median holdings	Maximum holdings
BBR	North	2.6%	2	50.0%	50.0%	90.3%	14	7.1%	6.1%	23.2%
	South	97.4%	14	7.1%	6.3%	21.4%				
BSS	North	47.0%	7	14.3%	12.1%	32.9%	17	5.9%	3.4%	25.2%
	South	53.0%	15	6.7%	0.7%	18.3%				
EAG	South	100.0%	9	11.1%	6.9%	45.4%	9	11.1%	6.9%	45.4%
EBT	Undesignated	100.0%	19	5.3%	1.8%	24.4%	19	5.3%	1.8%	24.4%
PIK	North	67.5%	6	16.7%	17.8%	34.5%	12	8.3%	5.0%	25.5%
	South	32.5%	9	11.1%	6.7%	42.7%				
SMB	North	78.3%	5	20.0%	24.8%	38.2%	10	10.0%	4.2%	32.7%
	South	21.7%	7	14.3%	13.4%	36.7%				
WAG	Undesignated	50.0%	8	12.5%	1.9%	59.3%	10	10.0%	3.4%	30.0%
	West	50.0%	7	14.3%	1.0%	52.7%				
WAI	South	100.0%	8	12.5%	4.0%	33.0%	8	12.5%	4.0%	33.0%
WBT	Undesignated	100.0%	19	5.3%	1.8%	24.4%	19	5.3%	1.8%	24.4%

Source: NMFS RAM Division IFQ database, Initial Allocation of PQS

Notes: These share holdings are publicly available and non-confidential

7 PROCESSING SECTOR

Similar to the harvest sector, the Council's goals for the processing sector in developing the CR Program included promoting economic stability, and eliminating excess capacity that promotes a system of low economic returns. Of the 8 distinct program goals for the CR Program identified in the Council's original

⁵² In addition, Table 6-4 on its own does not give an indication of the amount of leasing or custom processing of PQS that occurs. Some PQS holders have no affiliation with a processing plant, but rely on existing plants for processing arrangements. This is further discussed more in Section 7.

problem statement, the following are most specifically relevant to program elements affecting the processing sector:

- (1) *[Promote] resource conservation, utilization, and [address] management problems;*
- (5) *[Reduce] excess harvesting and processing capacity, as well as [discouraging a system that promotes] low economic returns;*
- (6) *[Promote] economic stability for harvesters, processors and coastal communities;*
- (7) *[Address] the social and economic concerns of the communities;*
- (8) *[Promote] equity between the harvesting and processing sectors, including healthy, stable, and competitive markets.*

These represent broad objectives, without clear metrics for evaluation of successful outcomes. As such, the following section presents an overview of the current status of the processing sector, and changes therein over the course of the program, in terms of elements of the program that are informative with regard to the stated program goals. These include: participation of crab processors in active processing of crab, with a focus on changes over time in the distribution of processing activity by community; a brief summary of the current status of processing community rights of first refusal (ROFR) on certain transfers of PQS and IPQ (noting that ROFR provisions were recently revised under Amendment 44 to the FMP, but the amendments have only recently begun to take effect, with the final rule published in January of this year), a summary of available information regarding IPQ leasing and custom processing and the effects these practices may have on regional distribution of processing activity; changes in physical processing capacity; and a summary of finished crab production and gross earnings, and employment and labor earnings in the processing sector.

7.1 Processor Participation

In the years leading up to the rationalization program, 20 or fewer processors participated in the largest crab fisheries (Table 7-1). The largest three processors in these fisheries processed less than 15% of the fisheries' landings in each year (or between 2 and 3 times the mean). Processing by the median processor was approximately equal to the mean suggesting that approximately 10 or fewer processors dominated processing in the fisheries. Between 2 and 6 processors were active in the Aleutian Islands golden king crab fisheries during the same period, limiting the information that may be released concerning the volume of processing in those fisheries. The distribution of processing activity by community during the 2001 to 2004 period (Table 7-2) indicates that Dutch Harbor shore plants attracted a majority of landings in the Bristol Bay red king crab fishery and slightly less than a majority in the Bering Sea snow crab fishery. The remainder of Bristol Bay red king crab landings were divided primarily among Adak, Akutan, King Cove, and floating processors located at in the Bering Sea, with smaller volumes processed in Kodiak and St. Paul. In the Bering Sea snow crab fishery, Floating processors, St. Paul, and Dutch Harbor represented the largest volume processed, with Akutan, King Cove, and Kodiak comprising the other 10% in most years. In the two Aleutian Islands golden king crab fisheries, participation fluctuated between 2 and 7 processors during the years leading up to implementation of the program. Dutch Harbor and Adak supported virtually all of the processing in those fisheries (see Table 6-3).

Table 7-1 Processing in the BBR, BSS, EAG, and WAG fisheries in the years leading up the implementation of the rationalization program

Fishery	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of fishery	pounds processed	as a percent of fishery	in pounds	as a percent of fishery
BBR	2001	17	433230	5.9	381096	5.2	1113502	15.1
	2002	17	498344	5.9	463363	5.5	1169863	13.8
	2003	20	677865	5	372667	2.7	1862769	13.7
	2004	17	781547	5.9	513753	3.9	1942253	14.6
BSS	2002	17	1643446	5.9	1422515	5.1	4147694	14.8
	2003	17	1447451	5.9	1438688	5.8	3022202	12.3
	2004	18	1181935	5.6	1025185	4.8	2564168	12.1
	2005	14	1571915	7.1	1525714	6.9	3136110	14.3
EAG	2001 - 2002	4	782102	25	*	*	*	*
	2002 - 2003	4	691359	25	*	*	*	*
	2003 - 2004	4	725062	25	*	*	*	*
	2004 - 2005	4	711568	25	*	*	*	*
WAG	2001 - 2002	6	308220	16.7	253814	13.7	592502	32
	2002 - 2003	2	881793	50	*	*	NA	NA
	2003 - 2004	4	498842	25	*	*	*	*
	2004 - 2005	3	624186	33.3	*	*	NA	NA

Source: ADFG Fish tickets.

* withheld for confidentiality.

Under the CR Program, a large portion of the processing (and raw crab purchasing) is vested in the holders of processing shares. To achieve efficiencies in processing, holders of processor shares have used custom processing arrangements to process substantial portions of the landings in the fisheries. Under these arrangements, an IPQ holder/crab buyer contracts for the processing of landings of crab, while retaining all interests and obligations associated with the landed and processed crab. The processor of the crab receives offloaded crab from vessels that has been purchased by the crab buyer and provides processing services as contracted, ultimately passing on the finished product to the crab buyer. The buyer is obligated to pay both the fisherman for the landing, as well as taxes on the landing. Because of the prevalence of these arrangements, this section assesses both plant activities and buyer activities, which are distinct activities under custom processing.

Table 7-2 Number of processors and amounts processed by fishery and community (2001-2004/5)

Fishery	Season	Communities	Number of Processors	Pounds processed	Percent of pounds processed
BBR	2001	Adak, Akutan, Floaters, King Cove	6	2663437	36.2
		Dutch Harbor	5	3902545	53.0
		Kodiak	6	798932	10.8
	2002	Akutan, Floaters, King Cove	7	3374438	39.8
		Dutch Harbor	6	4276910	50.5
		Kodiak, St. Paul	4	820497	9.7
	2003	Akutan, Floaters, King Cove, Sand Point	10	5207419	38.4
		Dutch Harbor	7	7131382	52.6
		Kodiak, St. Paul	5	1218494	9.0
	2004	Akutan, King Cove, Floaters, St. Paul	7	5932888	44.7
		Dutch Harbor	6	6504531	49.0
		Kodiak	4	848879	6.4
BSS	2001	Akutan, King Cove, Kodiak	3	1889513	9.5
		Dutch Harbor	5	7916618	39.9
		Floaters, St. Paul	8	10034268	50.6
	2002	Dutch Harbor, King Cove	6	13008117	46.6
		Floaters, St. Paul	8	14292205	51.2
		Kodiak	3	638264	2.3
	2003	Akutan, King Cove, Kodiak	3	2162245	8.8
		Dutch Harbor	6	10308648	41.9
		Floaters, St. Paul	8	12135777	49.3
	2004	Akutan, King Cove, Kodiak	4	2287481	10.8
Dutch Harbor		6	8714351	41.0	
Floaters, St. Paul Akutan, King Cove, Kodiak		8	10273001	48.3	
2005	Dutch Harbor	3	2206008	10.0	
	Floaters, St. Paul Sand Point	6 5	9759358 10041444	44.3 45.6	
EAG	2001/02	Adak	1	*	*
		Dutch Harbor	3	*	*
	2002/03	Adak	1	*	*
		Dutch Harbor	3	*	*
	2003/04	Adak	2	*	*
		Dutch Harbor	3	*	*
	2004/05	Adak	2	*	*
		Dutch Harbor	3	*	*
WAG	2001/02	Adak	3	*	*
		Dutch Harbor	3	*	*
		Floater	1	*	*
	2002/03	Adak	1	*	*
		Dutch Harbor	1	*	*
	2003/04	Adak	3	*	*
		Dutch Harbor	2	*	*
	2004/05	Adak	2	*	*
Dutch Harbor		2	*	*	

Source: ADF&G Fish tickets.

* withheld for confidentiality.

Since program implementation, the number of processing plants participating in the Bristol Bay red king crab fishery has declined from 17 during three of the four years prior to program implementation, to 11 during 2005, and further declining to 8 plants during the 2014/15 season (Table 7-4). The average processing by the top 3 plants in the Bristol Bay red king crab fishery increased from an average of 1.52 million pounds over the four pre-program years, generally comprising between 13.7 to 15% of the total Bristol Bay red king crab landings, to 3.12 million pounds, approximately 20% of aggregate landings in the fishery. Until the 2012/13 season, this level of concentration was fairly consistent, varying by less than a percentage point over several years, but increased substantially during the most recent three years, exceeding 26% of aggregate landings during the 2013/14 and 25.9% during 2014/15. Processing concentration is somewhat more pronounced when the different IFQ share types are treated separately. IFQ A share processing averaged 21.5% among the three largest of 10 processors that received A-share landings, with only minimal variation between years until 2012/13, when the average increased to 25% over the last three years, and active plants fell to 7. The degree of inter-annual variation in concentration of B- and C-share IFQ processing among the largest processors ranging from 17% of B-share processing in 2011/12 to 30.5% in 2014/15. The median percentage of total pounds of A-share IFQ processed doubled of the period, from 8.2% during the initial season, to 17.6 during the most recent. Also, among the declining numbers of plants receiving B and C share IFQ, a comparison of the mean and median percentages over the 10 year period indicates that ratio has increased from approximately 2:1 to more than 3:1, indicating that the distribution has become increasingly skewed toward a handful of processors dominating Class B and C share Bristol Bay red king crab IFQ processing.

Table 7-3 Processing by plants in the Bristol Bay red king crab fishery (2005/06 through 2009-2010)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2005/06	10	1,368,924	10	1,125,022	8.2	2,918,100	21.3
	2006/07	10	1,149,475	10	942,522	8.2	2,466,007	21.5
	2007/08	10	1,512,905	10	1,246,587	8.2	3,282,528	21.7
	2008/09	10	1,510,614	10	1,244,670	8.2	3,331,129	22.1
	2009/10	9	1,316,578	11.1	1,152,622	9.7	2,534,817	21.4
	2010/11	9	1,225,658	11.1	1,079,373	9.8	2,359,685	21.4
	2011/12	11	531,383	9.1	411,861	7	1,248,736	21.4
	2012/13	9	651,102	11.1	413,216	7.1	1,441,435	24.6
	2013/14	7	913,008	14.3	1,116,961	17.5	1,622,772	25.4
	2014/15	7	1,057,282	14.3	1,299,602	17.6	1,877,547	25.4
Class B	2005/06	10	164,939	10	90,961	5.5	395,155	24
	2006/07	12	142,188	8.3	129,424	7.6	282,617	16.6
	2007/08	11	165,604	8.3	50,773	2.6	492,390	24.8
	2008/09	12	164,128	8.3	89,023	4.5	474,159	24.1
	2009/10	11	146,031	9.1	74,989	4.7	363,578	22.6
	2010/11	12	124,283	8.3	48,784	3.3	286,695	19.2
	2011/12	12	66,887	8.3	52,014	6.5	136,577	17
	2012/13	9	89,243	11.1	34,940	4.4	200,543	25
	2013/14	9	97,764	11.1	20,485	2.3	264,495	30.1
	2014/15	7	152,327	14.3	42,526	4	325,362	30.5
C share	2005/06	11	40,336	9.1	25,794	5.8	103,500	23.3
	2006/07	12	32,524	8.3	23,703	6.1	70,334	18
	2007/08	11	47,553	9.1	28,880	5.5	126,516	24.2
	2008/09	10	52,425	10	23,623	4.5	139,697	26.6
	2009/10	9	46,013	11.1	32,070	7.7	92,303	22.3
	2010/11	9	41,598	11.1	46,823	12.5	79,810	21.3
	2011/12	9	21,610	11.1	20,573	10.6	38,381	19.7
	2012/13	7	27,774	14.3	24,572	12.6	53,490	27.5
	2013/14	7	30,249	14.3	10,031	4.7	64,137	30.3
	2014/15	7	35,954	14.3	20,873	8.3	68,915	27.4
All types	2005/06	11	1,434,757	9.1	1,103,043	7	3,122,613	19.8
	2006/07	12	1,132,608	8.3	774,675	5.7	2,769,757	20.4
	2007/08	11	1,469,948	8.3	1,211,779	6.9	3,419,404	19.4
	2008/09	12	1,466,660	8.3	1,346,831	7.7	3,515,381	20
	2009/10	11	1,260,878	9.1	1,472,101	10.6	2,678,455	19.3
	2010/11	12	1,074,725	8.3	877,163	6.8	2,548,194	19.8
	2011/12	12	570,196	8.3	382,724	5.6	1,348,202	19.7
	2012/13	10	685,752	10	495,588	7.2	1,598,045	23.3
	2013/14	9	831,408	11.1	183,894	2.5	1,945,318	26
	2014/15	8	1,089,867	12.5	821,601	9.4	2,262,000	25.9

Source: RAM IFQ database.
 * withheld for confidentiality.

Processing in the Bering Sea snow crab fishery has followed a somewhat similar pattern (Table 7-4), but has not exhibited a trend toward increasing concentration to the same degree. The initial consolidation reduced the number of operating plants from an average of 17 during the pre-rationalization period, to an average of 12 over the first four years of the program, and declining further during the most recent two seasons to 8 active plants. Processing of A share Bering Sea snow crab IFQ among the largest three processors has varied between 20.3 and 23.5 percent, with no string time trend discernible. Relative concentration has been higher in the processing of B and C share IFQ, but also with no apparent time trend.

Table 7-4 Processing by plants in the BSS fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2005/06	11	2,375,636	9.1	2,349,645	9	3,885,743	14.9
	2006/07	9	2,849,461	11.1	2,291,627	8.9	6,019,173	23.5
	2007/08	9	4,952,527	11.1	4,131,527	9.3	9,977,590	22.4
	2008/09	9	4,587,834	11.1	3,833,603	9.3	8,930,329	21.6
	2009/10	8	4,241,549	12.5	3,115,377	9.2	6,969,514	20.5
	2010/11	9	4,269,277	11.1	3,562,918	9.3	7,801,737	20.3
	2011/12	9	6,993,705	11.1	5,564,649	8.8	13,136,532	20.9
	2012/13	8	5,868,222	12.5	4,663,052	9.9	10,440,240	22.2
	2013/14	8	4,776,618	12.5	3,716,120	9.7	8,596,671	22.5
	2014/15	8	6,001,067	12.5	4,673,522	9.7	10,827,245	22.6
Class B	2005/06	12	273,732	8.3	228,681	7	553,783	16.9
	2006/07	11	365,251	9.1	268,694	6.7	871,462	21.7
	2007/08	13	568,341	7.7	186,920	2.5	1,538,580	20.8
	2008/09	11	631,770	9.1	466,864	6.7	1,548,324	22.3
	2009/10	9	672,719	11.1	685,398	11.3	1,321,014	21.8
	2010/11	10	658,616	10	598,442	9.1	1,401,617	21.3
	2011/12	10	1,098,237	10	1,110,564	10.1	2,087,224	19
	2012/13	10	813,783	10	793,365	9.7	1,617,380	19.9
	2013/14	8	828,520	12.5	690,439	10.4	1,578,004	23.8
	2014/15	8	1,095,524	12.5	980,106	11.2	2,045,002	23.3
C share	2005/06	12	76,165	8.3	66,001	7.2	167,648	18.3
	2006/07	11	86,490	9.1	49,278	5.2	222,982	23.4
	2007/08	11	151,226	9.1	54,986	3.3	417,467	25.1
	2008/09	10	154,065	10	45,925	3	387,638	25.2
	2009/10	9	140,765	11.1	100,849	8	295,058	23.3
	2010/11	11	130,242	9.1	111,307	7.8	230,763	16.1
	2011/12	8	293,815	12.5	265,666	11.3	531,098	22.6
	2012/13	7	248,877	14.3	177,113	10.2	418,070	24
	2013/14	6	239,020	16.7	158,876	11.1	343,220	23.9
	2014/15	7	257,886	14.3	156,563	8.7	460,076	25.5
All types	2005/06	12	2,527,564	8.3	2,729,467	9	4,341,008	14.3
	2006/07	12	2,551,192	8.3	1,740,559	5.7	6,181,594	20.2
	2007/08	13	4,124,974	7.7	2,721,288	5.1	10,335,891	19.3
	2008/09	12	4,148,385	8.3	3,302,777	6.6	9,244,535	18.6
	2009/10	9	4,583,750	11.1	3,633,432	8.8	8,168,056	19.8
	2010/11	12	3,870,194	8.3	3,653,921	7.9	9,227,305	19.9
	2011/12	11	6,934,203	9.1	5,496,052	7.2	15,591,452	20.4
	2012/13	10	5,682,574	10	5,326,223	9.4	11,868,859	20.9
	2013/14	8	5,784,402	12.5	4,788,978	10.3	10,199,634	22
	2014/15	8	7,322,242	12.5	5,859,943	10	13,027,920	22.2

Source: RAM IFQ database.

Ten or fewer plants participated in processing in the Bering Sea Tanner crab fisheries in each year of the program (Table 7-5 and Table 7-6). Until recently, these fisheries have been directly prosecuted by

relatively few vessels and landed at fewer plants, with the result of slightly greater concentrated than in the two largest fisheries, with the top three plants processing as much as 30% of A-share IFQ in the Western Bering sea Tanner crab fishery, and 28% in the Eastern Bering sea Tanner crab fishery. The number of active plants processing Tanner crab from these fisheries, particularly Western Bering sea Tanner crab, shows some indication of increasing, as the most recent year saw the entry of an additional plant receiving landings for the 2014/15 fishery.

Table 7-5 Processing by plants in the EBT fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2006/07	6	180,087	16.7	151,542	14	288,727	26.7
	2007/08	7	167,460	14.3	127,830	10.9	269,571	23
	2008/09	6	215,166	16.7	177,606	13.8	294,169	22.8
	2009/10	6	161,759	16.7	159,133	16.4	198,049	20.4
	2013/14	7	152,230	14.3	156,687	14.7	293,124	27.5
	2014/15	6	1,028,285	16.7	954,664	15.5	1,715,647	27.8
Class B	2006/07	7	16,705	14.3	14,776	12.6	24,243	20.7
	2007/08	3	60,323	33.3	67,879	37.5	60,323	33.3
	2008/09	6	31,160	16.7	15,694	8.4	56,606	30.3
	2009/10	6	28,288	16.7	28,916	17	44,070	26
	2013/14	4	44,606	25	44,940	25.2	59,330	33.3
	2014/15	5	207,859	20	81,273	7.8	315,158	30.3
C share	2006/07	8	3,292	12.5	2,845	10.8	6,375	24.2
	2007/08	4	8,186	25	7,825	23.9	10,615	32.4
	2008/09	6	6,771	16.7	3,442	8.5	11,774	29
	2009/10	5	5,800	20	4,729	16.3	8,527	29.4
	2013/14	3	11,375	33.3	12,153	35.6	11,375	33.3
	2014/15	3	68,933	33.3	69,757	33.7	68,933	33.3
All types	2006/07	8	152,974	12.5	96,393	7.9	317,842	26
	2007/08	8	173,241	12.5	133,767	9.7	296,924	21.4
	2008/09	9	168,731	11.1	157,059	10.3	307,034	20.2
	2009/10	7	167,040	14.3	164,802	14.1	225,023	19.2
	2013/14	7	182,595	14.3	168,379	13.2	360,077	28.2
	2014/15	6	1,235,967	16.7	1,005,731	13.6	2,083,624	28.1

Source: RAM IFQ database.

Table 7-6 Processing by plants in the WBT fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2006/07	6	180,087	16.7	151,542	14	288,727	26.7
	2007/08	7	167,460	14.3	127,830	10.9	269,571	23
	2008/09	6	215,166	16.7	177,606	13.8	294,169	22.8
	2009/10	6	161,759	16.7	159,133	16.4	198,049	20.4
	2013/14	7	152,230	14.3	156,687	14.7	293,124	27.5
	2014/15	6	1,028,285	16.7	954,664	15.5	1,715,647	27.8
Class B	2006/07	7	16,705	14.3	14,776	12.6	24,243	20.7
	2007/08	3	*	*	67,879	37.5	60,323	33.3
	2008/09	6	31,160	16.7	15,694	8.4	56,606	30.3
	2009/10	6	28,288	16.7	28,916	17	44,070	26
	2013/14	4	*	*	44,940	25.2	59,330	33.3
	2014/15	5	*	*	81,273	7.8	315,158	30.3
C share	2006/07	8	3,292	12.5	2,845	10.8	6,375	24.2
	2007/08	4	*	*	7,825	23.9	10,615	32.4
	2008/09	6	6,771	16.7	3,442	8.5	11,774	29
	2009/10	5	*	*	4,729	16.3	8,527	29.4
	2013/14	3	*	*	12,153	35.6	11,375	33.3
	2014/15	3	*	*	69,757	33.7	68,933	33.3
All types	2006/07	8	152,974	12.5	96,393	7.9	317,842	26
	2007/08	8	173,241	12.5	133,767	9.7	296,924	21.4
	2008/09	9	168,731	11.1	157,059	10.3	307,034	20.2
	2009/10	7	167,040	14.3	164,802	14.1	225,023	19.2
	2013/14	7	182,595	14.3	168,379	13.2	360,077	28.2
	2014/15	6	1,235,967	16.7	1,005,731	13.6	2,083,624	28.1

Source: RAM IFQ database

* Withheld for confidentiality

As has long been the case, the Eastern Aleutian Islands golden king crab and Western Aleutian Islands golden king crab fisheries are comprised of a small number of vessels and only slightly fewer processors, with between three and six plants operating in the Eastern Aleutian Islands golden king crab fishery, and between two and six in the Western Aleutian Islands golden king crab fishery (Table 7-7 and Table 7-8). While both fisheries have exhibited some degree of inter-annual variation in participation rates, there does not seem to be a trend toward greater concentration or permanent exit of shore-based processing capacity. The Saint Matthew Island blue king crab fishery is similar in terms of the small number of participating processors, with the three largest plants averaging nearly one-third of the total landings each during years when the fishery has been open (Table 7-9). During the most recent open season, only one processor received Saint Matthew Island blue king crab landings.

Table 7-7 Number of plants active in the EAG fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2005/06	4 *	*	*	447,218	21.2	641,455	30.3
	2006/07	5 *	*	*	383,690	17.3	669,140	30.1
	2007/08	4 *	*	*	466,748	21	709,853	31.9
	2008/09	5 *	*	*	394,803	16.9	651,337	27.9
	2009/10	3	776,650	33.3	700,623	30.1	776,650	33.3
	2010/11	4 *	*	*	440,596	19.1	741,475	32.1
	2011/12	6	389,161	16.7	191,099	8.2	678,972	29.1
	2012/13	5 *	*	*	357,588	14.5	742,228	30.2
	2013/14	4 *	*	*	408,628	16.7	748,697	30.7
	2014/15	3	816,217	33.3	816,088	33.3	816,217	33.3
Class B	2005/06	2	*	*	*	*	*	*
	2006/07	2	*	*	*	*	*	*
	2007/08	3	*	*	*	*	*	*
	2008/09	4	*	*	*	*	*	*
	2009/10	3	129,796	33.3	56,168	14.4	129,796	33.3
	2010/11	3	130,489	33.3	178,531	45.6	130,489	33.3
	2011/12	4	*	*	80,715	20.5	129,925	33.1
	2012/13	3	118,817	33.3	35,775	10	118,817	33.3
	2013/14	3	137,787	33.3	119,615	28.9	137,787	33.3
	2014/15	2	*	*	*	*	*	*
C share	2005/06	3	*	*	*	*	*	*
	2006/07	3	*	*	*	*	*	*
	2007/08	2	*	*	*	*	*	*
	2008/09	2	*	*	*	*	*	*
	2009/10	3	28,070	33.3	25,434	30.2	28,070	33.3
	2010/11	2	*	*	*	*	*	*
	2011/12	2	*	*	*	*	*	*
	2012/13	4	*	*	23,218	26.1	23,549	26.5
	2013/14	3	29,669	33.3	23,277	26.2	29,669	33.3
	2014/15	2	*	*	*	*	*	*
All types	2005/06	4	*	*	507,736	20.1	777,345	30.8
	2006/07	5	*	*	396,928	15	809,579	30.6
	2007/08	4	*	*	570,747	22.4	816,778	32.1
	2008/09	5	*	*	634,966	22.6	802,211	28.6
	2009/10	3	934,516	33.3	1,074,186	38.3	934,516	33.3
	2010/11	4	*	*	662,487	24	893,702	32.3
	2011/12	6	468,768	16.7	287,185	10.2	731,763	26
	2012/13	5	*	*	416,955	14.3	768,112	26.4
	2013/14	5	*	*	490,483	16.7	835,419	28.4
	2014/15	3	983,074	33.3	1,127,507	38.2	983,074	33.3

Source: RAM IFQ database

* Withheld for confidentiality.

Table 7-8 Number of plants active in the Western Aleutian Islands golden king crab fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2005/06	5	*	*	249,635	23	306,652	28.3
	2006/07	3	233,881	33.3	173,868	24.8	233,881	33.3
	2007/08	3	313,645	33.3	432,844	46	313,645	33.3
	2008/09	4	*	*	270,051	30.4	295,721	33.3
	2009/10	2	*	*	*	*	*	*
	2010/11	3	384,750	33.3	182,250	15.8	384,750	33.3
	2011/12	4	*	*	290,178	25.2	324,473	28.2
	2012/13	4	*	*	305,800	25.1	342,951	28.2
	2013/14	4	*	*	327,056	26.9	382,931	31.5
	2014/15	4	*	*	283,951	24.2	387,288	33
Class B	2005/06	3	42,275	33	52,176	41	42,275	33
	2006/07	2	*	*	*	*	*	*
	2007/08	2	*	*	*	*	*	*
	2008/09	2	*	*	*	*	*	*
	2009/10	2	*	*	*	*	*	*
	2010/11	3	*	*	*	*	*	*
	2011/12	2	*	*	*	*	*	*
	2012/13	4	*	*	*	*	*	*
	2013/14	3	430,147	33.3	94,462	7.3	430,147	33.3
	2014/15	3	357,458	33.3	426,918	39.8	357,458	33.3
C share	2005/06	3	13,820	33.3	10,600	25.6	13,820	33.3
	2006/07	2	*	*	*	*	*	*
	2007/08	1	*	*	*	*	*	*
	2008/09	2	*	*	*	*	*	*
	2009/10	2	*	*	*	*	*	*
	2010/11	2	*	*	*	*	*	*
	2011/12	2	*	*	*	*	*	*
	2012/13	2	*	*	*	*	*	*
	2013/14	3	26,821	33.3	21,739	27	26,821	33.3
	2014/15	3	26,520	33.3	33,348	41.9	26,520	33.3
All types	2005/06	5	*	*	249,635	19.9	341,821	27.3
	2006/07	3	291,272	33.3	224,772	25.7	291,272	33.3
	2007/08	3	368,475	33.3	435,120	39.4	368,475	33.3
	2008/09	4	*	*	272,273	25.9	297,608	28.3
	2009/10	2	*	*	*	*	*	*
	2010/11	3	442,858	33.3	240,813	18.1	442,858	33.3
	2011/12	5	*	*	230,730	17.4	366,826	27.6
	2012/13	6	340,706	16.7	349,666	17.1	503,805	24.6
	2013/14	4	*	*	553,845	21.4	799,541	30.9
	2014/15	4	*	*	602,223	25.9	752,892	32.4

Source: RAM IFQ database
 * Withheld for confidentiality

Table 7-9 Number of plants active in the SMB fishery (2005/06 through 2014/15)

IFQ type	Season	Plants processing	Mean		Median		Average processing of top 3 plants	
			pounds processed	as a percent of type	pounds processed	as a percent of type	in pounds	as a percent of type
Class A	2009/10	2	*	*	*	*	*	*
	2010/11	5	*	*	18,074	1.8	321,025	32.3
	2011/12	5	*	*	44,232	3	466,432	31.8
	2012/13	5	*	*	80,450	6.5	383,805	31.2
	2014/15	1	*	*	*	*	*	*
Class B	2009/10	1	*	*	*	*	*	*
	2010/11	4	*	*	12,113	15.4	23,172	29.5
	2011/12	5	*	*	12,822	7	52,105	30
	2012/13	5	*	*	10,301	6	52,122	31
	2014/15	1	*	*	*	*	*	*
C share	2009/10	1	*	*	*	*	*	*
	2010/11	5	*	*	5,326	20.7	7,741	30.1
	2011/12	2	*	*	*	*	*	*
	2012/13	4	*	*	9,786	28	11,295	32
	2014/15	1	*	*	*	*	*	*
All types	2009/10	2	*	*	*	*	*	*
	2010/11	5	*	*	31,736	2.9	349,050	31.8
	2011/12	6	278,367	16.7	58,075	3.5	525,262	31.4
	2012/13	6	238,719	16.7	87,489	6.1	447,222	31.2
	2014/15	1	*	*	*	*	*	*

Source: RAM IFQ database.

* Withheld for confidentiality.

7.1 Processing by IFQ Share Type and Community

In the first two years of the program, a large portion of the IPQ pool was subject to the “cooling off” provision, which required processing to occur in the community of the processing history that led to the allocation of the underlying PQS. Consequently, few changes in the distribution of processing of Class A IFQ/IPQ landings occurred in the first two years of the program. The following section examines changes in the distribution of landings by community and IFQ share type subsequent to the initial cooling off period. In addition to that temporary measure, the CR Program incorporated additional community protections, most notably a requirement that holders of most processor shares were required to enter agreements granting community designated entities a right of first refusal on certain transfers of those shares. Based on the qualifying criteria, eight communities were eligible to have representative entities receive ROFR in the different fisheries governed by the CR Program (see Table 7-10). The distribution of rights differs across fisheries, with Akutan, Unalaska, King Cove, St. Paul, and St. George all starting the CR Program with rights on approximately 10% or more of the PQS in at least one fishery. Tracking the existence of rights is complicated, as reporting requirements established under the original rule provided insufficient information for NMFS to actively monitor rights. Only if the lapse of rights was voluntarily reported to NMFS were those lapses recorded in NMFS data. It is possible unreported lapses of rights have occurred in addition to those shown. Since implementation, community representatives and fishery participants have suggested that some aspects of the rights of first refusal as initially implemented may have inhibited their effectiveness in protecting community interests. In response, the Council developed and NMFS recently published a CR Program amendment package (effective February 12, 2016) intended to improve the transparency and effectiveness of the right of first refusal program.⁵³ As this is a recent action and any effects are unlikely to be apparent at this point, this program review does not attempt to assess the impacts of the amendment, or examine in detail the effects of shortcomings in the original ROFR provisions that the amendments are intended to address.

Despite the end of the cooling off period and the ease with which the right of first refusal may have been avoided, a large share of the processing of IPQ landings are believed to have continued to be made in the community of origin. Three factors likely contribute to this distribution of processing. First, in many cases, shore-based processing capital was used to develop the history leading the PQS allocation. That capital continues to be used for processing in most of the fisheries by the initial recipient of the PQS allocation. The regionalization of PQS strictly limits the movement of processing across regional boundaries. In addition, to date, most processors have acknowledged a community interest in processing of landings using their IPQ, and report that they have continued to process those landings in the community of origin. Whether this acknowledgement of community interests will persist is not known. In the case of IPQ designated for processing in the North region, processing has effectively been required to occur in St. Paul, the only available location for processing in the North region to date. Further discussion of community effects are contained in the Social Impact Assessment, attached as Appendix A and the analysis performed in support of Amendment 44 provides a thorough analysis of the ROFR provisions as implemented to date.

⁵³ Amendment 44 to the BSAI king and Tanner crab FMP, Final rule published: 81 FR 1557.

Table 7-10 Initial and current distribution of rights of first refusal by community

Fishery	Region	Right of First Refusal Beneficiary	Percentage of PQS pool				
			On Initial Allocation	In the 2011-2012 season	Difference	In the 2014-2016 season	Difference
BBR	North	None	0	0	0	0.0	0.0
		St. Paul	2.5	2.5	0	2.5	0.0
	South	Akutan	19.7	19.7	0	19.7	0.0
		False Pass	3.7	3.7	0	3.7	0.0
		King Cove	12.7	7.4	-5.3	7.4	-5.3
		Kodiak	3.8	0.2	-3.5	0.2	-3.5
		None	3.4	12.2	8.8	12.2	8.8
		Port Moller	3.5	3.5	0	3.5	0.0
Unalaska	50.7	50.7	0	50.7	0.0		
BSS	North	None	1	16	15	16.0	15.0
		St. George	9.7	0	-9.7	0.0	-9.7
		St. Paul	36.3	30.9	-5.4	30.9	-5.4
	South	Akutan	9.7	9.7	0	9.7	0.0
		King Cove	6.3	6.3	0	6.3	0.0
		Kodiak	0.1	0	-0.1	0.0	-0.1
		None	1.8	2	0.1	2.0	0.1
		Unalaska	35	35	0	35.0	0.0
EAG	South	Akutan	1	1	0	1.0	0.0
		None	0.9	7.8	6.9	7.8	6.9
		Unalaska	98.1	91.2	-6.9	91.2	-6.9
PIK	North	None	0.3	2.7	2.5	2.7	2.5
		St. George	2.5	0	-2.5	0	-2.5
		St. Paul	64.8	64.8	0	64.8	0
	South	Akutan	1.2	1.2	0	1.2	0.0
		King Cove	3.8	3.8	0	3.8	0.0
		Kodiak	2.9	2.9	0	2.9	0.0
		Unalaska	24.6	24.6	0	24.6	0.0
SMB	North	None	64.6	64.6	0	64.6	0.0
		St. Paul	13.8	13.8	0	13.8	0.0
	South	Akutan	2.7	2.7	0	2.7	0.0
		King Cove	1.3	1.3	0	1.3	0.0
		Kodiak	0	0	0	0.0	-1.2
		None	0	0	0	3.1%	3.1
Unalaska	17.6	17.6	0	15.9%	-1.7		

Source: RAM PQS data 2015/16

Little information concerning the extent of processing in specific communities can be released because of the limited number of processors that participate in the crab fisheries. By aggregating across communities, some information can be gleaned concerning the distribution of processing across communities. In the first year of the program, approximately equal percentages of Class A IFQ, Class B IFQ, and C share IFQ deliveries were processed in Dutch Harbor and Akutan, collectively, and King Cove and Kodiak, collectively; however, in the Bering Sea snow crab fishery, Dutch Harbor and Akutan, collectively, received a substantially greater percentage of Class B IFQ and C share IFQ deliveries than Class A IFQ deliveries. Since deliveries of Bering Sea Tanner crab were not subject to the ‘cooling off’ period landing

requirements, the distribution of Class A IFQ/IPQ landings in the first year were not largely predictable. Approximately one-third of the Class A IFQ/IPQ landings in the fishery were processed in Dutch Harbor. A substantially greater share of Class B IFQ and C share IFQ were processed in that community (Table 7-11).

Table 7-11 Processing by share type and community (2005/06)

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares
BBR	Akutan	1	8,548,391	62.2	1	958,658	63.5	1	296,099	64.5
	Dutch Harbor	3			3			3		
	Other AK	2	*	*	2	*	*	2	*	*
	King Cove	1			1			1		
	Kodiak	2	3,242,970	23.6	2	370,538	24.6	2	102,567	22.3
	Sitka							1	*	*
	St. Paul	1	*	*	1	*	*	1	*	*
BSS	Akutan	1	12,186,788	45.9	1	1,964,551	67.2	1	688,401	76.0
	Dutch Harbor	4			4			4		
	Other AK	4	*	*	3	*	*	3	*	*
	King Cove	1	*	*	1			1		
	Kodiak	1	*	*	2	355,650	12.2	2	116,054	12.8
	St. Paul	1	*	*	1	*	*	1	*	*
EAG	Dutch Harbor	3	*	*	2	*	*	3	*	*
	Other AK	1	*	*						
WAG	Adak	1	*	*	1	*	*	1	*	*
	Dutch Harbor	2	*	*	2	*	*	2	*	*
	Other AK	2	*	*						
WBT	Akutan	1	*	*	1	*	*	1	*	*
	Dutch Harbor	4	329,999	27.8	3	32,967	60.3	3	5,016	45.0
	Other AK	2	*	*	1	*	*	1	*	*
	King Cove	1	*	*						
	Kodiak	1	*	*	1	*	*			
	St. Paul	1	*	*	1	*	*	1	*	*

Source: RAM IFQ database

* Withheld for confidentiality.

In the third year of the program, with the lapse of the ‘cooling off’ provision requirements, some redistribution of processing of Class A IFQ landings is apparent. Dutch Harbor and Akutan, collectively, attracted slightly more Class A IFQ landings and a substantially larger majority of the Class B and C share IFQ landings than in the two preceding years (Table 7-12). These landings returned King Cove and Kodiak, collectively, to a percentage of C share IFQ processing observed in the first year of the program, but reduced their processing of Class B IFQ crab to a level lower than the first year level. Akutan and Dutch Harbor also drew a substantial percentage of Class B and C share IFQ in the Bering Sea snow crab fishery in the third year of the program; however, processing of A share IFQ in those communities dropped substantially (by approximately 25 percent) from the previous two years. In the Eastern Bering Sea Tanner crab fishery, Dutch Harbor attracted slightly less than one-half of the Class A IFQ/IPQ processing and processed all Class B IFQ and C share IFQ landings.

Table 7-12 Processing by IFQ type and community (2007/08) - Post "cooling off"

2007/08 POST-COOLING OFF PERIOD

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares
BBR	Akutan	1			1			1		
	Dutch Harbor	4	10,141,102	66.4	4	1,395,927	82.4	4	359,073	68.4
	Other AK	1	*	*	1	*	*	1	*	*
	King Cove	1			1			1		
	Kodiak	2	2,931,636	19.2	3	204,118	12.0	3	118,397	22.5
	St. Paul	1	*	*	1	*	*	1	*	*
BSS	Akutan	1			1			1		
	Dutch Harbor	3	15,364,728	34.1	4	4,466,230	89.3	4	1,400,046	87.4
	Other AK	2	*	*	2	*	*	2	*	*
	King Cove	1	*	*	1					
	Kodiak	1	*	*	3	378,219	7.6	2	*	*
	St. Paul	1	*	*	1	*	*	1	*	*
EAG	Dutch Harbor	4	2,241,690	99.9	3	244,843	100.0	2	*	100.0
WAG	Adak	1	*	*	1	*	*			
	Dutch Harbor	2	*	*	1	*	*	1	*	*
WBT	Dutch Harbor	2	*	*	2	*	*	2	*	*
	Other AK	2	*	*	1	*	*			
	King Cove	1	*	*						
	St. Paul	1	*	*				1	*	*
EBT	Akutan	1	*	*						
	Dutch Harbor	3	695,543	27.5	3	146,584	100.0	4	32,984	100.0
	Other AK	2	*	*						
	King Cove	1	*	*						

Source: RAM IFQ database.

* Withheld for confidentiality.

Table 7-13 Processing by share type and community (2010/11)

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed
BBR	Akutan	1			1			1		
	Dutch/Unalaska	3	7,298,118	66.2%	3	1,044,895	57.7%	3	293,441	76.9%
	King Cove	1			1			1		
	Kodiak	2	2,371,635	21.5%	5	161,358	8.9%	2	28,236	7.4%
	Other AK	1	*	*	3			3		
	St Paul	1	*	*	1	606,004	33.4%	1	59,674	15.6%
BSS	Akutan	1			1			1		
	Dutch/Unalaska	3	14,475,355	37.7%	3	3,281,970	38.3%	4	903,219	61.9%
	King Cove	1			1			1		
	Kodiak	2	3,615,453	9.4%	5	68,074	0.8%	2	151,068	10.4%
	Other AK	2			3			4		
	St Paul	1	20,332,689	52.9%	1	5,223,575	60.9%	1	404,751	27.7%
EAG	Dutch/Unalaska	3			3	391,466	100.0%	3	65,215	100.0%
	Other AK	1	2,307,178	100.0%	0	-	0.0%	0	-	0.0%
SMB	Akutan	1	*	*	1			1	*	*
	Dutch/Unalaska	3	83158	8.4%	2	78,505	100.0%	3	7785	30.3%
	St Paul	1	*	*	1			1	*	*
WAG	Dutch/Unalaska	3	1,154,250	100.0%	3	1,273,839	100.0%	2	76,444	100.0%
	Other AK	0	-	0.0%	1			1		

Source: RAM IFQ database.

* Withheld for confidentiality.

Table 7-14 Processing by share type and community (2011/12)

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares
BBR	Akutan	1			1			1		
	Dutch/Unalaska	4	3,859,847	66.0%	4	584,656	60.8%	4	149,170	75.3%
	King Cove	1			1			1	*	*
	Kodiak	3	1,264,508	21.6%	4	57,643	6.0%	1	*	*
Other AK	St Paul	1	*	*	3			3		
		1	*	*	1	319,272	33.2%	1	35,368	17.8%
BSS	Akutan	1			1			1		
	Dutch/Unalaska	3	24,412,199	38.8%	4	6,853,945	48.9%	4	1,690,211	70.6%
	King Cove	1	*	*	1	*	*	0	-	0.0%
	Kodiak	1	*	*	1	*	*	0	-	0.0%
Other AK	St Paul	2			4			4		
		1	33,047,144	52.5%	1	6,982,974	49.8%	1	703,773	29.4%
EAG	Akutan	1	*	*	0	-		0	-	0.0%
	Dutch/Unalaska	4	2,065,712	88.5%	4	393,052	100.0%	2	*	*
	Other AK	1	*	*	0	-		0	-	0.0%
SMB	Akutan	1	*	*	1	*	*	0	-	0.0%
	Dutch/Unalaska	3	125,242	8.5%	3	32,163	18.3%	1	*	*
	St Paul	1	*	*	1	*	*	1	*	*
WAG	Adak	1			0	-	0.0%	0	-	0.0%
	Akutan	1	1,151,277	100.0%	1			1		
	Dutch/Unalaska	2			1	1,275,869	100.0%	1	76,523	100.0%
	Other AK	0	-		1			1		

Source: RAM IFQ database.

* Withheld for confidentiality.

Table 7-15 Processing by share type and community (2012/13)

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed
BBR	Akutan	1			1			1		
	Dutch/Unalaska	4	4,452,298	76.0%	4	717,590	74.6%	3	4,452,298	76.0%
	King Cove	1	*	*	1			0	-	0.0%
	Kodiak	2	*	*	2	50,653	5.3%	3	29,005	14.6%
	Other AK	0	-	0.0%	2			2	*	*
St Paul		1	*	*	1	194,253	20.2%	0	-	0.0%
BSS	Akutan	1			1			1		
	Dutch/Unalaska	3	18,043,095	38.4%	4	4,675,098	44.7%	3	852,468	48.0%
	King Cove	1			1			1	*	*
	Kodiak	1	4,431,675	9.4%	2	235,710	2.3%	0	-	0.0%
	Naknek	1			0	-	0.0%	0	-	0.0%
Other AK	St Paul	1	*	*	3			3	191,963	10.8%
		1	*	*	1	5,558,977	53.1%	1	*	*
EAG	Akutan	1			0	-	0.0%	1		
	Dutch/Unalaska	4	2,461,545	100.0%	3	356,452	100.0%	4	88,933	100.0%
SMB	Akutan	1	*	*	1	*	*	1		
	Dutch/Unalaska	3	188,424	15.3%	3	20,836	12.5%	2	35,061	100.0%
	St Paul	1	*	*	1	*	*	1		
WAG	Adak	1			2			0	-	0.0%
	Akutan	1	1,218,166	100.0%	1			1	*	*
	Dutch/Unalaska	2			1	1,307,707	100.0%	1	*	*
	Other AK	0	-	0.0%	1			0	-	0.0%

Source: RAM IFQ database.

* Withheld for confidentiality.

Table 7-16 Processing by share type and community (2013/14)

Fishery	Community	Class A IFQ			Class B IFQ			Class C IFQ		
		Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed	Number of active plants	Pounds of share type processed	issued shares processed
BBR	Akutan Dutch/Unalaska	1 2	4,850,059	75.9%	1 3	821,907	78.0%	1 3	195,761	90.7%
	King Cove	1	*	*	1			1		
	Kodiak	2	*	*	3	37,484	3.6%	2	15,983	7.4%
	Other AK	0	-	0.0%	2			2	*	*
	St Paul	1	*	*	1	194,944	18.5%	0	-	0.0%
BSS	Akutan Dutch/Unalaska	1 3	14,818,317	38.8%	1 3	3,224,032	37.7%	1 3	810,850	55.5%
	King Cove	1	*	*	1	*	*	0	-	0.0%
	Kodiak	1	*	*	1	*	*	0	-	0.0%
	Other AK	1	*	*	3	*	*	3	158,944	10.9%
	St Paul	1	*	*	1	*	*	1	*	*
EAG	Akutan Dutch/Unalaska	1 3	2,440,686	100.0%	1 2	413,362	100.0%	1 2	89,007	100.0%
EBT	Akutan Dutch/Unalaska	1 3	882,668	82.8%	1 2	177,991	88.5%	1 2	34,124	97.1%
	King Cove	1	*	*	1	*	*	0	-	0.0%
	Kodiak	1	*	*	0	-	0.0%	0	-	0.0%
	Other AK	0	-	0.0%	1	*	*	1	*	*
	St Paul	1	*	*	0		0.0%	0		0.0%
WAG	Akutan Dutch/Unalaska	1 3	1,215,213	100.0%	1 2	1,290,441	100.0%	1 2	80,464	100.0%
WBT	Akutan Dutch/Unalaska	1 3	740,923	76.0%	1 2	144,609	100.0%	1 3	25,130	81.0%
	King Cove	1	*	*	0	-	0.0%	1	*	*
	Other AK	1	*	*	2	*	*	2	*	*

Source: RAM IFQ database.

* Withheld for confidentiality.

Table 7-17 Processing by share type and community (2014/15)

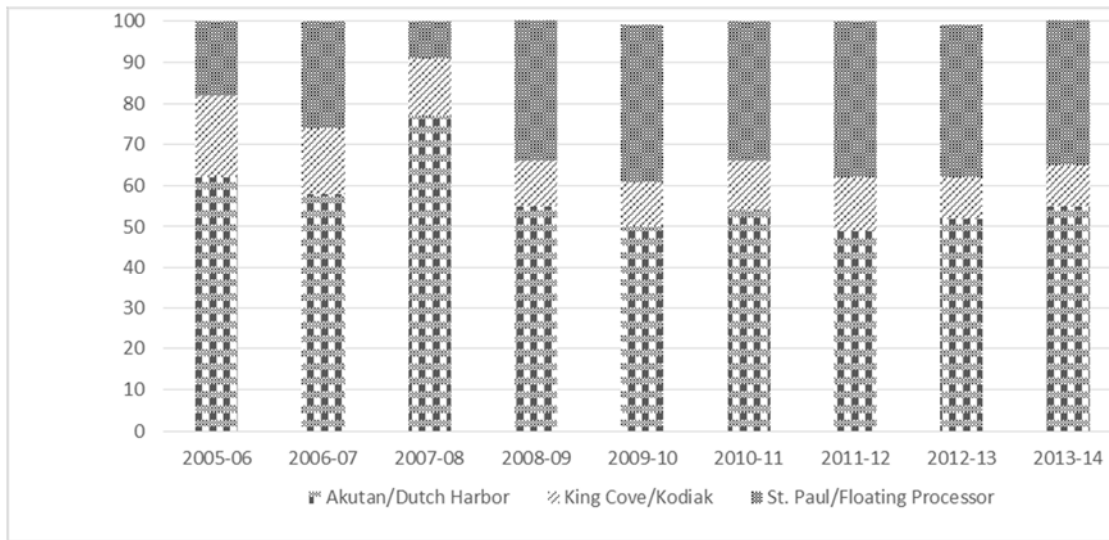
Fishery	Community	Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares	Number of active plants	Pounds of share type processed	Percent of issued shares
BBR	Akutan Dutch/Unalaska	1 2	5,603,170	75.7%	1 2	976,087	79.9%	1 2	206,744	80.6%
	King Cove	1	*	*	1	*	*	1	*	*
	Kodiak	2	*	*	1	*	*	1	*	*
	Other AK	0	-	0.0%	2			2		
	St Paul	1	*	*	1	197,940	16.2%	1	25,578	10.0%
BSS	Akutan Dutch/Unalaska	1 3	18,780,003	39.1%	1 3	4,984,269	46.4%	1 3	898,254	48.9%
	King Cove	1	*	*	1	*	*	1	*	*
	Kodiak	1	*	*	1	*	*	0	-	0.0%
	Other AK	1			3			3		
	St Paul	2	24,730,120	51.5%	1	5,735,701	53.3%	1	*	*
EAG	Akutan Dutch/Unalaska	1 2	2,448,652	100.0%	0 2	- *	0.0% *	0 2	- *	0.0% *
EBT	Akutan Dutch/Unalaska	1 3	5,056,494	82.0%	1 3	1,006,365	86.0%	1 1		
	King Cove	1	*	*	1	*	*	1	212,759	100.0%
	Other AK	0	-	0.0%	1	*	*	1		
	St Paul	1	*	*	0	-	0.0%	0	-	0.0%
SMB	St Paul	1	*	*	1	*	*	1	*	*
WAG	Adak	1			1			1		
	Akutan Dutch/Unalaska	1 2	1,172,098	100.0%	1 1	1,072,375	100.0%	1 1	79,559	100.0%
WBT	Akutan Dutch/Unalaska	1 3	3,061,166	82.0%	1 3	570,069	83.0%	1 2	110,929	87.9%
	King Cove	1	*	*	0	-	0.0%	0	-	0.0%
	Other AK	1	*	*	2	*	*	2		
	St Paul	1	*	*	0	-	0.0%	1	15,267	12.1%

Source: RAM IFQ database.

* Withheld for confidentiality.

A more detailed examination of the community level changes in processing by IFQ type is provided in Section 1 of the Social Impact Analysis appendix to this review. Overall, the percentage of crab processing occurring, for all fisheries and share types combined, in each community has fluctuated since implementation of the CR Program. Figure 1 provides the percentage of total crab processing that occurred in three community groups from the 2005-2006 through 2012-2013 crab fishing years¹⁴. Figure 1 shows that the percentage of total crab shares processed has decreased in the Dutch Harbor/Akutan (62% to 55%) and Kodiak/King Cove (20% to 10%) groups since the CR Program’s inception. Alternatively, the percentage of total crab shares processed has increased in the St. Paul/Floating Processor (18% to 36%) group over the same time period.

Figure 7-1 Percentage of total crab shares processed in community groups (2005-06 through 2013-14)



Source: RAM IFQ database

7.2 Summary of Leasing and Custom Processing Arrangements

Short-term transfers under leases and custom processing arrangements are the primary means by which PQS holders in the crab fisheries have achieved consolidation under the rationalization program. This section examines the use of leasing and custom processing in the fisheries under the rationalization program.

In each of the first five years of the program, as much as 20 to 30% of the IPQ pools in some fisheries were leased (Table 6-3). The extent of these leases suggests that some holders of PQS chose not to be active in processing in a given year, instead leasing their IPQ to realize benefits of consolidation. In addition to those more traditional leasing transactions, some portion of these leases is believed to be movement of shares to achieve efficiencies among active processors. For example, an IPQ holder operating a plant in the North may choose to exchange its South IPQ for another IPQ holder’s North IPQ to achieve efficiencies and

consolidate processing of its holdings. Leasing arrangements, however, are not the only means to achieving consolidation in the fisheries.

Custom processing arrangements are particularly attractive to IPQ holders who have identified markets for sales, but wish to achieve efficiencies in processing. Under these arrangements, the IPQ holder can contract for processing services, maintaining its interest in the crab and processed products. Custom processing is particularly appealing for processing in remote regions, where an IPQ holder may have an obligation to process and few fully operational shore plants exist. In these areas, a cost effective means of processing is for IPQ holders to consolidate processing in one or two plants reducing the cost of capital and labor (including the costs of moving crews and supplies to the remote location).

The prevalence of custom processing relationships is evident in comparing the number of active IPQ accounts with the number of active processing plants. In the first year of the program, custom processing of IPQ occurred most prominently in North region of the Bering Sea snow crab fishery (Table 7-18). Custom processing arrangements in that fishery expanded in the second year of the program and appear to have declined in the third year and remained constant between 2007 and 2010, before increasing to 8 IPQ holders during two of the last three seasons. Few custom processing arrangements existed in the Bristol Bay red king crab fishery until the third year of the program, when Dutch Harbor plants entered relationships with several buyers. Few custom processing arrangements exist in other fisheries; however, it is possible that extensive custom processing may have occurred under any of those arrangements. Data cannot be revealed on these processing arrangements because of the relatively few processing participants in the fisheries.

Table 7-18 Number of active IPQ holder (buyer) accounts and IPQ processing plants by fishery (2005/06 through 2014/15)

Number of active IPQ holder accounts and IPQ processing plants, by crab fishery, region, and community - 2005/06 to 2014/15 seasons

			2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15					
			Counts of active IPQ permit holders and processing plants														
Fishery	Region	Community	IPQ	plants	IPQ	plants	IPQ	plants	IPQ	plants	IPQ	plants	IPQ	plants			
BBR	North	ST PAUL	1	1	1	1	2	1	1	2	1	2	1	2	1		
		AKUTAN	1	1	1	1	2	1	1	2	1	2	1	2	1		
	South	DUTCH/UNALASKA	3	3	3	3	5	4	7	4	4	3	4	4	6	4	
		KING COVE	1	1	3	1	1	1	2	1	2	1	2	1	2	1	
		KODIAK	2	2	2	2	2	2	2	2	2	2	3	3	2	2	
Floating Processors	2	2	2	2	2	1	1	1	1	1	1	1	1	1			
BSS	North	ST PAUL	1	1	1	1	5	1	5	1	5	1	7	1	8	1	
		Floating Processors	6	3	9	2	3	1	2	1	2	1	2	1	2	1	
	South	AKUTAN	1	1	1	1	1	1	1	1	1	1	2	1	2	1	
		DUTCH/UNALASKA	5	4	7	3	4	3	3	3	4	3	5	3	5	3	
		KING COVE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
KODIAK	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Floating Processors	1	1	1	1	3	1	2	1	2	1	1	1	1	1			
EAG	South	AKUTAN			1	1	1	1			1	1	2	1	1	1	
		DUTCH/UNALASKA	4	4	4	4	3	4	4	6	3	6	3	5	4	6	4
		Floating Processors									1	1	1	1	1	1	
WAG	designat	AKUTAN									1	1	1	1	2	1	
		DUTCH/UNALASKA	2	2	2	2	5	3	4	2	4	2	4	2	2	2	
	ADA	1	1									1	1	2	2	3	2
	West	AKUTAN										2	1	2	1	2	1
DUTCH/UNALASKA		1	1					2	1	3	2	2	1	2	1	3	3
ADA	2	1	2	1	1	1	2	1			2	1	2	1			
Floating Processors	2	1															
EBT	designat	AKUTAN			1	1	1	1	2	1					3	1	
		DUTCH/UNALASKA			5	3	4	3	3	3	5	3			5	3	
		ST PAUL													1	1	
		KING COVE			1	1	1	1	2	1	2	1			2	1	
		Floating Processors			1	1	2	2	2	2	2	1			1	1	
WBT	U	AKUTAN	1	1	1	1									3	1	
		DUTCH/UNALASKA	4	4	5	3	3	2	3	3					5	3	
		ST PAUL	1	1			1	1							2	1	
		KING COVE	1	1	1	1	1	1	1	1					2	1	
		Floating Processors	4	2			3	2	2	2					1	1	
SMB	North	ST PAUL						5	1	6	1	5	1	5	1	4	1
	South	AKUTAN															
DUTCH/UNALASKA									1	1	1	1	2	1	3	1	
Floating Processors																	

Source: RAM IFQ database

7.3 Processor Operations

As with harvesters, one of the primary changes in operations under the rationalization program is the distribution of landings among processors and throughout the season. Prior to the rationalization program in the two largest fisheries, deliveries were concentrated in a very short period (see Table 7-19). In the Bristol Bay red king crab fishery, all deliveries were received in a period of one week or less, except in 2003, when a processor received its last delivery approximately 15 days after its first delivery under a special authorization. In four of five seasons leading up to the rationalization program in the Bering Sea snow crab fishery, all landings were completed in fewer than 20 days, and all landings in the Eastern Aleutian Islands golden king crab fishery were completed in less than one month in the seasons leading up to implementation of the program. In the Western Aleutian Islands golden king crab fishery, landings were spread over a substantially longer period in the seasons prior to implementation of the program. In that fishery, the average time between first and last landings for processors was approximately 3 months or more.

Table 7-19 Days between first and last delivery by processor prior to implementation of the rationalization program

Fishery	Season	Number of plants taking deliveries		Days between first and last delivery		
		One delivery	Multiple deliveries	Mean	Median	Maximum
BBR	2001	3	14	3.2	3.0	7.0
	2002	2	15	2.9	3.0	5.0
	2003	0	20	4.3	4.0	15.0
	2004	1	16	4.6	5.0	7.0
BSS	2001	0	16	8.9	7.5	16.0
	2002	1	16	17.9	20.5	38.0
	2003	1	16	10.6	9.5	17.0
	2004	2	16	8.9	8.0	16.0
	2005	1	13	9.0	10.0	14.0
EAG	2001/02	1	3	24.0	22.0	28.0
	2002/03	0	4	17.3	17.0	24.0
	2003/04	0	4	19.5	20.0	22.0
	2004/05	0	4	12.8	9.5	25.0
WAG	2001/02	2	4	91.8	83.5	179.0
	2002/03	0	2	173.0	173.0	191.0
	2003/04	1	3	85.3	92.0	154.0
	2004/05	1	2	97.5	97.5	122.0

Source: ADFG Fish tickets.

Note: Mean and medians exclude processors receiving a single delivery.

The contrast in the timing of prosecution of the fisheries is clear in results shown in Table 7-20 for the first five years of the CR Program, and in Table 7-21 for the most recent five years. As discussed in the preceding section on timing of harvest activity, the distribution of landings at processors over a longer time period under the rationalization program is apparent, when considering the number of days between first and last deliveries in each fishery on a processor basis (see Table 6-18). In the Bristol Bay red king crab fishery, most landings continue to be concentrated in a relatively short period in the fall; however, the processing season is considerably longer than prior to the rationalization program. In the North region, the average number of days between first and last deliveries in the first year was approximately one month, but has

shortened to less than two weeks in all subsequent years, with the exception of the 2010/11 season, which extended to 19 days. Given the small allocation required to be landed in the North, this concentration of landings is important to maintaining processing efficiencies in the region. Processing crews are deployed to facilities in the Pribilof Islands specifically to process North region Bristol Bay red king crab landings. Spreading these few landings over an extended period could be costly to the processor that must maintain crews and the plant while waiting to receive deliveries. In the South region, processing occurs over a longer period and with more variation from year to year, with the average processor receiving all deliveries within five weeks. This concentration of landings benefits processors, since lines are not required to be kept sanitized for deliveries for an extended period. Crews in the South also typically work in several groundfish fisheries, aiding processors in achieving efficiencies by using crews in processing activities for the different fisheries (including groundfish and crab) as demands arise.

In the North region of the Bering Sea snow crab fishery, the days between a processor's first and last deliveries has fluctuated since implementation of the program. From the outset, processors operating in the North expressed a strong preference for concentrating deliveries in a short period of time, but several factors, including general lack of familiarity with use of cooperative fishing practices may have contributed to extending processing over a period of between two and three months, in the three of the first five years of the program. In the second year of the program, a processor fire delayed the start of deliveries to the North region. By the time processing capacity came available, a substantial portion of the fleet was ready to make deliveries resulting in processing being concentrated in a relatively short period (less than one month for the average processor and less than two months for the longest operating processor). In the third and fourth years of the program, (when the TAC was substantially larger, processing was concentrated in two plants, and ice conditions delayed fishing and deliveries), the average time between the first and last landing was between two and three months. Although the larger TACs and the concentration of processing in two plants contributed to the extended processing season, icing delayed operations requiring plants to incur the costs of maintaining inactive crews for a period of time. In the fifth year, harvesters made a coordinated effort to complete landings in the North region early in the season. The result is that processing was completed in one and one-half months. Both sectors likely benefited from this coordination of landings, as harvesters avoided ice conditions that arose later in the season and processors were able to keep crews consistently active for a shorter period. In the South region in the Bering Sea snow crab fishery for the average processor, landings were distributed across a noticeably longer period, when compared to pre-rationalization years. This distribution of landings over time is less costly to South region processors, which process landings from groundfish fisheries (i.e., pollock and cod) during the early part of the year, when the Bering Sea snow crab fishery is primarily prosecuted. During the 2011/2012 Bering Sea snow crab season, an extended period of sea ice cover delayed the fishery, resulting in a the season extending over 230 days and requiring an extension of the legal season until June 15 to allow the fleet to complete the harvest of the full allocation.

In the Eastern Aleutian Islands golden king crab fishery in the first five years of the program, processors generally distributed their processing over a period of between two and three months. Since most of the processors in this fishery also participate in the groundfish fisheries, the distribution of landings across a greater period of time is of less importance, as crews need not be transported to the plants exclusively for crab processing. During the most recent four seasons, deliveries have spanned fewer than 60 days on average.

The average days between first and last delivery in the Western Aleutian Islands golden king crab fishery differs year to year since the rationalization program was implemented. To a large extent, this extended period has given rise to circumstances related to operations at the Adak plant. With the exception of the first year, that plant has been the only processing capacity in the West region. Yet, the Adak plant operator holds little of the West region PQS pool. Protracted negotiations of custom processing and leasing arrangements between PQS holders and the Adak plant operator are reported to have delayed landings in the first four years of the program. In the fifth year, the operator of the plant declared bankruptcy and was unable to process any landings from the fishery. NOAA Fisheries adopted an emergency rule (after receiving a recommendation from the Council) allowing an exemption from the West region landing requirement for all shares in the fishery. Subsequently, the Council adopted an Amendment 37 to allow for an exemption on the agreement of QS holders, PQS holders, and the communities of Adak and Atka. That amendment was implemented in early in 2012, and a subsequent amendment (Amendment 41) was implemented in 2013 to improve the emergency exemption process in the other CR fisheries.

Table 7-20 Days between first and last delivery by processor (2005/06 through 2009/10)

Fishery	Season	Region	Number of plants taking deliveries		Days between first and last delivery		
			One delivery	Multiple deliveries	Mean	Median	Maximum
2005/06	BBR	North	1	1	32	32	32
		South	10	8	52.9	42.5	88
	BSS	North	3	3	62.3	52	88
		South	9	7	96.3	90	202
	BST	None	1	1	116	116	116
	EAG	South	10	9	84.1	71	167
West		4	4	80.5	65	182	
2006/07	BBR	North	1	1	13	13	13
		South	10	10	16.4	15	32
	BSS	North	2	1	2	2	2
		South	8	7	86.6	84	144
	EBT	None	8	5	95.4	151	154
	WBT	None	6	6	51.8	43	141
EAG	None	5	4	59	72	82	
	West	2	2	76.5	76.5	78	
2007/08	BBR	North	1	1	10	10	10
		South	10	10	36.2	29	84
	BSS	North	2	2	107	107	108
		South	10	9	82	82	119
	EBT	South	8	8	91.5	122.5	150
	WBT	None	6	6	67.7	59.5	115
EAG	None	4	4	56.5	60	94	
	West	2	2	146.5	146.5	232	
2008/09	BBR	North	1	1	12	12	12
		South	11	9	46.7	37	90
	BSS	North	2	2	84.5	84.5	108
		South	10	7	80.7	82	121
	EBT	None	9	7	84.1	84	133
	WBT	None	7	5	48	60	83
EAG	None	5	5	66.4	78	106	
	West	3	3	190.3	201	238	
2009/10	BBR	North	1	1	8	8	8
		South	9	8	36.1	30	91
	BSS	North	1	1	46	46	46
		South	7	6	83	85	149
	EBT	None	7	6	57.3	33	118
	EAG	None	3	3	83.3	95	132
WAG	None	2	2	181.5	181.5	232	
	South	1	1	31	31	31	
SMB	South	1	1	0	0	0	

Source: RAM IFQ Database

Note: Region is region of operation of the plant in the fishery. A delivery is all offloads from a vessel on a single day.

Table 7-21 Days between first and last delivery by processor (2010/11 through 2014/15)

Fishery	Season	Region	Number of plants taking deliveries		Days between first and last delivery		
			One delivery	Multiple deliveries	Mean	Median	Maximum
2010/11	BBR	North	1	1	19	19	19
		South	10	8	30.5	32.5	46
	BSS	North	1	1	58	58	58
		South	9	7	58	58	133
	EAG	None	4	3	92	93	116
	WAG	None	3	3	83.7	44	186
SMB	North	1	1	38	38	38	
	South	4	3	15.3	8	36	
2011/12	BBR	North	1	1	8	8	8
		South	10	10	13.2	15.5	25
	BSS	North	1	1	156	156	156
		South	8	6	165	155.5	230
	EAG	None	6	6	56.7	63	89
	WAG	None	4	4	40.3	30.5	70
West		1	1	50	50	50	
SMB	North	1	1	42	42	42	
	South	5	5	5	0	21	
2012/13	BBR	North	1	1	13	13	13
		South	9	8	17.3	14.5	52
	BSS	North	1	1	124	124	124
		South	8	7	103.4	144	152
	EAG	None	5	5	50.8	50	69
	WAG	None	4	4	94.3	88	171
West		2	1	59	59	59	
SMB	North	1	1	38	38	38	
	South	5	3	10.7	13	19	
2013/14	BBR	North	1	1	10	10	10
		South	8	8	12.3	12.5	21
	BSS	North	1	1	137	137	137
		South	6	6	88.5	88	170
	EBT	None	7	5	72.4	43	157
	WBT	None	7	6	70	60.5	152
EAG	None	5	5	44.8	38	80	
WAG	None	4	4	183.5	188	210	
2014/15	BBR	North	1	1	11	11	11
		South	7	7	16.3	20	34
	BSS	North	2	1	132	132	132
		South	6	6	106.3	118.5	153
	EBT	None	6	6	117.3	139	161
	WBT	None	7	7	112.3	117	163
	EAG	None	3	3	52.3	59	74
WAG	None	3	3	165.3	216	231	
	West	1	1	142	142	142	
SMB	North	1	1	38	38	38	

Source: RAM IFQ Database

Note: Region is region of operation of the plant in the fishery. A delivery is all offloads from a vessel on a single day.

The number of deliveries received by each processor during each season also affects efficiencies in the processing sector. Receiving more, smaller deliveries may provide efficiency, if those deliveries are well-timed and spread over a longer period. Using this approach, a processor may operate at a lower level of throughput for a longer period, possibly operating fewer lines or slowing the rate of processing on a line. Yet, poorly timed deliveries over an extended period can cost a processor that must keep crews on hand and ready to receive those deliveries. Consequently, care must be taken in interpreting data concerning the effects of deliveries on processors.

Table 7-22 Deliveries per processor in the BBR fishery (2001 through 2014/15)

Season	Region	Number of plants taking deliveries	Number of deliveries		
			Mean	Median	Maximum
2001	NA	17	13.5	8	39
2002		17	14.2	11	41
2003		20	13.1	8	34
2004		17	15	9	40
2005/06	North	1	10	10	10
	South	10	21.9	21.5	50
2006/07	North	1	7	7	7
	South	10	16.4	14	37
2007/08	North	1	10	10	10
	South	10	20.6	18	58
2008/09	North	1	7	7	7
	South	11	21.3	19	48
2009/10	North	1	8	8	8
	South	9	19.3	24	38
2010/11	North	1	6	6	6
	South	10	18.3	15.5	44
2011/12	North	1	16	16	16
	South	10	19.8	19	50
2012/13	North	1	9	9	9
	South	9	23	15	63
2013/14	North	1	10	10	10
	South	8	29.8	20.5	73
2014/15	North	1	15	15	15
	South	7	32.9	36	74

Source: RAM IFQ database.

Note: A delivery is all offloads from a vessel on a single day.

In the years leading up to implementation of the program in Bering Sea snow crab fishery, the average processor received between 10 and slightly more than 20 deliveries (see Table 7-22). The processors receiving the most deliveries received between 26 and 66 deliveries. Since implementation of the program, the average number of landings at each facility in the North was more than twice the average number of deliveries in the South and substantially exceeded the number of deliveries in years prior to implementation of the program. Since the IPQ in that fishery are regionally designated nearly equally North/South, these numbers of deliveries reflect efforts on the part of processors to consolidate processing activity to achieve efficiencies in the North. In the North, little groundfish processing occurs in the winter. To achieve efficiencies, processors have consolidated processing to one or two plants during all seasons since 2005/06,

which receive as many as 222 deliveries in a season, receive all deliveries designated for that region. Plant capacity in the South has consolidated during recent years to six active plants, receiving 45-50 deliveries on average, some three times more than average deliveries during the years prior to program implementation.

Table 7-23 Deliveries per processor in the BSS fishery (2001 through 2014/15)

Season	Region	Number of plants taking deliveries	Number of deliveries		
			Mean	Median	Maximum
2001	NA	16	16.1	19	40
2002		17	22.1	25	66
2003		17	14.3	17	31
2004		18	12.7	14.5	26
2005		14	13.3	13.5	27
2005/06	North	3	25.7	36	39
	South	9	16.4	18	37
2006/07	North	2	1.5	1.5	2
	South	8	18.6	13	51
2007/08	North	2	90	90	114
	South	10	24.6	25.5	73
2008/09	North	2	88	88	143
	South	10	18	21	41
2009/10	North	1	103	103	103
	South	7	20.4	22	41
2010/11	North	1	153	153	153
	South	9	25.2	28	58
2011/12	North	1	220	220	220
	South	8	52.3	55	116
2012/13	North	1	190	190	190
	South	8	37.5	37	85
2013/14	North	1	222	222	222
	South	6	44.5	48	69
2014/15	North	2	116.5	116.5	232
	South	6	51.8	50	90

Source: RAM IFQ database.

Note: A delivery is all offloads from a vessel on a single day.

Table 7-24 Deliveries per processor in the EBT and WBT fishery (2005/06 through 2014/15)

Fishery	Season	Number of plants taking deliveries	Number of deliveries		
			Mean	Median	Maximum
EBT	2006/07	8	7	4	22
	2007/08	8	6.3	5.5	14
	2008/09	9	5.7	6	11
	2009/10	7	6	7	11
	2013/14	7	15	8	44
	2014/15	6	32.7	20.5	86
WBT	2006/07	10	6.9	7	13
	2007/08	6	9.8	6.5	28
	2008/09	6	7.2	7	13
	2009/10	7	6.7	3	23
	2013/14	7	18.3	14	42
	2014/15	7	32.9	33	75

Source: RAM IFQ database.

Note: A delivery is all offloads from a vessel on a single day.

Plants active in the Eastern Bering Sea Tanner crab and WBT fisheries have in the most recent two seasons substantially increased their engagement with the fishery as TAC levels have increased and a greater number of vessels actively target these fisheries, receiving more than 30 deliveries on average during the 2014/15 season in both fisheries, as compared to fewer than 10 deliveries in the four years that the fisheries were open during the initial period of the program.

Table 7-25 Deliveries per processor in the SMB (2009/10 through 2014/15)

Season	Region	Number of plants taking deliveries	Number of deliveries		
			Mean	Median	Maximum
2009/10	North	1	28	28	28
	South	1	2	2	2
2010/11	North	1	52	52	52
	South	4	2.8	2.5	5
2011/12	North	1	85	85	85
	South	5	4.6	3	11
2012/13	North	1	93	93	93
	South	5	6.6	4	15
2014/15	North	1	28	28	28

Source: RAM IFQ database.

Note: A delivery is all offloads from a vessel on a single day.

Table 7-26 Deliveries per processor in the EAG fishery (2001/02 through 2014/15)

Season	Number of plants taking deliveries	Number of deliveries		
		Mean	Median	Maximum
2001/02	4	11.3	12.5	19
2002/03	4	10.8	7	27
2003/04	4	9.3	9	16
2004/05	4	8.3	8.5	12
2005/06	4	7.8	7	15
2006/07	5	5.8	7	11
2007/08	4	7.3	8	11
2008/09	5	5.8	5	10
2009/10	3	10.7	12	15
2010/11	4	7.8	8	14
2011/12	6	7.5	6	15
2012/13	5	9.2	10	15
2013/14	5	7.8	5	20
2014/15	3	12.3	13	20

Source: RAM IFQ database.

Note: A delivery is all offloads from a vessel on a single day.

Table 7-27 Deliveries per processor in the WAG fishery (2001/02 through 2014/15)

Season	Region	Number of plants taking deliveries	Number of deliveries		
			Mean	Median	Maximum
2001/02	NA	6	10.5	7	31
2002/03		2	22	22	36
2003/04		4	9.5	6	25
2004/05		3	10.7	13	18
2005/06	None	4	3.8	4	6
	W	1	6	6	6
2006/07	None	2	4	4	5
	W	1	3	3	3
2007/08	None	2	6	6	6
	W	1	5	5	5
2008/09	None	3	4.3	5	5
	W	1	4	4	4
2009/10	None	2	10.5	10.5	17
2010/11	None	3	6.3	4	11
2011/12	None	4	5	3	12
	W	1	6	6	6
2012/13	None	4	6.8	6.5	12
	W	2	5.5	5.5	10
2013/14	None	4	11	9.5	19
2014/15	None	3	12.7	13	21
	W	1	6	6	6

Source: RAM IFQ database

Note: A delivery is all offloads from a vessel on a single day.

Scheduling deliveries around available processing windows is critical to processor efficiencies. The importance and the success of processors in scheduling deliveries have varied across time, location, and fisheries. At times in the first year of the program, harvester/processor relationships were particularly strained by attempts of both sectors to dictate scheduling of deliveries. Although some conflicts have continued to arise, most delivery scheduling issues have been resolved to the satisfaction of both parties. In the case of processors in the North region, scheduling of deliveries is critical to maintaining processing efficiencies under the program. Harvesters are generally sensitive to these circumstances and put some effort into cooperating with processors' operational schedules. In the 2009-2010 season, harvesters put substantial effort into coordinating landings in the North region soon after the New Year. Although this effort was primarily motivated by a desire to use the North region IFQ prior to ice conditions developing in vicinity of St. Paul, North region processors benefited from the consolidation of landings that reduced down times for processing crews. Seasons have been substantially longer in subsequent years, however, Processors in the South have more latitude to move labor among crab and groundfish species production. Despite this greater flexibility, delivery scheduling occasionally causes tension between the sectors.

As the statistics presented in the preceding discussion demonstrate, the largest operational effect of the program on processing operations has arisen from the extended seasons in the fisheries. In some cases (particularly in the South region), processors have operated fewer crab lines and reduced peak operating crews. Use of fewer lines reduces both labor and capital costs associated with opening, configuring, and maintaining lines. Reductions in peak crews allow processors to save on transportation costs associated with bringing in crew for the short crab seasons. In some instances, savings on overtime labor may also be realized. In the North region, these savings are less available as plants in that area typically process only crab during the periods when the crab fisheries are open. In North plants, concentrating processing activity into a short period is needed to achieve efficiencies. With processing consolidated in fewer plants, the processing season is substantially longer for operating plants, but accumulated experience with the timing of harvest and coordination of landings with the harvest cooperatives have likely improved the predictability and efficiency of delivery schedules and plant operations.

7.4 Processing Employment and Wages

Table 7-28 presents data on crab processing labor employment and wages associated with the CR Program fisheries. The lengthening of seasons and greater distribution of landings across those seasons has reduced peak staff levels in plants in the South during the Bristol Bay red king crab and Bering Sea snow crab processing seasons. Although these changes in delivery patterns, at times, mean less overtime for staff, in some instances, they may allow longer term employment, particularly for crews that work in both groundfish and crab fisheries. In addition, processors may be able to secure better-trained or more suitable crews, as short-term employment requirements decline. These changes can improve safety and performance in plants. In the North region of the Bering Sea snow crab fishery, processing patterns have changed under the extended seasons, but processing labor works under terms and conditions similar to those prior to rationalization. Processors attempt to concentrate deliveries to achieve efficiencies. This scheduling means plants operate at set capacity for a period of time with employees working relatively long hours and earning substantial overtime pay. Fewer persons are employed, as processing is consolidated into fewer plants, but those plants tend to operate for an extended period. Although the seasons last a few months (as opposed to a few weeks) work is short term with all employees brought in exclusively for the crab season.²⁷ In some

cases, these employees are relatively long term employees of the processor who work in other plants. In others, they are short-term employees hired exclusively for crab processing. In the other program fisheries, most processing is done by crews that work in both groundfish and crab fisheries, with crews shifting among different species production as demands arise. These crews tend to be longer-term employees, working several months for the processor. The change to rationalization has had little effect on processing workers active in these fisheries, but to the extent that rationalization has allowed fisheries to be prosecuted that might otherwise have been closed (e.g., the two Bering Sea Tanner crab fisheries) processing workers have benefited from additional employment.

As indicated in Table 7-28, inter-annual variation in processing labor input indicates general consistency with catch and production volume fluctuations, but estimated daily wage rates (prorated, based on an assumed 12-hour shift) have exhibited a general decline over the 2005-2014 period. It should be noted that most processing facilities that receive crab landings do not exclusively process crab, however, and it is likely that processing labor hours and wages reported and attributed to specific crab fisheries may be influenced by production activity and working conditions in other fisheries, including the relative amount of overtime labor and associated wages generated. As noted previously, one efficiency gain that may be achieved with improved timing of the fishery, particularly in the North region, is reduced use of overtime labor and savings on overtime premiums. Average wage rate increases in 2011 and 2012 in the Bristol Bay red king crab fishery, for example, do not appear to be driven by changes in production level within the fishery (which was declining) that would affect the relative amount of overtime hours and associated wages paid by processors. The increase in average wage in the 2014 Bering Sea snow crab fishery may, however, be indicative of overtime wages paid as a result of contraction in the number of facilities actively processing landed snow crab, which decreased from 15 to 12. Ongoing attention to processing labor costs and hourly wage rates will be important given implementation of increased changes in minimum wage in the State of Alaska.

Table 7-28 Processing labor, employment and wages, 2005 to 2014

Fishery	Sector	Year	Processors	Processing labor hours (1000 hrs)			Wages		
				Total	Median per plant	Median per position	Total (\$1000)	Median per plant (\$1000)	Median hourly wage (\$)
AIG	SF	2005	4	*	*	*	*	*	*
		2006	6	47	1.0	45	511	19.0	10.84
		2007	5	72	4.3	145	767	61.0	10.56
		2008	6	38	2.8	156	569	98.0	12.05
	SFCP	2009	5	*	*	*	891	139.0	*
		2010	4	*	*	*	*	*	*
		2011	7	49	4.8	33	1,156	78.0	10.41
		2012	8	53	2.6	-	1,125	60.0	10.37
		2013	6	61	6.0	-	617	62.0	10.09
		2014	4	*	*	-	*	*	*
BBR	SF	2005	11	202	12.1	148	2,304	207.0	11.25
		2006	11	180	10.8	118	2,064	166.0	11.03
		2007	11	261	25.2	216	2,855	234.0	11.54
		2008	11	245	12.6	299	2,885	293.0	11.57
	SFCP	2009	12	199	16.1	152	2,284	132.0	10.71
		2010	13	212	20.1	237	2,445	198.0	10.12
		2011	14	104	6.7	77	1,265	77.0	10.59
		2012	12	100	6.5	-	1,195	69.0	10.98
		2013	10	104	10.0	-	1,200	95.0	10.14
		2014	9	130	21.1	-	1,406	76.0	9.48
BSS	SF	2005	13	302	23.7	190	3,393	278.0	11.18
		2006	10	445	49.5	269	4,745	537.0	10.89
		2007	10	442	41.3	324	5,146	473.0	11.29
		2008	12	712	30.5	539	9,179	526.0	11.25
	SFCP	2009	14	600	58.4	413	7,022	322.0	10.79
		2010	11	534	50.9	390	5,739	379.0	10.32
		2011	14	555	45.7	337	6,264	363.0	10.75
		2012	13	1,087	77.9	-	12,148	620.0	10.54
		2013	12	774	63.6	-	8,086	488.0	10.16
		2014	10	590	76.0	-	6,351	459.0	10.64
BST	SF	2005	7	8	0.4	8	89	5.0	10.91
		2006	8	14	1.3	18	149	14.0	10.87
		2007	7	35	5.0	84	364	46.0	10.57
		2008	8	27	2.9	48	452	48.0	11.31
	SFCP	2009	8	29	4.3	24	298	34.0	10.32
		2010	5	6	0.7	14	65	7.0	10.33
		2013	7	17	1.9	-	164	16.0	9.74
		2014	8	122	8.5	-	1,230	80.0	9.64
SMB	SF	2009	2	*	*	*	*	*	*
		2010	5	19	0.4	8	175	4.0	10.07
		2011	6	17	0.8	12	153	8.0	9.59
		2012	6	21	0.8	-	246	7.0	9.90
		2014	1	*	*	-	*	*	*

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Starting in 2009, data are summarized over all processing sectors (SFCP) to preserve confidentiality. Processing labor hours reflect shoreside and floating processor sectors only. Data for EAG and WAG fisheries are summarized together as the 'AIG' fishery. Where a submitter reported processing employment in both EAG and WAG fisheries, the maximum reported number of processing positions, rather than the sum of processing positions, is used to calculate total and mean processing positions. * Withheld for confidentiality.

8 CDQ GROUP AND ADAK COMMUNITY GROUP PARTICIPATION IN CR PROGRAM FISHERIES

Before the CR Program was implemented, the Community Development Quota (CDQ) groups received an allocation of 7.5% of the GHL in the Bristol Bay red king crab, Pribilof red and blue king crab, Norton Sound red king crab, Bering Sea snow crab, and Bering Sea Tanner crab fisheries. The CR Program increased the program allocation up to 10% and was expanded to all crab fisheries included under the CR Program. In a similar design to the CDQ Program, an allocation for 10% of the Aleutian Islands golden king crab TAC was granted to the community of Adak at the onset of the CR Program. The CDQ and Adak community allocation, are exempt from the CR Program management, but are subject to separate CDQ/ Adak community allocation regulations.

In addition to CDQ/ Adak community program allocations, these groups and their subsidiaries were allocated CR Program QS associated with their previous LLP licenses and have purchased interest in shares issued under the CR Program. Allowing for QS and PQS acquisition by CDQ groups was in line with the Program's intention to:

- (4) *[Promote] economic stability for harvesters, processors and coastal communities;*
- (6) *Address the social and economic concerns of communities;*

This section will briefly detail the CDQ and Adak community allocations in crab fisheries, describe the extent that these groups also hold harvesting and processing privileges under the CR Program, and discuss the integration of fishing CDQ and the Adak allocation with CR Program holdings. Jointly, these groups are referred to in this section as “community groups”.

8.1 CDQ and Adak Community Allocations

Regulations establishing the CDQ Program were first implemented in 1992. The CDQ Program was incorporated into the MSA in 1996, through the Sustainable Fisheries Act (Pub. L. 104–297). Since the inception of the program, CDQ fisheries management regulations have continued to be developed and amended.

Particularly in fitting with National Standard 8,⁵⁴ MSA §305(i)(1) describes the intent of the CDQ Program:

- (i) to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the Bering Sea and Aleutian Islands Management Area;
- (ii) to support economic development in western Alaska;
- (iii) to alleviate poverty and provide economic and social benefits for residents of western Alaska;
- (iv) to achieve sustainable and diversified local economies in western Alaska.

⁵⁴ Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities. (MSA §301(a)(8)).

Currently, 65 communities participate in the CDQ Program. Approximately 27,000 people reside in CDQ communities. These communities have formed six non-profit corporations (CDQ groups) to manage and administer the CDQ allocations, investments, and economic development projects. The six CDQ groups are:

- Aleutian Pribilof Island Community Development Association (APICDA)
- Bristol Bay Economic Development Corporation (BBEDC)
- Central Bering Sea Fishermen’s Association (CBSFA)
- Coastal Villages Region Fund (CVRF)
- Norton Sound Economic Development Corporation (NSEDC)
- Yukon Delta Fisheries Development Association (YDFDA)

Table 8-1 illustrates the breakout of the program allocation by CDQ group, both as a percentage of program allocation, as well pounds using the 2014/2015 crab-fishing year as an example. The CDQ group makes internal management decisions about how to harvest their program allocations. Some of the fisheries allocations under the CDQ groups are focused towards providing direct harvest opportunities for members of the CDQ communities. For example, some fisheries are relatively easier and safer to access with smaller vessels, and have represented historical sources of employment and income for residents. Other allocations under the CDQ program, particularly in those fisheries that are more industrialized, require greater access to capital and specialized gear, and/or are prosecuted in remote areas of the BSAI, are often harvested on larger, more efficient vessels. The revenues from these types of operations can aid in funding other types of economic development opportunities.

Table 8-1 also illustrates the Adak community allocation that was set aside for the community during the implementation of the CR Program. The 10% Adak community allocation of Western Aleutian Islands golden king crab was intended to provide the community with a sustainable allocation of crab to aid in the development of local seafood harvesting and processing activities. Thus, the goal was to provide Adak with a means for sustainable participation in fisheries harvesting and processing within the community. Building on the concept of community development quotas, a community fishing quota, such as the allocation to Adak, was intended to be used to direct the flow of economic and social benefits from a fishery to a coastal community.

Table 8-1 CDQ and Adak community allocations by fishery and group, as a percent of total and as pounds based on the 2014/2015 season

Fishery	Group Allocation (as a % of program allocation)						Adak allocation	Program allocation (% of TAC)
	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFA		
BBR	17%	19%	10%	18%	18%	18%	-	10%
BSS	8%	20%	20%	17%	18%	17%	-	10%
EBT	10%	19%	19%	17%	18%	17%	-	10%
WBT	10%	19%	19%	17%	18%	17%	-	10%
WAG	-	-	-	-	-	-	100%	10%
EAG	8%	18%	21%	18%	21%	14%	-	10%
WAI	8%	18%	21%	18%	21%	14%	-	10%
STB	50%	12%	-	12%	14%	12%	-	10%
PIK	-	-	100%	-	-	-	-	10%
Fishery	Group Allocation (in pounds based on the 2014/2015 TAC)						Adak allocation	Total pounds by fishery
	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFA		
BBR	169,762	189,734	99,860	179,748	179,748	179,748		998,600
BSS	543,600	1,359,000	1,359,000	1,155,150	1,223,100	1,155,150		6,795,000
EBT	84,800	161,120	161,120	144,160	152,640	144,160		848,000
WBT	66,250	125,875	125,875	112,625	119,250	112,625		662,500
WAG	-	-	-	-	-	-	298,000	298,000
EAG	26,480	59,580	69,510	59,580	69,510	46,340		331,000
WAI	<i>Fishery closed</i>							
STB	32,750	7,860	-	7,860	9,170	7,860		65,500
PIK	<i>Fishery closed</i>							
Total pounds by group	923,642	1,903,169	1,815,365	1,659,123	1,753,418	1,645,883	298,000	9,998,600

Source: NOAA NMFS and ADF&G TAC announcements 2014/2015.

8.2 CDQ and Adak Community Allocation Group QS Holdings under the CR Program

Both before and after implementation of the CR Program, CDQ groups made substantial investments in the BSAI crab fisheries. While these entities do not meet the requirements to hold C shares, community groups may, and have, invested in both CVO and CPO QS. Some CDQ groups and wholly owned subsidiaries were granted CR Program QS at initial allocation; however, much of holdings have been acquired since program implementation. In some cases, QS is purchased outright, and in some cases groups may acquire a company or equity in a company that might include QS, vessels, or other assets.

Change in CR Program QS holdings by community groups are illustrated in a few ways in this section. Table 8-2 presents a comparison of 2010 and 2014 holdings of CR Program CPO and CVO by CDQ groups and wholly-owned subsidiaries.⁵⁵ Direct holdings alone, as displayed in Table 8-2, show that CDQ groups

⁵⁵ Given current available data, a full time series on CDQ holdings was not able to be presented in this review. A challenge in demonstrating QS holdings is that the data files flag a subsidiary of a CDQ group as a CDQ affiliate through the time series data. For instance, if XYZ, LLC was purchased in 2012, that entity's holdings are attributed to the CDQ group for as long as XYZ, LLC has participated in the CR Program. It is possible, but more difficult to link the history of that acquisition of a subsidiary, partner, or joint venture with the CDQ group. Analysts were able

have substantial interest in CR Program fisheries. All six of the CDQ groups, as well Adak Fisheries, LLC holds QS in at least one of the CR Program fisheries.

In particular, some community groups have made significant investments in catcher processor owner QS within the last five years. Groups may be uniquely positioned for this type of transfer with increased access to capital and potential access to catcher processor vessels through CDQ program allocations in crab and groundfish fisheries. Under 2010 CDQ entity structure, CDQ groups and wholly owned subsidiaries only held CPO QS in Bristol Bay red king crab, Bering Sea snow crab, and Eastern and Western Bering Sea Tanner crab fisheries. The collective CDQ group holdings from each of these CR Program fisheries did not exceed 30% at that time. Based on current CDQ entity structure, CDQ groups and their wholly owned subsidiaries held nearly all of the CPO QS in the Western Aleutian Islands golden king crab, St. Matthew's blue king crab and Western Aleutian Islands red king crab fisheries in the 2014/2015 season (the latter fishery which has not be open since program implementation). The groups also hold the majority of CPO QS in the Eastern and Western Bering Sea Tanner crab fisheries (with holdings of approximately 65% for the 2014/2015 season in both fisheries) and a substantial portion of the CPO QS in the Bristol Bay red king crab fishery and Bering Sea snow crab fishery (with holdings of approximately 42% and 45%, respectively).

CDQ groups and fully owned subsidiaries have also increased their holdings of CVO QS. Based on 2010 CDQ entity structure, groups held less than 10% of the catcher vessel QS in all the CR Program fisheries, except for the Eastern and Western Aleutian Islands golden king crab fisheries (with holdings of approximately 30% and 13%, respectively) (NPFMC 2010a). Based on the current CDQ entity structure, groups and their wholly owned subsidiaries increased their holdings of Western Aleutian Islands golden king crab fisheries to approximately 29%, while holdings of Eastern Aleutian Islands golden king crab fisheries decreased slightly. CDQ group CVO QS holdings in all other CR Program fisheries increased to between 12% and 18% of each fishery QS pool.

CDQ and Adak program allocations can provide market leverage which aids the entities in making further investments in the CR Program. In addition, as a diversified portfolio of fisheries, CDQ program allocations allow groups to absorb more risk in crab QS investments, with the knowledge that one fishery's loss, may be balanced out by a gain in another. This allows groups to focus more on the long-term benefits of QS investments, even in a situation where a fishery might experience seasonal closures. Individuals that are less diversified are generally more susceptible to losses in the event of TAC changes or fisheries closures.

By considering the pool of all harvesting shares available under the CR Program (including C shares), the last column in Table 8-2 demonstrates the increasing CR Program harvesting privilege available to the CDQ groups and wholly owned subsidiaries. In 2014/2015, CDQ groups and wholly owned subsidiaries held between 14% to 18% of the CR Program harvesting privilege for Bristol Bay red king crab, Bering Sea snow crab, Eastern Bering Tanner crab, Western Bering Tanner crab, Pribilof Island red and blue king crab and St. Matthew's blue king crab. In 2014/2015, CDQ groups and wholly owned subsidiaries held approximately 27% of the CR Program harvesting privilege for Eastern Aleutian Islands golden king crab, approximately 47% of the CR Program harvesting privilege for Western Aleutian Islands red king crab,

to link a "snapshot" of the history built into the holdings displayed in Table 8-3; however, this "decomposition" of holdings data is not yet available throughout the time series of the CR Program.

and approximately 60% of the CR Program harvesting privilege for the Western Aleutian Islands golden king crab fishery.

Table 2-2 in Section 2.3.2 illustrates the QS use cap for CDQ groups. These QS use caps are higher than those for non-CDQ individuals or entities with owner QS or C-shares. CDQ QS use caps range from 5% to 20% of the CVO/CPO QS pool for each CR fishery, based on the initial allocation of CVO and CPO (§680.42(a)(3)(i)).

Regulations also allow for individuals or entities who received QS at initial allocation in excess of the QS use caps, to continue to hold these harvesting privileges based on historical participation (§680.42(a)(3)(i)). Some of examples of these entities, ‘grandfathered in’ above the CR Program QS use caps, are wholly or partially owned subsidiaries of CDQ groups. If an entity that was initially issued QS above a cap restructures, the CR Program regulations do not stipulate that this entity must divest its QS. However, these entities are not permitted to directly acquire more QS through transfer while they remain over the cap. If there is a transfer or merger of entities, which includes a QS holder grandfathered in with holdings higher than the QS use caps, any ‘non-grandfathered-in’ QS associated with the same fishery is required to be divested.

NMFS RAM Division checks individual and corporate holdings against the QS use cap for the corresponding fisheries when a QS transfer application is submitted. If an entity will exceed a use cap, the transfer is not approved. However, entities can also inadvertently exceed their QS use caps through the transfer or merger of entities. Entities should seek to understand their status relative to the cap prior to the transfer or merger. In a scenario where entities have inadvertently exceeded their QS use caps, QS holders would be required to divest until they reached below the caps. Sometimes participants will seek NMFS RAM Division guidance on its status relative to the cap prior to the transfer or merger of entities.

Table 8-2 CDQ group holdings of CR Program QS, 2010 and 2014

Fishery	Season	CPO		CVO		CDQ group holdings of all QS		
		CDQ held QS units	% of CPO shares	CDQ held QS units	% of CVO shares	Number of CDQ groups holding QS	Number of total units	% of total QS units in fishery
BBR	2010	3,905,664	22.1%	35,051,013	9.4%	5	38,956,677	9.7%
	2014	7,425,499	42.0%	54,914,978	14.8%	5	62,340,477	15.6%
BSS	2010	24,764,449	27.9%	85,840,632	9.7%	5	110,605,081	11.0%
	2014	40,278,283	45.4%	138,049,715	15.7%	6	178,327,998	17.8%
EAG	2010	0	0.0%	2,780,392	30.1%	3	2,780,392	27.8%
	2014	0	0.0%	2,693,986	29.2%	3	2,693,986	26.9%
EBT	2010	3,598,738	27.5%	15,971,780	8.8%	5	19,570,518	9.8%
	2014	8,506,463	65.1%	21,877,412	12.1%	6	30,383,875	15.2%
PIK	2010	0	0.0%	1,570,592	5.4%	4	1,570,592	5.2%
	2014	0	0.0%	4,252,737	14.7%	5	4,252,737	14.1%
SMB	2010	0	0.0%	2,566,537	8.9%	4	2,566,537	8.5%
	2014	579,116	100.0%	4,004,402	14.0%	5	4,583,518	15.3%
WAG	2010	0	0.0%	5,132,960	24.6%	3	5,132,960	12.8%
	2014	17,742,670	98.9%	5,998,198	28.8%	4	23,740,868	59.4%
WAI	2010	0	0.0%	1,412,120	4.0%	4	1,412,120	2.4%
	2014	21,999,156	96.9%	6,277,690	17.7%	5	28,276,846	47.1%
WBT	2010	3,598,738	27.5%	15,971,779	8.8%	5	19,570,517	9.8%
	2014	8,506,463	65.1%	21,877,411	12.1%	6	30,383,874	15.2%

Source: AKR RAM Division QS and PQS database 2010 and 2014, sourced through AKFIN.

Table note: Holdings represent direct CDQ group holdings or wholly owned subsidiaries. These share holdings are publicly available and non-confidential.

Table 8-3 expands on CDQ holdings by augmenting information on direct CDQ group holdings and wholly owned subsidiaries, with QS equity from joint ventures or partnerships. In Table 8-3, if a CDQ group owns 50% equity in a company that holds 500,000 QS units, 250,000 QS units would be attributed to that group. Table 8-3 presents holdings from just the 2014/2015 season.

Table 8-3 CDQ group and equity holdings of CR Program QS, 2014/2015

Fishery	CDQ CPO holdings			CDQ CVO holdings			% of total harvesting shares
	CDQ group count	CPO QS units	% of CPO shares	CDQ group count	CVO QS units	% of CVO shares	
BBR	4	8,994,546	50.8%	6	70,832,859	19.1%	20.0%
BSS	4	43,433,184	49.0%	6	168,267,312	19.1%	21.2%
EAG	0		0.0%	3	2,910,000	31.5%	29.1%
EBT	4	9,124,722	69.8%	6	28,109,129	15.5%	18.6%
PIK	1	62,143	41.0%	5	4,647,988	16.0%	15.7%
SMB	2	579,116	100.0%	5	5,557,766	19.5%	20.5%
WAG	1	17,742,670	98.9%	3	5,998,895	28.8%	59.4%
WAI	2	22,291,987	98.1%	5	8,259,349	23.3%	50.9%
WBT	4	9,124,722	69.8%	6	28,109,128	15.5%	18.6%

Source: AKR RAM Division QS database 2014, sourced through AKFIN

Table notes: Holdings represent direct CDQ group holdings, wholly owned subsidiaries, and also equity in other shareholding companies.

Table 8-4 presents data on PQS transaction of CDQ group or wholly owned subsidiaries. CDQ groups were not issued PQS at the initial allocation of the CR Program. However, several groups began to acquire PQS after the 2008/2009 season. Only one additional CDQ group entered into the PQS market in the last 5 years (in the Bering Sea snow crab fishery); however, holdings have increased in all fisheries except for the Western Aleutian Islands golden king crab fishery and the Western Aleutian Islands red king crab fishery (in which no CDQ groups directly hold PQS).

CDQ groups also have influence in the acquisition of PQS. These groups are the ROFR holding entity for the communities they represent. Therefore, if a PQS holder was planning to sell outside the community of origin represented by a CDQ group, the seller would first need to allow the CDQ group to exercise their right. Given the limited use of ROFR, it is understood PQS sellers will often make sales directly with the ROFR holder.

Table 8-4 CDQ group holdings of PQS, 2005/2006 through 2014/2015

Fishery	Season	CDQ held PQS units	% of PQS shares	CDQ entity count
BBR	2010	15,754,205	3.9%	2
	2014	55,658,324	13.8%	2
BSS	2010	115,300,302	11.5%	2
	2014	229,466,375	22.9%	3
EAG	2010	826,359	8.2%	2
	2014	1,186,218	11.7%	2
EBT	2010	15,428,486	7.7%	2
	2014	36,966,837	18.6%	2
PIK	2010	738,827	2.5%	2
	2014	4,730,291	15.8%	2
SMB	2010	1,769,081	5.9%	2
	2014	7,122,874	23.7%	2
WAG	2010	12,000,000	30.0%	1
	2014	12,000,000	30.0%	1
WAI	2010	-	0.0%	0
	2014	-	0.0%	0
WBT	2010	15,428,486	7.7%	2
	2014	36,966,837	18.6%	2

Source: AKR RAM Division QS and PQS database 2010 and 2014, sourced through AKFIN

Table notes: Holdings represent direct CDQ group holdings or wholly owned subsidiaries. These share holdings are publicly available and non-confidential.

Table 8-5 demonstrates CDQ holdings of CR Program PQS by including PQS equity from joint ventures or partnerships, along with direct CDQ group holdings and wholly owned subsidiaries for the 2014/2015 season. By comparing holdings in the 2014/2015 season in Table 8-5 with the 2014/2015 season in Table 8-4, the effect from joint ventures or partnerships can be identified. In many of the fisheries, one or more CDQ groups hold equity in QS or another entity that holds QS. For example, in the Bristol Bay red king crab fishery, 2 CDQ groups hold 13.8% of the PQS directly or through their wholly owned subsidiaries. If

joint the equity from ventures and partnerships are included, and attributed based on the proportion of their holding, 3 CDQ groups hold 32.7% of the Bristol Bay red king crab PQS.

Table 8-5 CDQ group holdings of PQS, 2014/2015

Fishery	CDQ PQS holdings		
	CDQ group	PQS units	% of PQS shares
BBR	3	131,490,344	32.7%
BSS	3	321,781,255	32.1%
EAG	2	1,640,770	16.2%
EBT	2	44,415,978	22.3%
PIK	2	4,730,291	15.8%
SMB	2	7,135,829	23.8%
WAG	2	12,558,611	31.4%
WAI	0	-	0.0%
WBT	2	44,415,978	22.3%

Source: AKR RAM Division QS and PQS database 2014, sourced through AKFIN

Table notes: Holdings represent direct CDQ group holdings, wholly owned subsidiaries, and also equity in other shareholding companies.

8.3 Harvest of CDQ and Adak Community Allocations

CDQ groups may and do, harvest their group allocations using both catcher vessels and catcher processors. The distribution of catch between the operation types, however, cannot be shown because confidentiality limits prevent disclosure of catch information of the few catcher processors that harvest CDQ allocations. The number of vessels of each operation type may be shown (see Table 8-6). As in the CR Program fisheries, few catcher processors have actively harvested CDQ allocations, with some fisheries having no catcher processor participation in some years. In the Western Aleutian Islands golden king crab fishery, the Adak allocation is harvested exclusively by catcher vessels (however, there has been one catcher processor active in the CR Program harvesting Western Aleutian Islands golden king crab).

Table 8-6 Vessel participation CDQ and Adak allocation fisheries by operation type

Fishery	Year	Vessel participation in CDQ fisheries		Fishery	Year	Vessel participation in CDQ fisheries	
		CV	CP			CV	CP
BBR	2005/2006	11	2	EBT	2006/2007	3	1
	2006/2007	12	1		2007/2008	2	1
	2007/2008	8	2		2008/2009	3	
	2008/2009	13	2		2009/2010	5	
	2009/2010	10	1		2013/2014	5	1
	2010/2011	9	1		2014/2015	6	1
	2011/2012	8	1	SMB	2010/2011	3	
	2012/2013	8	1		2011/2012	5	
	2013/2014	9	1		2012/2013	4	
	2014/2015	9			2014/2015	1	
BSS	2005/2006	13	2	WAG	2005/2006	1	
	2006/2007	10	2		2006/2007	2	
	2007/2008	13	2		2007/2008	1	
	2008/2009	13	2		2008/2009	1	
	2009/2010	11			2009/2010	1	
	2010/2011	13	1		2010/2011	1	
	2011/2012	15	1		2011/2012	1	
	2012/2013	12	1		2012/2013	1	
	2013/2014	11	1		2013/2014	1	
	2014/2015	11	1		2014/2015	1	
EAG	2005/2006	3		WBT	2005/2006	6	
	2006/2007	3			2006/2007	7	1
	2007/2008	3			2007/2008	5	1
	2008/2009	3			2008/2009	4	
	2009/2010	3			2009/2010	3	
	2010/2011	3			2010/2011	5	
	2011/2012	3			2011/2012	8	
	2012/2013	3			2012/2013	6	
	2013/2014	3			2013/2014	10	1
	2014/2015	3			2014/2015	7	1

Source: Crab eLanding, sourced through AKFIN

Table note: Participation in the WAG fishery represents the Adak community allocation.

The integration of the harvest of CDQ allocations with program allocations can be shown by examining the number and quantities of landings that include both program and CDQ allocations.

Table 8-7 demonstrates the variability in how CDQ groups chose to integrate their program allocation with any CR Program CVO/CPO holdings year to year. In the Bristol Bay red king crab fishery, the portion of the annual CDQ harvest landed with harvest from the program fishery has fluctuated from approximately 15% up to 77% of the total catch throughout the 10 years of the program. In the Bering Sea snow crab fishery, between approximately 5% and 33% of the annual CDQ harvests are landed with harvest from the CR Program fisheries. This demonstrates that while there has been fluctuation in the integration of CDQ/CR Program crab harvests, the Bering Sea snow crab fishery tends to separate these harvesting privileges more often than in the Bristol Bay red king crab fishery. In other program fisheries, much of the CDQ landings data cannot be revealed because of confidentiality limitations. Similar to the Bristol Bay red king crab fishery and the Bering Sea snow crab fishery, reliance on the integration of CDQ/CR Program crab

harvests in other fisheries has fluctuated throughout the time series. The Adak allocation in the Western Aleutian Islands golden king fishery has been harvested separately by one vessel for the last five years, which prevents harvest data from being displayed.

Table 8-7 Landings of CDQ group and Adak community group allocations along with CR holdings

Fishery	Season	Deliveries of combined CDQ harvest and CR Program harvest				Deliveries of exclusively CDQ harvest			
		Number of vessels	Number of landings	CDQ pounds	% of CDQ CV catch	Number of vessels	Number of landings	CDQ pounds	% of CDQ CV catch
BBR	2005/2006	7	10	593,742	44%	9	13	765,619	56%
	2006/2007	12	15	944,707	67%	5	8	467,783	33%
	2007/2008	7	13	799,839	47%	6	11	915,060	53%
	2008/2009	3	3	262,023	15%	13	25	1,489,471	85%
	2009/2010	4	5	382,193	25%	7	13	1,128,360	75%
	2010/2011	5	6	403,309	30%	7	9	941,255	70%
	2011/2012	6	6	541,839	76%	3	3	171,062	24%
	2012/2013	7	7	359,448	50%	4	5	355,173	50%
	2013/2014	6	6	599,279	77%	3	3	179,905	23%
2014/2015	8	9	603,364	56%	6	7	481,295	44%	
BSS	2005/2006	11	16	924,151	33%	8	15	1,854,991	67%
	2006/2007	8	10	1,129,847	32%	7	14	2,384,296	68%
	2007/2008	5	8	582,532	10%	12	33	5,073,577	90%
	2008/2009	4	5	345,088	5%	12	40	5,994,244	95%
	2009/2010	7	12	1,904,103	33%	10	17	3,819,784	67%
	2010/2011	9	11	1,450,857	24%	11	23	4,593,069	76%
	2011/2012	10	16	1,332,903	13%	14	43	8,847,048	87%
	2012/2013	9	14	1,201,871	15%	12	33	6,603,136	85%
	2013/2014	10	13	1,976,617	29%	11	23	4,890,451	71%
2014/2015	7	10	937,868	13%	11	33	6,169,313	87%	
BST	2006/2007	10	18	153,663	90%	4	5	16,581	10%
	2007/2008	-	-	-	0%	6	11	80,551	100%
	2008/2009	2	2	*	*	6	14	*	*
	2009/2010	5	6	135,000	99%	4	5	820	1%
	2010/2011	-	-	-	0%	5	6	118	100%
	2011/2012	-	-	-	0%	8	14	588	100%
	2012/2013	-	-	-	0%	6	13	410	100%
	2013/2014	10	16	181,967	80%	10	14	45,436	20%
2014/2015	11	19	674,494	48%	9	13	726,533	52%	
EAG	2005/2006	2	2	*	*	3	4	265,374	*
	2006/2007	3	5	182,162	*	1	1	*	*
	2007/2008	1	1	*	*	3	5	265,485	*
	2008/2009	2	5	*	*	1	3	*	*
	2009/2010	3	6	310,428	*	1	1	*	*
	2010/2011	3	3	214,202	*	1	2	*	*
	2011/2012	3	3	93,188	*	2	4	*	*
	2012/2013	2	2	*	*	2	6	*	*
	2013/2014	3	5	216,509	*	2	2	*	*
2014/2015	3	3	271,431	*	1	1	*	*	
SMB	2010/2011	2	5	*	*	2	2	*	*
	2011/2012	3	3	33,500	18%	3	10	149,115	82%
	2012/2013	2	3	*	*	3	5	100,383	*
	2014/2015	-	-	-	0%	1	1	*	*

Source: Crab eLandings, sourced through AKFIN.

Table notes: * denotes confidential data. WAG harvest is excluded due to exclusively confidential harvest data. The combined CDQ harvest and program deliveries column can include deliveries with incidental catch of IFQ crab in those fisheries in which such harvest is permitted.

9 CRAB MARKETS AND PRICES

Many of the goals of the program were a response to the high risk and the instability for individual participant's economic investments, as well as the instability and inefficiency of the production chain as a whole. This section provides a brief overview of trends in the global wholesale market for king and snow crab products that have been influential over the last decade, and a more detailed discussion of the ex-vessel market for BSAI crab and changes in vessel delivery terms and pricing through implementation of the CR Program and over the course of the program.

9.1 Wholesale Crab Markets

Alaska king and snow (including both *C. opilio* and *C. bairdi*) crab products are sold into both domestic and international export markets. A significant share of the crab produced by the Alaska industry remains in the US; between 2010 and 2014, an estimated average of 44% of Alaska king crab and 58% of Alaska snow crab was sold directly to the domestic market (Table 9-1).⁵⁶ Domestic consumption of crab exceeds domestic supply with the balance being supplied by imports from other countries. Because of this, international crab prices have a strong influence on Alaska crab prices regardless of whether the product is exported or retained domestically. Alaska crab represents a significant but not dominant share of global production; Alaska king crab competes on the global market primarily with crab from Russia, the largest global producer, and Alaska snow crab competes in the export market with Canada, the largest producer, as well as South Korea and Russia. Key export markets for Alaska crab include Japan and China, although a significant share of the exports to China are thought to be re-exported after secondary processing.

The following provides a brief overview of crab wholesale markets, which summarizes a more detailed profile of king and snow crab product markets available in ASFC (2016).⁵⁷ This is intended as a general background on changes in the market that have occurred over the course of the CR Program and have been influential to some degree on the Alaskan ex-vessel market and production and earnings in the processing sector. Because Alaska king and snow crab production represents a relatively small fraction of global trade in these products, the CR Program itself has limited effect on the wholesale market outside of localized effects, and a more detailed review of global trade is beyond the scope of this review.

⁵⁶ Except as noted, statistics cited in this section (9.1) of the report are inclusive of all Alaska king and snow (including both *C. opilio* and *C. bairdi*) crab produced from CR fisheries and other state and federally managed crab fisheries.

⁵⁷ See the report for more information and data sources; *Wholesale market profiles for Alaska groundfish and crab fisheries* (AFSC, 2016) is available online at:

http://www.afsc.noaa.gov/News/pdfs/Wholesale_Market_Profiles_for_Alaskan_Groundfish_and_Crab_Fisheries.pdf.

Additional information on CR program and statewide Alaska crab processing output and wholesale volume and sales statistics are updated annually in the Crab SAFE Economic Status Report, available at:

<http://www.afsc.noaa.gov/REFM/Socioeconomics/SAFE/default.php>.

Table 9-1 Alaska king and snow crab production and wholesale market summary, 2014

Species/Product	Alaska Production			Key Markets		
	First Wholesale Value (\$millions)	Volume (million pounds)	Pct. of Global Harvest (2013)	U.S.	Japan	China
King Crab	117	10.74	0.15	U.S.	Japan	--
Snow Crab	233	44.14	0.15	U.S.	Japan	China

Source: Source: ADF&G (COAR), NMFS Foreign trade data, and McDowell Group estimates (AFSC, 2016).

Notes: King crab statistics include all Alaska production of red, blue, and golden king crab products; snow crab statistics include all Alaska production of snow (*C. opilio*) and Tanner (*C. bairdi*) crab products.

Changes in illegal, unreported, and unregulated (IUU) fishing from Russia (which has historically produced a large volume of IUU crab products) is thought to have a significant impact on market demand for crab from Alaska. King crab prices in particular appear to be most responsive to total volume of Russian king crab production and exports, but snow crab prices are also affected. Increased king crab harvests in Argentina and Chile are adding more production to global supply, impacting the market value of Alaska's king crab harvest. The recent increase in Tanner harvests in Alaska has incentivized the industry to try to differentiate it from the smaller snow crab at the retail level.

9.1.1 King crab

King crab are primarily sold in the wholesale market as cooked/frozen sections, accounting for approximately 95% of all product volume in 2014. In 2014, the first wholesale production volume of king crab sections was approximately 10.2 million pounds with a value of \$109.4 million. A small portion of the king crab harvest is flown to high-end markets as a live or fresh, uncooked product. Live king crab production totaled approximately 260,000 pounds in 2014 worth \$3.5 million, while fresh production totaled 105,000 pounds worth \$1.3 million. Together these product forms accounted for 4.1% of total king crab first wholesale value. Live and fresh product forms accounted for 6.0% of first wholesale value in 2012, the recent high-water mark.

The global supply of king crab averaged nearly 150 million pounds per year from 2004 to 2013 and is dominated by Russian production, which accounted for an estimated 71% of the total harvest volume during the 10-year period. Total supply increased sharply between 2004 and 2006 due to increased Russian production, producing a significant decline in wholesale prices coinciding with the transition of Alaska fisheries to rationalized management (see Table 9-6 and Table 9-8 below). Global supply declined by more than 50% between 2007 and 2010, but has increased slightly in recent years, reaching 115 million pounds in 2013. Alaska typically has the second-largest king crab production, followed by Chile and Argentina (producing Southern king crab, a close substitute of red king crab), of which combined harvest has grown substantially in recent years, increasing from 9.3 million pounds in 2004 to 21.6 million pounds in 2013. Norway accounts for the balance, harvesting 3 million pounds of king crab in the Barents Sea.

Over the last 5 years, more than 80% of all king crab consumed domestically has originated outside the United States, mainly from Russia (Table 9-2). In 2014, nearly 70% of king crab consumed in the United States came from imported Russian product; a figure representing 22.7 million pounds, or more than four times Alaska's estimated U.S. sales of 5.2 million pounds. King crab from Russia is typically sold at a

discount relative to Alaska product in the domestic market.⁵⁸ Imports from Argentina have grown from approximately 700,000 pounds in 2010 to nearly 4.4 million pounds in 2014, or 14% of total domestic sales. All other sources equaled approximately 1%. According to industry representatives, an estimated 70% of red king crab sold in the United States goes to food service with the remaining 30% sold at retail. Golden king crab is split about evenly between food service, retail, and the military, which is required to purchase domestic food products.

Table 9-2 Estimated U.S. king crab market supply, million pounds, 2010 - 2014

Year	Alaska Production	Imports	Exports	U.S. Supply (est.)	U.S. Supply from Alaska (est.)	Percent Alaska
2010	15.1	23	9.5	28.5	5.6	20%
2011	11.4	20.1	8.1	23.4	3.3	14%
2012	10.3	24.7	4.9	30.1	5.4	18%
2013	10.7	25.3	4.3	31.7	6.4	20%
2014	10.7	27.6	5.2	33.1	5.5	16%
Five-year Average	11.7	24.1	6.4	29.3	5.2	18%

Source: ADF&G (COAR), NMFS Foreign trade data, and McDowell Group estimates (AFSC, 2016).

Notes: King crab statistics include all Alaska production of red, blue, and golden king crab products. Totals and rows may not sum due to rounding.

The United States is the most significant market for Alaska king crab, averaging 44% of all production over the last 5 years (Table 9-3). The domestic market buys the most golden king crab and is the second largest market for Alaska red king crab.⁵⁹ Japan is the largest export market, accounting for 60% of all exports globally, and buying an estimated one-third of total Alaska king crab production. U.S. exports to Japan have been reduced in recent years due to more conservative harvest levels in Alaska and a strengthening U.S. dollar, which has reduced the competitiveness of U.S. exports in the Japanese market. In total, Japan imported an average of nearly 30 million pounds of king crab annually from all exporters between 2010 to 2014, more than 80% of which originated in Russia. Collectively, Canada, China, and all other countries have imported an average of 22% of all Alaska king crab exports from 2012 to 2014.

Table 9-3 Estimated sales of Alaska king crab to key markets, million pounds, 2010 - 2014

Market	2010	2011	2012	2013	2014	Percent of total (5-year average)
Japan	6.4	3.8	2.6	2.8	3.7	34%
Canada	0.8	1.3	0.9	0.7	0.6	8%
China	0.7	0.7	0.4	0.4	0.4	5%
Other Countries	1.4	2.3	1	0.5	0.6	10%
Total Exports	9.4	8.2	4.9	4.3	5.2	56%
U.S. ¹	4.9	3.2	4.8	6.4	5.5	44%
Total Production	14.3	11.4	9.7	10.7	10.7	100%

Source: ADF&G (COAR), NMFS Foreign trade data, and McDowell Group estimates (AFSC, 2016).

Notes: Data pertains to primary exports only, does not portray product which may be re-exported to other markets. Figures may not sum due to rounding. ¹ Estimate based on annual production less calendar year exports.

⁵⁸ Interview with domestic seafood company wholesale representative.

⁵⁹ Interview with domestic seafood company wholesale representative.

9.1.2 Snow and Tanner crab (*C. bairdi* and *C. opilio*)

For the most part, both Tanner crab (*C. bairdi*) and snow crab (*C. opilio*) are currently marketed under the name snow crab. Beginning in 2015, one of the most pressing issues facing the Alaska crab processing industry is how to differentiate Tanner and snow crab from one another. In most years, this has not been a large focus of the industry as Tanner crab harvests were relatively small. However, as Eastern Bering Sea Tanner crab TACs have increased from 2.2 million pounds in 2013 to 16.5 million pounds in 2015, marketing efforts have been pursued to add value to Tanner crab harvests by highlighting its larger size and sweeter taste compared to snow crab. Product differentiation efforts notwithstanding, the supply chain between snow and Tanner crab is very similar. Since they have been historically marketed together and are frequently not differentiated in trade data sources, discussion and wholesale statistics reported in this subsection (9.1.2) for “snow crab” represent combined production and trade of both *C. opilio* and *C. bairdi* crab products.

Snow crab sections are the most important product by both volume and value. Sections are priced by the weight per section, ranging from 5 oz. to 12 oz., with heavier sections typically worth more. Wholesale value of sections has ranged from a low of \$2.99 per pound in 2006 to \$5.45 in 2011. Small amounts of raw crab are processed in Alaska facilities for consumption in the Asian market. While a number of smaller primary processors sell directly to retail and food service markets, the majority of snow crab is sold first to a broker, which facilitates distribution.

The global harvest of snow crab averaged slightly more than 400 million pounds per year from 2005 to 2013, when it reached approximately 452 million pounds. Canadian harvest totaled 216.1 million pounds in 2013, averaging 50% of global production over the period. Volume from South Korea, the second largest global producer, and Russia have steadily increased over the period (up 60% to 69 million pounds, and up 40% to 64.4 million pounds, respectively). Snow crab harvest in the United States (mostly Alaska) has fluctuated significantly over this period, from a low of 28.4 million pounds in 2005 to approximately 93 million pounds in 2012.

A relatively small proportion of all snow crab consumed in the United States comes from Alaska. McDowell Group estimates (AFSC, 2016) indicate that over the last 5 years, approximately 80% of all snow crab consumed in the United States originated outside the United States (Table 9-4). In 2014, an estimated 87.9 million pounds of snow crab sold in the United States came from Canada, a figure representing 66% of U.S. sales, or more than three times Alaska’s estimated U.S. sales of 27.8 million pounds, an estimated 21% of U.S. supply, while the remainder came from other countries, the largest of which is Russia, accounting for 8%.

Table 9-4 Estimated U.S. snow crab market supply, million pounds, 2010 - 2014

Year	Alaska			U.S. Supply (est.)	U.S. Supply from Alaska (est.)	Percent Alaska
	Production	Imports	Exports			
2010	31.8	101.9	11.3	122.4	20.5	17%
2011	39.5	95.6	19.7	115.4	19.8	17%
2012	62.1	99.9	28.6	133.4	33.5	25%
2013	49.4	121.8	18.7	152.5	30.7	20%
2014	44.1	104.6	16.3	132.4	27.8	21%
Five-year Average	45.4	104.7	18.9	131.2	26.5	20%

Source: ADF&G (COAR), NMFS Foreign trade data, and McDowell Group estimates (AFSC, 2016).

Notes: Totals and rows may not sum due to rounding.

The United States is the most significant market for Alaska snow crab producers, receiving an estimated 58% of all first-order sales over the last 5 years (Table 9-5). Sales to China, Japan, Canada, and other foreign countries averaged 42% of all Alaska snow crab production from 2010 to 2014. Globally, China is the largest export market, accounting for 57% of all exported product and 24% of total Alaska snow crab production over the same period. Since 2007, China has imported an average of 9.7 million pounds of Alaska snow crab worth \$42.1 million annually. While China is the largest trading partner measured by exports, anecdotal evidence suggests the majority of this crab undergoes secondary processing, mainly extracting meat for use in sushi, before being re-exported to Japan. From 2010 to 2014, Japan imported an annual average of 51.6 million pounds of snow crab from all countries, valued at slightly more than \$312.3 million per year; about \$153.2 million (49%) of which was imported from Russia, \$103.8 million (27.8%) from Canada, and \$51.9 million (15.6%) from the U.S. The strong U.S. dollar and weak Russian ruble make Alaska snow crab relatively more expensive, positioning Russian snow crab as a more affordable option for Japanese consumers. According to industry contacts, the dollar/yen exchange rate is one of the most significant challenges faced by processors trying to sell into the Japanese market.

Table 9-5 Estimated sales of Alaska snow crab to key markets, million pounds, 2010 - 2014

Market						Percent of total (5-year average)
	2010	2011	2012	2013	2014	
China	7.6	9.8	15.9	11	9.2	24%
Japan	3.1	7.6	7.4	3.3	3.6	11%
Canada	0.5	1.4	2.1	1.4	1.6	3%
Other Countries	0.2	0.9	3.3	3	1.9	4%
Total Exports	11.3	19.7	28.6	18.7	16.3	42%
U.S. ¹	20.4	19.5	33.5	30.7	27.8	58%
Total Production	31.7	39.2	62.1	49.4	44.1	100%

Source: ADF&G (COAR), ASMI Alaska Seafood Export Database, and McDowell Group estimates (AFSC, 2016).

Notes: Data pertains to primary exports only, and does not portray product which may be re-exported to other markets. Figures may not sum due to rounding.

¹ Estimate based on annual production less calendar year exports.

9.2 Ex-vessel Price and Terms of Delivery

Ex-vessel pricing structures for BSAI crab have changed under the CR Program. To assess how changes in pricing structure have affected negotiations and pricing, the section begins with a brief discussion of delivery terms prior to program implementation (including ex-vessel pricing). After that discussion, this section describes delivery terms under the rationalization program, including those terms for Class A IFQ landings and Class B and C share IFQ landings.

9.2.1 Delivery Terms and Pricing Under the LLP

Prior to the CR Program, harvests in most BSAI crab fisheries were consolidated over a short season. Pricing practices differed somewhat between crab fisheries with relatively short seasons and a relatively high number of participants (such as the Bristol Bay red king crab and Bering Sea snow crab fisheries) and fisheries with fewer participants and longer seasons (such as the Aleutian Islands golden king crab fisheries). These differences in ex-vessel pricing across fisheries are highlighted below.

9.2.1.1 Pricing in the Bristol Bay Red King Crab and Bering Sea Snow Crab Fisheries

In the years leading up to implementation of the rationalization program, harvesters in the Bristol Bay red king crab and Bering Sea snow crab fisheries coordinated most price negotiations. Since the early 1990s, the Alaska Marketing Association (AMA) represented a substantial share of harvesters in price negotiations in the largest crab fisheries—the Bristol Bay red king crab, the Bering Sea snow crab and the Bering Sea Tanner fisheries.

Approximately one month prior to each season opening, AMA representatives met with each of the major crab processors to informally discuss the markets for crab products. Based on these discussions and information gathered through its own market research, AMA representatives would determine an expected price for crab, which it would communicate to the processors. The AMA would then solicit price offers from each processor and submit those offers to its members for a vote. This process of soliciting prices would continue until a price offer acceptable to AMA members was received. Since deliveries were unrestricted, once an acceptable offer was received from a processor all other processors usually matched that offer in order to maintain market share. Prices generally remained constant over the short seasons. In 2001, AMA members created an incentive for higher price offers in the Bristol Bay red king crab fishery by informally agreeing to reward the processor that offered the accepted price with additional deliveries. AMA members made a similar agreement for the 2002 Bering Sea snow crab fishery.

If an acceptable price was not received prior to the seasoning opening, catcher vessels would not begin fishing. For example, in both the 2000 and 2001 Bering Sea snow crab seasons harvesters did not begin fishing until several days after the announced opening because no processor had offered an acceptable price during pre-season price negotiations. Although not all vessel owners were members of the AMA, the entire catcher vessel fleet remained at port until an acceptable price was received by the AMA.

Catcher processors, on the other hand, did not abide by these “stand downs” but began fishing at the opening of the season. These vessels were unaffected by the price negotiations because they process the crab they

harvest. Fishing by catcher processors, however, had the potential to weaken the negotiating position of catcher vessels by reducing the amount of crab available for harvest after a price agreement was reached.

The pricing process in the fisheries typically established two prices—the main price applied to higher value, new shell crab (grade 1) and a secondary, lower price was established for lower value, old shell crab (grade 2). The price differential reflected the differences in prices the two grades brought in wholesale and retail markets. The ex-vessel price difference between grades often varied substantially across processors. In general, the price difference averaged approximately 25% of the grade 1 price (\$1.00 per pound for red king crab and \$0.25 for snow crab), but in some instances the price difference was much greater.

Although this informal system established a single price for each grade of crab, price competition among processors existed on a minor scale. Occasionally, some processors offered small bonuses (e.g., \$0.05 per pound) or used different grading practices to attract additional vessels. In addition, a few harvesters preferred to handle their own price negotiations rather than be represented by the AMA.

Ex-vessel pricing could also vary regionally for a number of reasons. In fisheries where vessels made several deliveries, the availability of goods and services in a delivery location can be important to harvesters. Food, bait, fuel, and good port facilities could make a processor more attractive to vessels wishing to offload harvests. Processors in locations that offer fewer goods and services were at times compelled to pay a price premium to induce harvesters to sell their catch. Processors more distant from grounds might also be required to pay a higher price to compensate harvesters for increased transiting time and costs and higher risk of deadloss (and possibly for time away from the grounds if harvesters made midseason deliveries). Proximity to markets could also influence ex-vessel prices. Processors with less access to markets sometimes paid slightly less for crab because they were required to bear a higher cost to transport the crab to markets.

9.2.1.2 Pricing in the Aleutian Islands Golden King Crab Fisheries

Historically, the Aleutian Island golden king crab fisheries had far fewer participants than the Bristol Bay red king crab and Bering Sea snow crab fisheries. Seasons in these golden king crab fisheries also lasted several months, in contrast to seasons shorter than one month in the Bristol Bay red king and Bering Sea snow crab fisheries. As a result, ex-vessel pricing practices differed substantially in the Aleutian Islands golden king crab fisheries.

Longer seasons in the Aleutian Islands golden king crab fisheries allow for substantial in-season price fluctuations, which are uncommon in the short season fisheries. The long seasons with fluctuating prices complicate collective negotiation of ex-vessel prices by participants in the Aleutian Islands golden king crab fisheries. Traditionally, harvesters in these fisheries negotiated prices independently. Only in the last few years of LLP management did some harvesters use collective action to negotiate ex-vessel prices.

9.2.2 Delivery Terms Under the CR Program

Several aspects of the structure of the CR Program have affected delivery terms and pricing since the implementation. The different catcher vessel IFQ types (Class A IFQ v. Class B and C share IFQ) may bring different prices because of the different limitations on use of those shares and the effects of the

arbitration system on Class A IFQ landing prices. Class A IFQ must be delivered to a holder of unused IPQ and are subject to the arbitration system, which guides both delivery negotiations and price formation. Class B and C share IFQ may be marketed and sold freely to any registered crab receiver (RCR). Moreover, negotiations of prices and terms of delivery are likely to occur independently for the different share types to avoid potential infractions of the statute that prohibits processors from using IPQ to leverage Class B IFQ deliveries. That statute specifically provides:

If the Secretary determines that a processor has leveraged its Individual Processing Quota shares to acquire a harvester[']s open-delivery 'B shares', the processor's Individual Processor Quota shares shall be forfeited.

For these reasons, the price setting and delivery terms for Class A IFQ are discussed separately from those for Class B and C share IFQ. This section begins with a detailed discussion of pricing of Class A IFQ landings (including the Arbitration System). The section concludes with a discussion of landings of Class B and C share IFQ and distributional issues related to the use of those shares.

9.2.2.1 The Arbitration System for A Shares

The Arbitration System (or System) is a component of the CR Program that serves several important purposes, including: dissemination of market information to facilitate negotiations, the coordination of matching Class A IFQ held by harvesters to IPQ held by processors, and the opportunity to use the binding arbitration process to resolve terms of delivery. Certain aspects of the Arbitration System are required of CVO and PQS holders and operate regardless of whether participants in the fishery actually initiate binding arbitration in order to resolve terms of price or delivery. The Arbitration System is designed to minimize antitrust risks for crab harvesters and processors.

Most of the Arbitration System is regulated through private contracts among QS/IFQ holders and PQS/IPQ holders through mandatory Arbitration Organizations (AOs). These organizations are parties to the contracts that define and govern the share matching and Arbitration System. They are responsible for establishing the administrative aspects of the Arbitration System, including selecting arbitrators, coordinating the dissemination of information concerning uncommitted shares among the participants, ensuring confidentiality of sensitive information, and collecting payments that are disbursed to cover program costs. All CVO share holders and PQS holders are required to join an arbitration organization by May 1st of each year.⁶⁰ NOAA Fisheries will not issue IFQ or IPQ in a program fishery until arbitration organizations representing enough QS and PQS holders to account for at least 50% of the A share QS and 50% of the PQS issued for a fishery select the market analyst, formula arbitrator and a pool of contract arbitrators, and notify NOAA Fisheries of their selection. This requirement is intended to ensure that the Arbitration System is in place prior to the start of the fishery.

⁶⁰ Holders of exclusively catcher processor shares are exempt from the requirement of arbitration organization membership because they are not subject to the processor landing requirements. In addition, C share holders are exempt from the requirement because the IPQ landing requirements do not apply to C shares. B Class shares also do not have IPQ landing requirements; however, those who hold B Class CVO also hold A Class CVO, therefore they would be required to join an arbitration organization for their A Class shares. Regulations call A Class IFQ held by harvesters not affiliated with a PQS holder "arbitration IFQ". These "Arbitration IFQ" are the only IFQ for which delivery terms may be arbitrated.

Since the arbitration organizations serve primarily an administrative function, share holders are able to achieve efficiencies through joining a common organization without compromising their competitive position or operational aspects of their businesses. After the first year all unaffiliated harvesters joined a single organization. Separate organizations are required for harvest share holders and processing share holders. Holders of harvest shares that are affiliated with holders of processing shares are required to join an arbitration organization for purposes of facilitating share matching and administration. Due to antitrust concerns, these “affiliated harvesters” are not permitted to join an organization that includes unaffiliated harvesters and are not permitted to use a binding arbitration proceeding to settle terms of delivery. In each of the first ten years of the program, a single organization formed for processor share holders and a single organization formed for processor-affiliated harvester share holders.

9.2.2.1.1 The Market Report and Price Formula

The Arbitration System begins with dissemination of information. The two sectors (harvesters and processors) jointly select a “market analyst,” who produces a market report, a “formula arbitrator,” who develops a price formula specifying an ex-vessel price as a portion of the first wholesale price. The two sectors (i.e. the Arbitration Organizations) also choose a pool of “contract arbitrators,” who preside over any binding arbitration proceedings.

The price formula is an important pre-season report that is intended to inform negotiations and the binding arbitration process by a general application of the arbitration standard (identified and discussed in Section 9.2.2.1.2). The market report is intended to provide baseline information concerning the market and a signal of a reasonable price. Neither the market report, nor the formula price, has any binding effect. Instead, they are intended to provide baseline information concerning the market and a signal of a reasonable price. These market reports and the price formula has served as the starting point for price negotiations.

The market report and formula price are required to be released at least 50 days prior to the season opening. The market analyst and formula arbitrator (who may be the same person) generate the market report and formula price, respectively, based on any relevant information, which may include information received from IFQ holders and IPQ holders. After the first year of the CR Program, a single analyst (analytical team) has prepared all market reports and price formulas.

An amendment passed in 2011 (80 FR 15891), now allows the arbitration organizations to determine the timing and content of the market report. This amendment allows the report and any supplements to be prepared mid-season to provide current market information. Given the contentious price negotiations in the crab fisheries in the past, the opportunity for unbiased, up-to-date market information is beneficial to negotiations. No single price reported in these market reports should determine the ex-vessel price (unless specifically agreed to by the parties to that transaction). Instead, periodic price information, along with other relevant information concerning market prices, should be interpreted in the broad scope of the markets to arrive at an appropriate ex-vessel price. The report may rely only on publicly available information to ensure that it is not used for anticompetitive purposes.

In the first year of the program, the price formula report for Aleutian Islands golden king crab recommended a staged price setting process. Under this approach, harvesters receive an advance, guaranteed minimum

price at the time of landing based on prevailing market prices at the time of the report. At the end of the season, a price adjustment is made based on average first wholesale prices for the year. This formulation was suggested to put market risk on processors. The report suggested that this starting price would present a risk of loss to processors only in years of very steeply declining market conditions. This approach to pricing has been followed in negotiations in most program fisheries to date, but has not been suggested in any of the other non-binding price formulas. The approach has also not been part of any binding arbitration proceeding. Instead, harvesters have negotiated for a minimum price paid at landing prior to beginning fishing.

9.2.2.1.2 Application of the Arbitration Standards

To ensure predictability and fairness, the Arbitration System sets forth standards to be followed by formula arbitrators and contract arbitrators. They are both intended to “establish a price that preserves the historical division of revenues in the fishery” while considering several factors. The specific standards applicable to the two different arbitrators are described in regulations at 80 CFR 680.20(g)(2) and at 80 CFR 680.20(h)(4) (with substantive differences bolded):

-
- (2) **The contract with the Formula Arbitrator must specify that:**
- (i) **The Formula Arbitrator will conduct a single annual fleet-wide analysis of the markets for crab to establish a Non-Binding Price Formula under which a fraction of the weighted average first wholesale prices for crab products from the fishery may be used to set an ex-vessel price; and**
 - (ii) The Non-Binding Price Formula shall:
 - (A) Be based on the historical distribution of first wholesale revenues between fishermen and processors in the aggregate based on arm’s length first wholesale prices and ex-vessel prices, taking into consideration the size of the harvest in each year; and
 - (B) Establish a price that preserves the historical division of revenues in the fishery while considering the following:
 - (1) Current ex-vessel prices, including ex-vessel prices received for crab harvested under Class A, Class B, and CVC IFQ permits;
 - (2) Consumer and wholesale product prices for the processing sector and the participants in arbitrations (recognizing the impact of sales to affiliates on wholesale pricing);
 - (3) Innovations and developments of the harvesting and processing sectors and the participants in arbitrations (including new product forms);
 - (4) Efficiency and productivity of the harvesting and processing sectors (recognizing the limitations on efficiency and productivity arising out of the management program structure);
 - (5) Quality (including quality standards of markets served by the fishery and recognizing the influence of harvest strategies on the quality of landings);
 - (6) The interest of maintaining financially healthy and stable harvesting and processing sectors;
 - (7) Safety and expenditures for ensuring adequate safety;
 - (8) Timing and location of deliveries; and
 - (9) The cost of harvesting and processing less than the full IFQ or IPQ allocation (underages) to avoid penalties for overharvesting IFQ and a mechanism for reasonably accounting for deadloss.
 - (C) **Include identification of various relevant factors such as product form, delivery time, and delivery location.**
 - (D) **Consider the “highest arbitrated price” for the fishery from the previous crab fishing season, where the “highest arbitrated price” means the highest arbitrated price for arbitrations of IPQ and Arbitration IFQ which represent a minimum of at least 7 percent of the IPQ resulting from the PQS in that fishery. For purposes of this process, the Formula Arbitrator may aggregate up to three arbitration findings to collectively equal a minimum of 7 percent of the IPQ. When arbitration findings are aggregated with 2 or more entities, the lesser of the arbitrated prices of the arbitrated entities included to attain the 7 percent minimum be considered for the highest arbitrated price.**
-

(4) Basis for the Arbitration Decision.

The contract with the Contract Arbitrator shall specify that the Contract Arbitrator will be subject to the following provisions when deciding which last best offer to select.

- (i) The Contract Arbitrator's decision shall:
- (A) Be based on the historical distribution of first wholesale revenues between fishermen and processors in the aggregate based on arm's length first wholesale prices and ex-vessel prices, taking into consideration the size of the harvest in each year; and
 - (B) Establish a price that preserves the historical division of revenues in the fishery while considering the following:
 - (1) Current ex-vessel prices, including ex-vessel prices received for crab harvested under Class A IFQ, Class B IFQ, and CVC IFQ permits;
 - (2) Consumer and wholesale product prices for the processing sector and the participants in the arbitration (recognizing the impact of sales to affiliates on wholesale pricing);
 - (3) Innovations and developments of the harvesting and processing sectors and the participants in the arbitration (including new product forms);
 - (4) Efficiency and productivity of the harvesting and processing sectors (recognizing the limitations on efficiency and productivity arising out of the management program structure);
 - (5) Quality (including quality standards of markets served by the fishery and recognizing the influence of harvest strategies on the quality of landings);
 - (6) The interest of maintaining financially healthy and stable harvesting and processing sectors;
 - (7) Safety and expenditures for ensuring adequate safety;
 - (8) Timing and location of deliveries; and
 - (9) The cost of harvesting and processing less than the full IFQ or IPQ allocation (underages) to avoid penalties for overharvesting IFQ and a mechanism for reasonably accounting for deadloss.
 - (C) Consider the Non-Binding Price Formula established in the fishery by the Formula Arbitrator.**
-

The arbitration standard applies to the development of the price formula through four general components. First, the formula arbitrator is required to establish a price that preserves the historic division of first wholesale revenues between harvesters and processors. The price formulas in the different fisheries generally attempt to derive the average historic division of first wholesale revenues from price information from 1990 until the season preceding the implementation of the CR Program (2004 in all fisheries except the Bering Sea snow crab fishery which had a 2005 season under the LLP management). Second, in developing this price, the arbitrator must consider several factors, including current ex-vessel, consumer, and wholesale prices, innovations and developments, efficiency and productivity, quality, and financial health and stability. Third, the arbitrator must identify factors relevant to price determination, including delivery timing and location; however, the arbitrator is not required to consider these factors in setting the price. Fourth, the arbitrator is required to consider the "highest arbitrated price" from the previous season.

Given the array of directions that an arbitrator is given in establishing a price formula, it is not surprising that some confusion arose in the early interpretation and application of the standard. However, a review of the record of the standard's development indicates that establishing a price that preserves the historical division of revenues was a primary consideration.

Moreover, while both formula and contract arbitrators are instructed to consider any relevant information presented by the parties, associated cost of business are not included in the list of considerations that qualify. This was a deliberate exclusion by the Arbitration Workgroup, a group formed to aid the process of establishing the system, understanding there could be an incentive to artificially inflate costs in order to secure a higher percentage of the first whole sale value. However, processing sector representatives have recently testified to the costs associated with a recent series of increases in the Alaska minimum wage (John Iani, personal communications, 4/4/2016). Processor representatives have contended that this increased cost of business is unlike other business expenses, in that it is imposed by Alaska Statute across the whole sector. Currently, the resulting additional costs are being wholly absorbed by the processing sector.

An additional concern that has been identified with the application of the arbitration standard to price setting is the potential disincentive for processors to aggressively market their products. As the formula arbitrator has observed, if the formula is applied by solely dividing the first wholesale revenues between harvesters and processors the incentive for a processor to take risks associated with more expensive market opportunities (such as developing new markets or holding product to time sales most advantageously) will be diminished greatly, and possibly fully removed. For example, if a formula returns only 30% of the first wholesale revenues to a processor, a processor would realize no additional return from a product that costs 30 additional cents to produce and sells for an additional dollar. At the extreme, a processor could pre-sell all of its production (i.e., contract for its sale prior to the season) to remove all risk. Although this practice may seem inappropriate, in some circumstances it may benefit all parties (i.e., if market prices fall, a pre-season sale could bring the best price). Yet, the potential distortion of market incentives displayed by these types of sales may be problematic in some circumstances. Given the uncertainty concerning the application of the standard to these and similar circumstances, a processor may be deterred from making additional investments to serve higher risk or cost markets, in the absence of an agreement with a harvester concerning the division of any revenues from sales.

9.2.2.1.3 Share Matching

The share matching process of Class A IFQ with IPQ is facilitated through a process of share commitments and dissemination of information concerning available shares. For a 5-day period starting when IFQ and IPQ are issued, shares are matched only by mutual agreement of share holders. After that period has expired, shares may be matched either by agreement or by unilateral commitment of the IFQ holder. Throughout, holders of uncommitted IPQ are required to report the amount of uncommitted shares held to holders of uncommitted IFQ (updating that report within 24 hours of any change).

Although this share matching process may aid in establishing commitments to deliver and receive Class A IFQ landings, the terms of those transactions may be still be disputed (i.e., the commitments need not define the terms of the delivery). If the parties are unable to negotiate terms, the binding arbitration procedure may be used to resolve those terms.

To aid in meeting the share matching timeline, the harvester arbitration organization has developed an internet-based system for matching shares—sharematch.com—to facilitate real time commitment of shares and the timely exchange of information concerning uncommitted shares. This system has benefited participants by creating a single forum for commitment of shares.

9.2.2.1.4 Initiating Binding Arbitration

An IFQ holder that is not able to resolve all terms of delivery with a processor to whom it has committed deliveries may unilaterally initiate an arbitration proceeding. The process for initiating a binding arbitration proceeding is coordinated with share matching. The window for initiating arbitration is 10 days long, beginning 5 days after the allocation of IFQ and IPQ; the period during which harvesters may unilaterally commit IFQ to a processor. Once an arbitration proceeding is initiated with an IPQ holder, any holder of IFQ that has committed shares to that IPQ holder may join the arbitration proceeding, as long as they are a member of the same Fishery Collective Marketing Act (FCMA) cooperative. Processors may not initiate

arbitration. Once a proceeding is initiated, harvesters that are party to the proceeding select an arbitrator to preside over the specific proceeding from the pool of arbitrators jointly selected earlier. This ability to join is critical because the system limits each processor to a single arbitration proceeding. A last opportunity to make use of arbitration is available for harvesters that choose not to join a proceeding.

Binding arbitration proceedings are conducted on a “last best offer” basis. Under this system, each party to the proceeding submits a “last best offer”. The role of the arbitrator is to select one offer from the two competing offers. In binding arbitration involving two or more harvesters, each harvester may either submit an independent offer or join a collective offer (as part of a FCMA cooperative). The processor submits a single offer. For each harvester offer, the arbitrator’s role is to select either that harvester’s offer or the processor’s offer (which applies to all harvesters). After arbitration is completed, any holder of uncommitted IFQ can bind the IPQ holder to the terms of the proceeding by committing deliveries to the IPQ holder.

Since the full effects of the program on the timing of fishing and marketing activities were not predictable, the Arbitration System allows participants to modify the arbitration timeline. This “lengthy season” approach allows IFQ and IPQ holders that have committed deliveries to negotiate a modified schedule for arbitration. After the window for initiating arbitration has closed, if a holder of Class A IFQ has not either initiated a proceeding or adopted the ‘lengthy season approach,’ the ability to access the arbitration system is effectively forfeited. If the parties are unable to agree on the lengthy season approach, they may arbitrate whether to adopt that approach and the timing of the proceeding. Agreements to use the lengthy season approach to arbitration must be entered into prior to the opening of a program fishery.

All participants who have used the binding arbitration process have relied on the lengthy season approach, whereby arbitration proceedings are delayed until a time during the crab fishing year. Use of this approach has relieved the time pressure under the standard arbitration timeline and has allowed participants to negotiate with more complete market information. Lengthy season approach discourages a situation where harvesters refuse to fish until terms and delivery price is negotiated because details can still be contested. On the other hand, occasionally the proceedings have been delayed well into the following season. Some processors contend that the reliance on the lengthy season approach (particularly, if arbitration is delayed beyond the season end) unduly burdens processors by preventing them from timely reconciling their books. The few instances where harvesters have initiated arbitration on whether to use the lengthy season approach, it is likely that these cases have primary been to contest the timing of the lengthy season approach (Joe Sullivan, personal communications, 5/10/16).

9.2.2.1.5 Price Formula in Crab Fisheries

Many participants view the price formula as not only the starting point for negotiations, but the driver of delivery terms for Class A IFQ landings in the program fisheries. Challenges in attempting to represent historic division of first wholesale versus ex-vessel revenue in the price formula arise in fisheries that have had closed seasons in the historic basis years (such as the Bering Sea Tanner crab fisheries) and fisheries that experienced variability in the first wholesale versus ex-vessel split (such as Bristol Bay red king crab and Bering Sea snow crab fisheries).

Table 8-1 through Table 8-3 show the first wholesale prices and ex-vessel prices in the Bristol Bay red king crab, Bering Sea snow crab, and Aleutian Islands golden king crab fisheries from 1998 through 2014/2015. Ex-vessel prices were obtained from COAR Reports and fish tickets. Fish tickets typically show payments at the time of landing, while COAR data generally include post-landing bonuses. In the COAR database, the location of the processor that purchased the fish is recorded by ADFG regulatory area, but harvest location is not reported. Crab harvested in one regulatory area may be sold to a processor in another area. Consequently, data for the Aleutian Islands golden king crab and red king crab include deliveries from the Norton Sound red king crab fishery and relatively small fisheries in southeast Alaska. The Bering Sea snow crab fishery is the only snow crab fishery in the state; therefore, those data are solely from the Bering Sea fishery.

The tables also show the ex-vessel price as a percentage of first wholesale price generated by the formula arbitrator. The tables display only first wholesale prices for shellfish sections, which is consistent with the methodology followed by the formula arbitrator. Focusing on shellfish sections simplifies the analysis, as the prices of other products would have to take into account differences in recovery rates. In addition, shellfish sections represent a large majority of the production from program fisheries (both historically and currently) and generally provide a good overall measure of the change in markets for crab. A future change in product types could require a change in application of the price formula.

Table 9-6 First wholesale prices and ex-vessel prices in the BBR (1998 through 2014/15)

Fishery	Season	GHL/TAC	First wholesale price	COAR ex vessel price	COAR ex vessel percentage of first wholesale price	Percentage from formula arbitrator's report
BBR	1998	15.800	5.52	2.63	47.64%	47.6%
	1999	10.127	11.25	6.25	55.56%	55.7%
	2000	7.724	9.11	4.74	52.03%	52.7%
	2001	6.600	8.93	4.83	54.09%	55.1%
	2002	8.575	11.58	6.21	53.63%	53.5%
	2003	14.535	9.82	5.14	52.34%	52.5%
	2004	14.300	9.25	4.69	50.70%	51.4%
	2005/2006	16.496	8.52	4.5	52.82%	
	2006/2007	13.974	7.49	3.85	51.40%	
	2007/2008	18.335	8.6	4.42	51.40%	
	2008/2009	18.328	9.77	5.11	52.30%	
	2009/2010	14.408	8.96	4.75	53.01%	
	2010/2011	13.355	13.76	7.3	53.05%	
	2011/2012	7.051	17.82	10.57	59.32%	
2012/2013	7.068	14.99	7.9	52.70%		
2013/2014	7.740	12.63	6.81	53.92%		
2014/2015	8.987	11.58	6.75	58.29%		

Source: ADF&G Commercial Operators Report

Notes: Wholesale price is reported for shellfish sections and includes all red king crab fisheries (including state level fisheries) because COAR reports do not indicate harvest location. Ex-vessel price includes all red king crab fisheries

(including state level fisheries) because COAR reports do not indicate harvest location. GHL (TAC from 2005 forward) in millions of pounds for Bristol Bay fishery only.

Table 9-7 First wholesale prices and ex-vessel prices in the BBS (1998 through 2014/15)

Fishery	Season	GHL/TAC	First wholesale price	COAR ex vessel price	COAR ex vessel percentage of first wholesale price	Percentage from formula arbitrator's report
BSS	1998	225.91	2.03	0.57	28.08%	28.1%
	1999	186.2	2.92	0.98	33.56%	33.6%
	2000	26.3625	4.16	1.85	44.47%	44.5%
	2001	25.2525	3.73	1.55	41.55%	41.3%
	2002	28.51	3.58	1.39	38.83%	38.6%
	2003	23.69	4.4	1.85	42.05%	42.0%
	2004	19.269	4.79	2.07	43.22%	43.2%
	2005	19.362	3.85	1.81	47.01%	47.0%
	2006/2007	33.4656	2.89	1.15	39.79%	
	2007/2008	32.9094	3.93	1.74	44.27%	
	2008/2009	56.7306	4.05	1.77	43.70%	
	2009/2010	52.695	3.43	1.45	42.27%	
	2010/2011	43.2153	3.27	1.31	40.06%	
	2011/2012	48.8529	5.35	2.54	47.48%	
	2012/2013	80.0046	4.73	2.21	46.72%	
2013/2014	59.715	4.97	2.29	46.08%		
2014/2015	48.5847	5.23	2.37	45.32%		

Source: ADF&G Commercial Operators Report.

Notes: Wholesale price is reported for shellfish sections. GHL (TAC from 2005 forward) in millions of pounds.

Table 9-8 First wholesale prices and ex-vessel prices in the AIG (1998 through 2014/15)

Fishery	Season	GHL/TAC	First wholesale price	COAR ex vessel price	COAR ex vessel percentage of first wholesale price	Percentage from formula arbitrator's report
AIG	1998	5.4	4.24	1.97	46.46%	45.0%
	1999	5.4	6.89	3.15	45.72%	46.6%
	2000	5.4	7.2	3.31	45.97%	58.9%
	2001	5.4	6.95	3.37	48.49%	48.1%
	2002	5.4	7.58	3.46	45.65%	46.2%
	2003	5.4	7.89	3.62	45.88%	45.7%
	2004	5.4	6.02	3.15	52.33%	52.2%
	2005	4.86	6	2.89	48.17%	46.4%
	2006/2007	4.86	4.35	2.18	50.11%	
	2007/2008	4.86	5.55	2.43	43.78%	
	2008/2009	5.103	6.94	3.7	53.31%	
	2009/2010	5.103	5.37	2.68	49.91%	
	2010/2011	5.103	8.08	3.9	48.27%	
	2011/2012	5.103	11.22	5	44.56%	
	2012/2013	5.364	8.5	4.31	50.71%	
	2013/2014	5.364	8.64	4.4	50.93%	
2014/2015	5.364	9.22	4.37	47.40%		

Source: ADF&G Commercial Operators Report

Notes: Wholesale price is reported for shellfish section and includes all golden king crab fisheries (including state level fisheries) because COAR reports do not indicate harvest location. Ex-vessel price includes all golden king crab fisheries (including state level fisheries) because COAR reports do not indicate harvest location. GHL (TAC from 2005 forward) in millions of pounds for East and West Aleutian Islands.

9.2.2.1.6 Use of Arbitration under CR Program

Arbitration events have generally occurred less over the more recent years of the CR Program. This could be both due to resolved issues, fine-tuning price formulas, and arbitration related amendments. It could also be due to more predictable understanding of the likely outcome; and therefore a willingness to settle terms outside of arbitration. Table 9-9 includes a summary of arbitration events pulled from proceedings and included in NMFS Alaska Region RAM annual management report (2012). This is augmented with further recent records. It is possible this table is not all inclusive of arbitration events. In recent years many of the arbitration proceedings have involved the Western Aleutian Islands golden king crab fishery. Representatives of the harvesting and processing sectors have noted issues about the Arbitration System they consider compromises, but in general, representatives of both sectors perceive the system to add predictability and stability to the price-setting and delivery process (John Iani, personal communications, 4/4/2016; Joe Sullivan, personal communications, 5/10/16).

Table 9-9 Arbitration Proceedings, 2005/2006 through 2014/2015

Season	Number of Proceedings	Fishery	Issue	Outcome
2005/06	2	BSS, BST	Crab costs/ delivery terms	Contract arbitrators selected harvesters' offers.
2006/07	5	BBR, BSS, WBT, WBT	Crab costs/ delivery terms	Contract arbitrators selected harvesters' offers.
2007/08	2	All fisheries	Procedural: clarify specific timing of price dispute resolutions	Lengthy season approach selected; no further arbitration to resolve price, quality, or other disputes.
2008/09	1	BBR	Procedural: Crab costs/ delivery terms	An issue of a processor's use of a two-tier price structure was settled and a price issue was resolved in favor of the harvester.
2009/10	3 (1 dispute)	AIG, BSS	Procedural (golden king crab); Crab costs/ delivery terms	For the golden king crab fishery, arbitrators selected a later lengthy season arbitration filing date. For the snow crab fishery, contract arbitrators selected the processor's offer.
		AIG	Crab costs/ delivery terms	Two post-season crab costs and terms of delivery disputes: one settled outside of arbitration, and arbitrators resolved issues in favor of harvester.
2010/11	1 (2 disputes)	AIG	Crab costs/ delivery terms	Arbitrators selected the processor's offer for WAG crab.
		AIG	Crab costs/ delivery terms	WAG price and terms of delivery dispute settled outside of arbitration.
2011/12	2 disputes (number of proceedings unknown)	AIG	Crab costs/ delivery terms	Outcome unknown
2012/13				
2013/14	1	AIG	Crab costs/ delivery terms	Arbitrators selected the harvester's offer for WAG.
2014/15				

Source: NMFS Alaska Region RAM annual management report (2012)

9.2.2.2 Delivery Terms for B and C Class QS

Since 90% of the annual IFQ allocation is made up of A shares, the distribution of benefits between harvesters and processors under the rationalization program has in large part depended on the distribution of benefits from landings of Class A IFQ. In developing the program, however, the Council included 10% of the annual catcher vessel owner IFQ allocation as B shares, which may be landed with any registered crab receiver (RCR). To ensure that the benefit of the B share allocation to independent harvesters is not diminished by vertical integration, B shares are issued only to QS holders to the extent of their independence of processor affiliation.⁶¹ In addition, C share IFQ, available to be held by active crew in the fisheries, are free from processor share landing requirements and may be landed with any RCR.

In the first year of the program, harvesters had some difficulty adjusting to the IPQ landing requirements on Class A IFQ. These complications led many harvesters to use Class B IFQ to address logistical complications arising because of the landing limitations on Class A IFQ.⁶² Although harvesters have adapted to the program, this practice still occurs at times in the current fisheries. Since the first few years of the program, many harvesters have learned to use their cooperative associations to pool Class B IFQ to be marketed separately from Class A IFQ. Thus, at times, harvesters can increase competition for their Class B IFQ landings.

Vessel-level data distinguishing ex-vessel prices by IFQ Class, as well as anecdotal evidence, suggest that harvesters have been able to gain a premium for landings of Class B and C IFQ catch over landings of Class A IFQ. Table 9-10 displays aggregate ex-vessel revenue and pounds by QS Class for the Bering Sea snow crab and Bristol Bay red king crab fisheries over the 2006 to 2014 period. This table also demonstrates the unweighted average price per pound for each Class category, and the price per pound difference for landings of Class B and C IFQ, relative to Class A. Using the “unweighted average” means the analysts divided total gross revenues across all vessels, by the total pounds landed across all vessels (both values which are presented in Table 9-10), rather than the “weighted average” which would imply the average price per pound was calculated at the individual vessel level and then an average of these averages was produced.⁶³

⁶¹ Affiliation under the regulation exists in the case of either functional control of the QS holder or common ownership in excess of 10% (50 CFR 680.2). QS holders receive Class A IFQ in an amount equal to the IPQ allocation of their affiliates, with any remainder subject to the Class A IFQ/Class B IFQ split.

⁶² In some cases, harvesters landed small amounts of Class B IFQ with deliveries of Class A IFQ, effectively rounding out the trip. These harvesters believed that it is more efficient to fully harvest and deliver their Class A IFQ allocations with a minor overage that is covered by Class B IFQ, rather than risk a minor underage that might require an additional delivery to a processor. Harvesters clearly gain some efficiencies from this practice, but it does limit their ability to competitively market Class B IFQ landings. In other cases, harvesters used almost exclusively Class B IFQ to cover deadloss. Both of these practices are believed to have declined since the first year of the program.

⁶³ Using the unweighted average in this case, is in contrast to weighted average prices reported elsewhere in this document. The unweighted average provides a more direct indicator of vessel-level price differentials for landings on different IFQ types. The weighted average tends to confound the differential in price by IFQ type realized by delivering vessels with price differences between vessels' relative volume of landings. Weighted average prices (not shown) produce the same general result of price premiums for Class B and C IFQ landings, but of somewhat smaller magnitude than indicated by the unweighted average. This may suggest that vessels that pursue the largest share of total landings have less effectively captured potential market premia for landings that are exempt from share-matching requirements.

These results indicate a general tendency toward a price premium for landings of B and C Class IFQ over A Class IFQ. Table 9-10 demonstrates premia of 0% to 5% (averaging 2%, or \$0.17/pound) on Bristol Bay red kings crab Class B IFQ landings, and 1% to 8% (average 3%, or \$0.20/pound) on Class C IFQ landings between 2006 and 2014.⁶⁴ Premia for Bering Sea snow crab B and C Class IFQ landings have been somewhat larger in percentage terms, averaging 4% (\$0.09/pound) and 5% (\$0.10/pound) respectively, over the same period.

During the last 3 years, the price premium for Class B Bristol Bay red kings crab landings and both Class B and C Bering Sea snow crab IFQ landings have been relatively strong (higher than the 9-year averages), but there has been considerable variation from year-to-year and it is difficult to discern a clear directional trend in the relative size of price premia harvesters have been able to gain.

Data summarized Table 9-10 represent vessel-level reporting of total annual ex-vessel revenue and landing volume by IFQ type, and do not account for in-season variation or between crab buyers, or other potential sources of price variability. As discussed in Section 5.4 of this review (see Figure 5-8), there is a fairly consistent time lag in Class B and C IFQ landings relative to Class A IFQ. This lag has been relatively pronounced in the Bering Sea snow crab fishery during the last 4 seasons. The benefit of operational flexibility it provides is itself incentive to retain Class B and C IFQ until later in the season, but the delay may also be part of a strategy for negotiating higher ex-vessel prices. There is also anecdotal evidence that harvesters use commitment of B and C share landings as a mechanism to negotiate with buyers for higher prices for A Class landings. This would result in smaller explicit premia for B- and C share landings, but would nonetheless be evidence that the share-matching exemption provides a market advantage to harvesters. Attributing the price differentials shown in Table 9-10 to such a market advantage for harvesters as a result of B and C Class IFQ is tenuous without a more controlled statistical analysis of price variation across vessels and over time. The magnitude and consistency with which a premium has occurred, however, is strong evidence that at least some harvesters have used this element of the IFQ system to effectively gain a market advantage.

⁶⁴ The difference between ex-vessel prices for Class A IFQ landings and Class B and C share IFQ landings are likely the best available information for valuing IPQ and PQS. The value of an annual IPQ pound is the difference between the Class A IFQ/IPQ landings price and Class B and C share IFQ landings price. The value of PQS is the discounted stream of savings on the yielded IPQ ex-vessel price payments as compared to price payments for the same quantity of Class B or C share IFQ landings. As with QS, PQS values may be discounted from these levels to accommodate TAC and market uncertainties.

Table 9-10 Average ex-vessel price by IFQ type in BBR and BSS fisheries, 2006 through 2014

Fishery	Year	CVO Class A IFQ landings			CVO Class B IFQ landings			Crew share IFQ landings			Price difference from CVO Class A	
		Revenue (\$million)	Pounds (million)	Average Price/lb	Revenue (\$million)	Pounds (million)	Average Price/lb	Revenue (\$million)	Pounds (million)	Average Price/lb	CVO Class B	Crew share
BBR	2006	\$50.37	11.51	\$4.37	\$5.44	1.22	\$4.43	\$2.30	0.53	\$4.43	1%	1%
	2007	\$72.02	14.59	\$4.95	\$8.11	1.59	\$5.12	\$2.55	0.49	\$5.16	3%	4%
	2008	\$81.12	14.37	\$5.62	\$11.87	2.07	\$5.62	\$1.88	0.33	\$5.67	0%	1%
	2009	\$58.62	11.62	\$5.04	\$6.76	1.31	\$5.15	\$2.35	0.45	\$5.16	2%	2%
	2010	\$83.78	10.68	\$7.83	\$10.07	1.26	\$8.03	\$4.21	0.54	\$8.43	3%	8%
	2011	\$62.50	5.75	\$11.02	\$7.21	0.68	\$11.15	\$1.80	0.17	\$11.14	1%	1%
	2012	\$47.14	5.76	\$8.19	\$5.72	0.67	\$8.44	\$1.71	0.20	\$8.45	3%	3%
	2013	\$45.03	6.26	\$7.18	\$5.96	0.79	\$7.56	\$1.51	0.20	\$7.51	5%	5%
	2014	\$46.17	6.89	\$6.71	\$6.30	0.90	\$6.93	\$1.63	0.24	\$6.77	3%	1%
BSS	2006	\$33.14	26.02	\$1.28	\$3.61	2.73	\$1.32	\$1.10	0.84	\$1.30	4%	2%
	2007	\$47.58	24.97	\$1.90	\$5.04	2.61	\$1.92	\$1.57	0.84	\$1.93	1%	1%
	2008	\$80.83	42.87	\$1.87	\$11.69	5.85	\$2.00	\$2.99	1.48	\$2.01	7%	7%
	2009	\$63.76	40.55	\$1.55	\$6.76	4.16	\$1.61	\$2.16	1.26	\$1.68	3%	8%
	2010	\$45.40	33.05	\$1.37	\$5.06	3.58	\$1.41	\$1.83	1.29	\$1.43	3%	4%
	2011	\$99.10	37.23	\$2.81	\$12.03	4.22	\$2.84	\$2.93	1.06	\$2.82	1%	0%
	2012	\$140.54	63.49	\$2.22	\$15.44	6.54	\$2.33	\$6.61	2.73	\$2.40	5%	8%
	2013	\$114.36	49.07	\$2.34	\$13.37	5.38	\$2.49	\$4.59	1.84	\$2.50	7%	7%
	2014	\$93.33	39.39	\$2.39	\$11.19	4.33	\$2.62	\$3.61	1.39	\$2.60	10%	9%

Source: NMFS AFSC BSAI Crab Economic Data Report (EDR) database

Notes: Dollar values are inflation adjusted to 2014-equivalent value. Average price per pound is calculated as the unweighted arithmetic mean over vessel-level ex-vessel value per pound of crab landed by IFQ type, as reported in EDR data. The unweighted average price represents a closer comparison of price by IFQ type than the average weighted by pounds landed, and indicates a larger premium for B Class and Crew share IFQ than the weighted mean (equivalent to dividing the fleet total revenue by total pounds, which weights prices reported by vessels with higher volume of landings relative to vessels with lower volume). Some outlier ex-vessel revenue and volume observations were censored in calculating results shown in the table.

10 ENTRY OPPORTUNITIES

Increased barriers to entry represent a trade-off when fisheries management seeks to mitigate over-capitalization in a fishery. Whether it be through allocations of limited entry permits or of harvesting/processing privileges, when allocations are distributed based off of historical participation there will be differentiated accessibility to the fisheries between initial quota issues and non-initial recipients.

This section examines entry opportunities to the crab fisheries and how those opportunities changed under the CR Program and in the past five years. For purposes of this review, “entry” into the CR fisheries is considered in terms of investment in an LLP or QS/ PQS, with or without ownership of an interest in a vessel. The section begins with a brief discussion of harvester entry opportunities under the LLP, which preceded the CR Program, followed by a discussion of entry opportunities under the CR program, including entry into the harvest sector as well as a concluding section on entry into the processing sector.

This section relies on some quantitative data of QS transfer, but primarily focuses on a qualitative narrative to describe changes in access to the CR Program fisheries. This section is accompanied by perspectives of industry participants on access to quota shares, new entry, and upward mobility to provide further context to noted trends. These perspectives were collected through interviews with quota shareholders, vessel

owners, skippers and crew that are were participating in the crab fisheries in 2014 (Himes-Cornell 2015) and 2015 (Himes-Cornell and Legendre-Fixx unpublished data).⁶⁵

⁶⁵ AFSC conducted two phases of interviews with Bering Sea crab fisheries participants. In 2014, an effort was made to interview the population of individuals currently participating in the BSAI crab fisheries (see Himes-Cornell 2015 for more details). The target population included all individuals that participated in or were knowledgeable about harvesting activities during the 2012-2013 fishing season. Stakeholders of the crab fisheries were categorized into several groups based on their experience with the fisheries, including: quota shareholders, vessel owners, skippers, crew, representatives of Alaska's Community Development Quota program groups and expert respondents (e.g., individuals involved with lending, advocacy, and related activities specific to the BSAI crab fishery). These categories of participants are not mutually exclusive (i.e. some entities are both QS holders and vessel owners), therefore there is redundancy between these categories.

Ultimately, AFSC conducted in-depth, semi-structured interviews with 220 individuals (139 quota shareholders, 53 vessel owners, 53 skippers and 49 crew and an additional 18 key informants). Overarching topics included participants' history in the BSAI crab fisheries and their experience with and opinions about absentee ownership, crew compensation, and lease rates. Interviewees were also asked to explain how they view the future of the crab fisheries. Many interviewees specifically brought up barriers to new entrants and upward mobility in the BSAI crab fisheries before and after rationalization was put into effect.

Given the frequency of interviewees that brought up these topics and the NPFMC's interest in the topic as well, a round of follow-up interviews was conducted in 2015 with individuals that gave significant information on their experience with new entry and upward mobility in their 2014 interview. A total of 39 individuals were contacted, 15 of which were ultimately interviewed. AFSC contacted individuals that had participated extensively in the crab fisheries before rationalization and those that had not been in the crab fisheries long, but had some experience fishing before rationalization. This included participants ranging from relatively new crew members and long-term crab fishermen. All participants AFSC interviewed in 2015 owned quota, many owned vessels, and a few were still skipping their boats. AFSC interviewed experienced participants because their long-term involvement in the Bering Sea crab fisheries allowed them to comment on entry and upward mobility both before and after rationalization. The majority of these individuals were already well established in the crab fisheries and involved stakeholders when rationalization was enacted. Therefore, they are likely to have different perceptions than new entrants. However, the interviews of these long-time participants are valuable due to their extensive experience from early on in the fisheries and firsthand perceptions of what it takes to be successful in these fisheries.

The audio recordings from interviews conducted in both 2014 and 2015 were transcribed. When respondents did not give consent for audio recording, the interviewer took detailed notes during the interview and transcribed them for use in analysis. The transcribed interviews were then analyzed using the data analysis software package NVivo, which is commonly used in qualitative data analysis and reporting. Descriptive coding was used to organize the interviews into parent codes that emerged during the semi-structured interviews. Within the structure of parent codes, magnitude, and in vivo coding were used to delve deeper into specific sub-codes. Magnitude coding was used for themes that elicited a positive or negative response as to whether the participant was familiar with a specific topic. The bulk of the analysis used in vivo coding to draw out content precisely as reported by respondents. In vivo coding prioritizes the way participants conceptualize the topics discussed above the perceived importance of given topics as determined by the interviewer. Additionally, it is a method of employing grounded theory in which themes are developed based on the data themselves. This framework for data analysis allowed the coding to stay true to what respondents conveyed, rather than being limited by a predetermined set of hypotheses.

The transcripts from the interviews were coded and sorted by theme, based relevance for the topics that were intended to be highlighted in this section. The representative quotes that were chosen for inclusion in the document expressed a repeated sentiment from one particular stakeholder groups or a shared sentiment across groups. The analysts determined which quote most clearly and concisely represented each set of codes within a common theme.

Interviews conducted by AFSC augments the type of information provided in public testimony, with similar benefits of qualitative context provided from the experience of stakeholder in the crab fisheries. AFSC interviews amplifies this type of information by soliciting perspectives from a much wider and more diverse range of stakeholders than

In some cases, stakeholder perceptions can be contrasted with available data, in order to understand the validity of their views. This is done when possible throughout this section. Other times, this is more difficult due to limits on data, particularly in differentiating true new entry and transfer rates into a fishery by QS acquisition, versus the restructuring of existing entities. However, particularly for understanding entry opportunities, the perception of those opportunities is a crucial factor in understanding whether and at what rate entry opportunities are taken advantage of. Stakeholder quotes can add deeper context to trends that are observed. They can point out contrasting opinions and information gaps.

10.1 Entry into the harvest sector under the LLP

Entry into the fisheries under the LLP occurred primarily in two ways. Some persons with access to considerable capital were able to enter through the purchase of an LLP license and vessel. Since the fisheries were greatly overcapitalized, some lenders were reluctant to extend financing for entry into the fisheries. In addition, historically low GHGs in the early 2000s, made investments in the fishery less attractive. The nature of the fisheries also increased the risk associated with entry. In brief derby seasons of a few days or weeks, poor catch rates and vessel breakdowns could result in no or little revenues for the season. New entrants dependent on revenues from the fisheries for their vessel payments faced greater risks under this derby management as they competed with others for a share of the GHG. In the years leading up to the rationalization program, the cost of full scale entry of this sort was generally dependent on the history associated with the license and vessel purchase. Most persons anticipated the history-based harvest allocations under the CR Program (and under the buyback), so prices of licenses and vessels were typically dependent on catch histories. Few transactions occurred in the years leading up to the program, as many persons sought to retain holdings until the CR Program was implemented (see Table 4-6 in Section 4.3).

An alternative method of entry was open to some captains and crew in the fisheries. The typical progression in the fisheries was for crewmembers to work their way up to become captains. With most vessels employing approximately 5 deck crew, the opportunity for advancement to captain was limited. Some long-term captains who sought to enter the fisheries were able to convince the vessel owner/license holders they worked for to sell them an interest in the operation. Persons entering the fishery in this manner typically had strong long term relationships with their employers (i.e., the vessel owners) and shared in the oversight of annual maintenance and upkeep of the vessel. However, this progression from captain to vessel owner was only available to a few captains, who had strong relationships with a vessel owner who was also interested in sharing an interest in the vessel. Some vessel owners were unwilling to accept investments in the years leading up to the CR Program, anticipating history based allocations under the program. As a consequence of the distribution of harvest privileges and stock conditions in the fisheries, entry opportunities were limited under the LLP.

often attend Council meetings to testify. These interviews provided the opportunity to collect more detailed narratives and anecdotes about particular aspects of the program, than public testimony usually allows for, given limits on time and questions. In addition, interviewees were not given the interview topics ahead of time and were not responding to a specific Council action up for debate, which also led to the collection of much richer information than is typically presented to the Council in prepared statements. A final advantage of the AFSC interviews is that they captured perspectives from a substantial number of fisheries participants, representing 87.2% of the active vessels in the BSAI crab fisheries in 2012, including 42.6% of quota shareholders, 70.7% of vessel owners, 47.3% of skippers and 10.3% of crewmembers.

10.2 Entry into the harvest sector under the CR Program

Since the crab fisheries were greatly overcapitalized on implementation of the CR Program, obstacles to entry in the fisheries post implementation of the program were fully expected. The intent of the CR Program was to reduce the exceptional overcapitalization which was occurring in the BSAI crab fisheries, in order to maintain fisheries that promote stock conservation, safety at sea, and a system that could provide a more stable environment of economic returns for harvesters, processors, and communities. However, in creating this system there was an expected tradeoff in quota share access and market leverage for those individuals and entities that are not already invested in the fishery. Indeed, the restructuring of harvest privileges under the CR Program has changed the nature of entry opportunities substantially.

One way to examine entry to the harvest sector is to estimate the acquisition of QS by persons who did not receive an initial allocation. Two types of entrants could be considered: entrants that acquired shares in a crab fishery in which they hold no shares and entrants that acquired shares who do not hold shares in any other of the CR Program fisheries. Table 10-1 examines these two thresholds for catcher vessel owner QS since program implementation, as well as in the past five years. As with other data concerning owner share holdings, transfer data needs to be caveated. In some cases, transfers are changes in the name of the holder. In other cases, the transfer might reflect a change in structure of the shareholding entity (such as the addition of a new partner or a change in corporate ownership). Given that many persons hold owner QS indirectly, through corporations, LLCs, partnerships, or trusts, it is likely that a portion of this suggested entry is simply restructuring of holdings of persons who received allocations. The prevalence of restructuring entities was confirmed by a number of QS holders that were interviewed in 2014 (Himes-Cornell 2015).

Based on Table 10-1, Bering Sea snow crab fishery is shown to have the greatest number of new entrants since program implementation (11 that have diversified from other crab fisheries and 80 that entered from outside the CR Program fisheries). Since program implementation, the greatest percent of a fishery QS pool acquired by new entrants, has occurred in the Eastern Aleutian Islands golden king crab fishery, with the majority of the new entrants buying in from outside of the CR Program crab fisheries.

There have generally been fewer new entities buying catcher vessel owner QS in the past 5 years than in the first 5 years of the program. In the past 5 years, the Bering Sea snow crab fishery has had the greatest number of new entrants (2 that have diversified from other crab fisheries and 32 that entered from outside the CR Program fisheries).

Table 10-1 New holders of CVO QS since 2010 and since initial allocation

Since initial allocation				
Fishery	New QS holder in fishery		New QS holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR	70	25%	63	21%
BSS	91	23%	80	21%
EBT	53	18%	53	18%
WBT	54	19%	54	19%
EAG	16	49%	12	44%
WAG	4	17%	3	5%
WAI	17	27%	8	13%
SMB	41	23%	31	17%
PIK	30	30%	19	22%
Since 2010 season end				
Fishery	New QS holder in fishery		New QS holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR	23	7%	19	5%
BSS	34	5%	32	5%
EBT	25	6%	18	5%
WBT	26	6%	19	5%
EAG	10	13%	8	12%
WAG	2	14%	1	2%
WAI	10	23%	4	10%
SMB	14	6%	10	5%
PIK	11	12%	7	6%

Source: AKR RAM Division quota shareholder files, sourced through AKFIN

While large scale entry is particularly challenging for individuals, C share QS are intended to open avenues for small scale entry by eligible crew. C share QS typically sell for less than owner QS, (as later demonstrated in Figure 10-2 for the Bristol Bay red king crab fishery and the Bering Sea snow crab fishery). The relatively low caps on C share QS holdings and the small percentage of the total harvest share allocation made up of C shares limit the ability of persons to consolidate large C share QS holdings. As a result, C shares transfers must be of relatively small amounts of QS, which are likely to be more affordable, particularly to crew, who may have less access to capital.

However, despite these provisions, catcher vessel C share QS transfer patterns still demonstrate less new entry compared to the owner QS pool. In many ways, this is not surprising. The owner QS pool is much larger, with far more entities holding QS and in a position to enter the market. In the Western Aleutian Island red king crab fishery, there were only 4 entities initially issued C share QS. Those 4 entities still currently hold those C share QS demonstrating no new entry into the fishery from that avenue. In addition, as mentioned, some of the new entry displayed in Table 10-1 could be attributed to the restructuring of a corporation. Table 10-2 demonstrates that a higher percentage of entry occurred in the first 5 years of the program, compared to the last 5 years for C share QS holders.

Table 10-2 New holders of C shares QS since 2010 and since initial allocation

Since initial allocation				
Fishery	New Cshare holder in fishery		New Cshare holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR	25	23%	18	18%
BSS	31	25%	25	20%
EBT	21	12%	19	12%
WBT	21	12%	19	12%
EAG	5	28%	2	18%
WAG	3	27%	2	20%
WAI	0	0%	0	0%
SMB	16	26%	10	16%
PIK	5	15%	1	3%
Since 2010 season end				
Fishery	New Cshare holder in fishery		New Cshare holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR	7	7%	7	7%
BSS	13	9%	11	7%
EBT	10	4%	8	4%
WBT	10	4%	8	4%
EAG	1	5%	0	0%
WAG	1	8%	1	8%
WAI	0	0%	0	0%
SMB	7	10%	6	9%
PIK	2	6%	0	0%

Source: AKR RAM Division quota shareholder files, sourced through AKFIN

For the remainder of this section, entry into the harvest sector of the CR Program fisheries is considered in terms of four primary categories 1) *harvesting privileges reaching the market*, 2) *access to market opportunities*, 3) *QS prices and access to finance opportunities*, and 4) *willingness to investment*. This section concludes by demonstrating some of the differing perspectives on the role of the CR Program in entry opportunities.

The narrative in the following sections uses these categories to discuss perceived entry challenges into the current CR fisheries and contrast these challenges with entry opportunities pre and post CR Program, and in the last five years. This review does not suggest the *right* level of entry that should be available, but highlights the barriers to entry and resources and provision currently available in program. This section also focuses on the Council’s interest in “promoting quota share ownership among crew and active participants,” which was highlighted in further discussion after the 5-yr review of the CR Program (NPFMC 2012a).

10.2.1 QS Reaching the Market

In a program designed for limited entry, which places a value on the exclusive opportunity to harvest and process in a fishery, it is not surprising that QS holders have little incentive to divest.

The market for crab QS has tended to be less fluid than that for sablefish or halibut QS because crab QS holdings are more concentrated with a relatively smaller number of known participants in the market (refer to Table 4-6 for QS transfer rates). Since much of the share concentration resulted from the initial allocation of QS, the thin market is largely a reflection of the historic distribution of interests in the fisheries. The more industrial nature of the fishery, with larger investments in vessels, has also contributed to concentration of interests. With this concentration, few transactions take place and most transactions for owner QS have tended to be large, requiring substantial access to capital.

A common perception among stakeholders interviewed by AFSC in 2014 is that little QS ever reaches the open marketplace, and when it does it moves in larger bundles that are cost prohibitive (QS value is discussed in more detail in Section 10.2.3). The following quotes exemplify perceptions of the thin market:

- “One year there’ll be nothing for sale and all of a sudden there’ll be quite a bit for sale, it just seems to go through the waves of it.” (Vessel owner and quota shareholder, *Respondent013*)
- “I have not bought any [quota], there hasn’t been any that’s been very available.” (Skipper, *Respondent056*)
- “You can’t find quota a lot of times, it’s gone off the table as soon as it gets out there. You were the one lucky person to get quota these days to buy because it gets snatched up so fast” (Crewmember, *Respondent074*)
- “If there’s a large chunk for sale and the guys don’t want to split it up then it kind of narrows the playing field of people who are eligible to purchase. If they’re smaller chunks are available, sometimes people are getting in a toe-hold. They feel that’s more appealing to them.” (Crewmember, *Respondent050*)

As previously described, C shares were intended to be used by individuals active in the fishery and therefore more accessible for captains and crew. These share do not include the complexities of share matching with IPQ holders and the acquisition of these shares has required certain active participation standards. Based on feedback from captains and crew initially displaced from the CR Program, on May 1, 2015, a regulatory package became effective that, among other things,⁶⁶ amended the regulations for C shares acquisition and active participation requirements.

The impetus for this action dates back to the June 2007 Council meeting, in which public testimony was received on the lack of entry opportunities from captains and crew that were displaced from fisheries, due to the active participation requirements of the C shares paired with the consolidation of vessels and crew opportunities that occurred in the program. The analysis for Amendment 31 raised the following issues (NPFMC 2015a; 79 FR 77419):

- At least 750 former crew, who did not receive an initial allocation of C shares but who were active in CR Program fisheries in the five years preceding implementation of the CR Program, are no longer

⁶⁶ The part of Amendment 31 described here are relevant to entry opportunities. This section does not go into detail on the piece of the regulatory amendment which adjusted application deadlines for IFQ/ IPQ

active in CR Program fisheries due to the significant reduction in the number of vessels participating in CR Program fisheries subsequent to implementation of the CR Program.

- The current eligibility requirement for recent participation in one of the CR Program crab fisheries prevents acquisition of C shares by individuals formerly active in CR Program fisheries, but who are no longer a participant due to the significant fleet contraction and resulting loss of crew positions on crab boats.
- Estimates of available information indicate that approximately 30% (70 individuals) of the individuals who received an initial allocation of C share QS (239 individuals) have remained active in the CR program fisheries, while approximately 70% (169 individuals) have not remained active in CR program fisheries.
- The regulations intended to keep C share QS holders active in the fisheries are not working due to the exemptions from these active participation requirements for holders of C shares who join a crab harvesting cooperative.

The Council took action on a package to amend C share regulation in 2008, which was later augmented by a CR Program action to amend IFQ/ IPQ deadlines.

For 4 years following implementation (beginning May 1, 2015), the number of individuals eligible to purchase C shares has been increased with a change in active participation requirements necessary for C share transfer. This temporary change is intended to extend opportunity of C share acquisition to historical participants that received C shares upon initial allocation, but were not able to remain active in the program due to the significant consolidation of vessels. Prior to Amendment 31, in order to receive C shares by transfer, an individual:

- must be a U.S. citizen with at least 150 days of sea time in a harvesting capacity in a U.S. commercial fishery, *and*
- must have been active as a crewmember in one of the CR Program fisheries in the preceding 365 days.

In other words, those captains and crew that were displaced from the program after the first year were no longer eligible to purchase C shares.

For a period of 4 years from the implementation of Amendment 31 (May 1, 2015), C shares can *also* be acquired by an individual who:

- is a U.S. citizen with at least 150 days of sea time in a harvesting capacity in a U.S. commercial fishery, *and*
- either received an initial allocation of CVO or CPC shares, *or*
- demonstrate participation in the BSAI rationalized crab fisheries during 3 of the 5 seasons (starting with 2000/2001 through 2004/2005).

Therefore, continuing for the next 3 years, the eligible pool of C shares buyers will be larger than it previously has been as former captains and crew of the crab fisheries that were rationalized will have access to the C share market again.

In addition to an expanded group of eligible C share buyers, Amendment 31 also increased active participation requirements for current C shareholders, potentially expanding the pool of QS sellers. Prior to Amendment 31:

- There was no leasing of C share QS, except under the hardship provision
- Individuals who hold C share IFQ are required to be onboard the vessel harvesting the IFQ
- However, the CR Program exempts holders of C shares from these two requirements if the holder of C shares has joined a cooperative and the holder's C share IFQ is converted to cooperative IFQ.

Given the prevailing use of cooperatives, many C shareholders have had hired skippers fish their C shares in the past.

Under Amendment 31, in order to receive an annual allocation of IFQ, a C share holder must:

- Have participated in at least one delivery in a CR Program fishery in the 3 crab fishing seasons preceding the IFQ application, OR
- Have received an initial allocation and participated in 30 days of the State of Alaska or Federal commercial fisheries in the 3 seasons preceding the application for IFQ.

Under Amendment 31, in order to maintain control of C shares, a C share holder must:

- Have participated in at least one delivery in a CR Program fishery in the preceding 4 crab fishing seasons, OR
- Have received an initial allocation and participated in 30 days of a State of Alaska or federal commercial fishery in the preceding 4 crab seasons

If these provisions are not met, Amendment 31 establishes a process to revoke QS, as well as a process to adjust the QS pool so that C shares remain 3% of the total IFQ. However, no C shares will be revoked before 5 years of implementation of the amendment (on April 30, 2015).

Although it is perhaps too early to know how effective this amendment has been on creating a culture of more active C share shareholders, during the first year after its implementation, industry participants envisioned that it would have significant impacts on CVC shareholders. The fact that an estimated 70% of initial issue C shareholders were not considered "active" at the time of regulation writing indicates a large potential for changes to who holds C shares over the next couple of years, particularly before QS is revoked.

10.2.2 Access to Market Opportunities

In addition to their limited occurrence in the market, second challenge associated with entry into a CR Program fishery is gaining access to the QS market when the QS is available for sale. Interviews in 2014 highlighted some of the perceived barriers to gaining access to QS market opportunities, including sales occurring privately rather than through a broker and on an open market.

- Many interviewees indicated that most of the quota tends to be sold in a "grey market, you have to know who's selling it before it goes on. You somewhat have to have an insider information, 'oh this guy from Sandpoint is going to sell his vessel and quota'" (Crewmember, *Respondent050*).

- “Now [quota shares] are expensive and there isn’t very much for sale. Stuff that is sold is pretty much on the hush hush, sold at coffee shops and things like that instead of through brokers.” (Quota shareholder, *Respondent011*)

Respondents commonly highlighted the importance of networks, and described a culture where family members and friends were more likely to provide a leg up in the industry. This sentiment is similar to the state of the crab fisheries pre-program implementation; however, with a higher value on harvesting privilege, it may be more difficult to pass on that opportunity. New entrants that have access to quota, in some cases, have obtained it from family members that were initial issuees. From one crewmember’s perspective, “you’re pretty much phased out unless you’ve got a family member that owns a boat” (Crewmember, *Respondent007*). “There are a few guys that bought [quota] that made it but don’t forget their either father runs the boat or they’ve been included” (Crewmember, *Respondent018*). This sentiment was shared by some fishery participants that have lots of family in the fisheries or who have brought family members in.

- “For my family, we would have no intention of selling anything at all, to be honest with you. We want just keep it in the family. I guess if nobody in the family’s capable of fishing or wants to fish then I guess that would be a different plan. But as of now, we really have no plans to sell anything. It’s a good fishery we’ve got the boats, we built some of the boats, and our plan is just to keep it going.” (Quota shareholder and vessel owner, *Respondent013*)
- “I got my son into it, he’s been fishing with me for three years on the [*vessel name withheld*] and then he also goes with me tendering because I run the boat in the summertime. So I mean there’s definitely new blood coming in, but for our boat, we basically hire mainly family and friends that we know.” (Crewmember, *Respondent096*)

In addition, some respondents noted to in 2014 AFSC that when QS was available for sale, there was very limited time to compete with other, more liquid entities.

- “If somebody wants to sell crab they call Dock Street Brokers usually, and there’s already money sitting there in escrow accounts for purchase of crab to native corporations. You see what I mean? They already have money standing by in escrow, waiting for the crab to come in. So the minute it comes in, they call, they get it. I can’t beat them at that, I can’t compete with that, and they can pay more than what I can.” (Quota shareholder, vessel owner and skipper, *Respondent042*)
- “[An individual] has to have already gone in to the bank and get his loan set up because these [shares] are on the market for a couple days or a day or a week or whatever the number, and if he doesn’t buy it there’s somebody across the street with big pockets saying ‘yeah, I’ll just write out a check for \$1.5 million’.” (Quota shareholder, *Respondent011*)
- “For people that already have huge chunks of quota to keep acquiring through it? I just can’t compete with that. Their money is in the bank, cash sitting there, ready to go, and they’re just snagging it up as it becomes available, and whereas me, as a small mom and pop operation, it’s

tough for me to have \$5-6 million cash on hand ready to go at all times” (Quota shareholder, vessel owner and skipper, *Respondent045*).

It is difficult to validate perceptions about the duration of time QS spends on the market and the savings potential of different entities. However, considering the diversity and types of entities involved in the CR Program (e.g. individuals, corporations, LLCs, partnerships, trusts etc.) it is reasonable to understand there would significant differences in access to capital by different entities.

In 2013, a portion of the harvesting sector (specifically, the Inter-cooperative Exchange (ICE), representing about 70% share of the IFQ) worked with its members to develop a right of first offer (ROFO) program.⁶⁷ This program seeks to offer market access to crew members and active participants when opportunities become available. This program provides crew members and active participants the opportunity to purchase catcher vessel owner QS in connection with each QS sale made by a member, provided the transfer does not fall within a specific right of first offer exemption.

Under the ROFO, captains and crew members have first access to 10% of qualified QS transfers. For purposes of the ROFO, a “crab crew member” definition matches that of the regulatory requirements for receiving annual IFQ derived from C shares⁶⁸ (i.e., in order to receive annual allocation of C share IFQ, a C share holder must have (i) been a member of a crew that made a delivery in a rationalized crab fishery during the prior 3 year period; *or* (ii) been an initial C share QS recipient, and participated in fishing in a commercial fishery in Alaska or the EEZ off Alaska as a crewmember for at least 30 days during the prior 3 year period) and who did not receive catcher vessel owner shares (CVO or CPO) at initial allocation. ICE maintains a list of individuals that qualify as crab crew members under this definition.

The remaining 90% of the QS proposed for transfer is subject to a ROFO from an expanded pool of applicants, deemed “active participants” under the program. This category is defined as captains or crewmembers that qualify under the first threshold, as well as individuals holding an ownership interest in an active vessel. An active vessel is a vessel over 29 feet in length that has made a landing in any commercial fishery in the 365 days preceding the share acquisition.⁶⁹

The ROFO program requires the seller to define the terms of the offer, which persons receiving the right are free to accept. If accepted, a transaction will precede subject to the terms of the offer; if not, the seller may offer the quota shares to the general market. Any sale in the open market, however, must be subject to terms no more favorable than those of the original offer. ICE established a website⁷⁰ in 2013 to aid in the administration of the right. Crew and other active participants can identify their eligibility through

⁶⁷ Members of several other cooperatives have also participated in this program.

⁶⁸ These eligibility requirements are defined as matching the regulatory C share requirements, as of the “record date”. This allows the ROFO “crab crew member” definition to be modified with the implementation of Amendment 31.

⁶⁹ Note that this is different than related case law guidance for defining active under Fishermen’s Collective Marketing Act (FCMA) in which a person must either be (i) employed as a crewmember in a U.S. commercial fishery under terms that give her or him exposure to the risk of production, or (ii) a direct, documented owner of a U.S. commercial fishing vessel who has exposure to the risk of production. This definition does not necessarily require crewmember participation or vessel ownership in a CR Program fishery.

⁷⁰ <http://crabqs.com/>

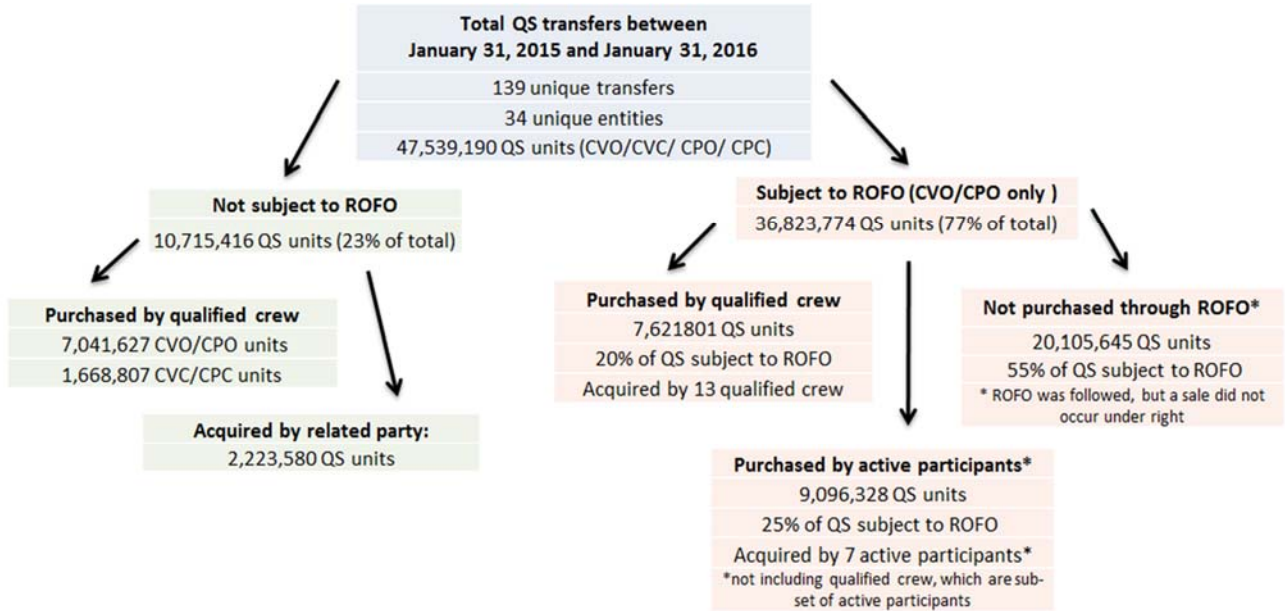
registration. Registered participants are notified of sales offerings and brokers aid in distribution of offerings to qualified crew.

Transfers that are exempt from the program include sales of owner QS that are directly to active crew members or active participants (although in the latter case 10 % would still be available for active crew members). In addition, sales between affiliates, sales that are accompanied by crab fishing vessel or of an entire commercial fishing operation, and sales made in foreclosure or under a court order are not be subject to the right.

During the 5-year program review, the industry-lead right of first offer on QS was in the development process and the Council was unsure of the potential effectiveness of the program. For instance, the listed exemptions could be used to avoid limitations created by the right. A person wishing to avoid the right could structure transactions to be a sale of a business or a sale to an affiliate to avoid the complications that might arise, if an offer is extended under the right. Additionally, it was noted that the “active participation” requirements of having only a minimal interest in a vessel could provide opportunities to persons with minimal connection to fisheries to the detriment of persons that expend substantial time, effort, and resources to participate in the crab fisheries. Even three years after this program has been in effect, it would be difficult to identify if exemptions to the right have been used inappropriately, given other factors that may also contribute to the restructuring of QS holding entities.

Through the voluntary cooperative reports, ICE has provided annual updates on the usage and performance of the ROFO program. Based on three years of reporting, (2013 through 2015), ICE has tracked the levels of participation in the program (ICE 2014; ICE 2015; ICE 2016). Figure 10-1 illustrates information provided in these cooperatives reports, between Jan 31, 2015 and Jan 31, 2016.

Figure 10-1 Right of first offer usage between Jan 31, 2015 and Jan 31, 2016



Source: ICE 2016 and Jake Jacobsen, personal communication, 4/29/2016

As the identification of market opportunities is one noted obstacle in catch share fisheries, the ROFO program is one industry response to lowering the barriers associated with CR Program entry for crew and other active participants by connecting them with available owner QS.

The various stakeholder groups expressed different levels of knowledge and experience with the program. Based on AFSC’s interviews, many quota shareholders, vessel owners and skippers had heard of the ROFO program. This is to be expected, as members of the cooperative ICE have a binding agreement to participate in the program as established in their cooperative contract, should they chose to transfer QS. However, the majority of interviewed skippers that were aware of the ROFO program had not actively looked into the program. Additionally, there are still a large number of crewmembers that were unaware of the program. There are also active participants that might have heard of the ROFO program, but are not fully aware of the process for registering or able to get through the entire process of bidding on quota to finally purchasing it. *Respondent062* captured this issue, “I wasn’t aware that I needed to be registered on a website to be notified that I could get quota that was for sale... Even when I’m on the ocean fishing, if I was registered on the website, how am I supposed to be able to check the internet when I’m working on the ocean?” (Crewmember).

The AFSC interviews found that industry participants believe that the ROFO program is a good avenue to take in general; however, respondents noted that the ROFO program is likely not enough on its own to get quota shares in the hands of active participants. The following respondents summarize common perceptions.

- “It’s great that crews get the first right, but at the prices that these shares are selling for, there again it becomes pretty cost-prohibitive for a crewmember to invest in that, just because of the payback and the amount of years, the only thing you can hope is that quota shares go up or the prices goes up and then of course those years of breaking even diminish.” (Quota shareholder and vessel owner, *Respondent017*)
- “As far as ROFO, even that ROFO program it’s a great thing because it’s going to get these fellas a chance to become something if some quota comes up for sale. That 10% is available for guys that want to break into the fishery. But the quota is so expensive now which makes it quite difficult. But then the guys have got the NMFS loan program and, in the last year, I went so far as to offer to help a young fella that works with me but I mean you can’t force them to do things, I just told him it was a good opportunity but he still wouldn’t do it.” (Quota shareholder and vessel owner, *Respondent061*)
- “The Council wanted a program available for the crew members, I really don’t think the market’s out there to support it. And truth be told, that’s just my opinion of it. I think that they’d much rather invest someplace else, whether it be a new car, real estate, a house, or take care of themselves until they’re in the position.” (Quota shareholder, vessel owner and skipper, *Respondent008*)

Although most interviewees in 2014 believed that the ROFO program was still in its infancy and not possible to evaluate yet, they agreed that it was a step in the right direction. As *Respondent058* explained, “It’s going to take a long time for those pieces to amount to a transition to active participants owning more and more and more quota but it’s definitely going down the right path in my mind” (Quota shareholder and vessel owner). Other respondents echoed this sentiment and suggested that financing will be important in the ultimate success of the ROFO program.

- “I think this ROFO is helping, I wish more crew would get involved and do stuff to get their financing in order so that when stuff comes available... a lot of times when you talk to them, you say something’s available and they’ll say ‘well let me see if I can borrow some money.’ Well it’s too late then. They need to have things in place so that they can move more quickly.” (Quota shareholder, *Respondent005*)
- “These [ROFO] transactions are occurring and I guess I would like to see the pace of them increase as people become familiar with the program, but there’s two ways to make it effective, one is to initiate the program and the second phase would be to provide access to the money...to encourage the crew and captain and crew to buy in. There’s other ways to facilitate these transactions happening besides just making it [possible].” (Quota shareholder and vessel owner, *Respondent058*)

In addition to QS availability in the marketplace, a related obstacle accessing the marketplace noted by interviewees and other participants in the fishery is the complexity of the CR Program. Some respondents in the 2014 AFSC interviews also commented on the complexity involved in simply owning and earning revenue from quota shares. As *Respondent045* explained,

- “The paperwork that’s involved with [quota ownership] and the deadlines. A lot of these guys are fishing when the deadlines need to be met, so if they send in the application [for their annual IFQ allocation] and they screw up on something and it gets rejected and gets sent back, by the time the

deadline rolls around, for them to qualify for the year, they're still out fishing and they haven't got the paperwork, they get in and it's too late, and they're screwed for the year"

- “Especially as a new participant; they would never be able to get it all together to share match and make it worthwhile to own the quota.” (Expert respondent, *Respondent028*)

10.2.3 Quota Share Price and Finance Opportunities

10.2.3.1 Quota Share Price

Many participants in the 2014 AFSC interviews identified the price of quota shares as the largest perceived barrier for entry into the ownership structure of the crab fisheries. To an extent, the high cost of entry was already present in BSAI crab fisheries prior to the implementation of the program. However, differentiated access to capital between initial issuees and others, as well as between individuals, larger corporations and CDQ groups create more pronounced effects in a program when there is competition for the available harvesting shares. Some respondents believe that individuals and entities that can pay cash for quota are contributing to rising quota share prices.

- “There are entities out there any time a piece of quota comes up for sale, they will pay near twice of what it's worth to get it. They'll pay well, and who's to say that's a true statement, maybe the fact that they pay it, maybe it justifies it being that price and that rules the crew member out...The average crew member won't be able to participate in that at all, he won't be able to buy anything.” (Quota shareholder and vessel owner, *Respondent009*)
- “A lot of folks in the fishery who received initial QS have made a lot of money leasing their IFQ. This creates a lot of money for people who can then go buy [more] IFQ and pay a lot for it.” (Quota shareholder, *Respondent029*)
- “There are several groups of individuals out there that we do have to compete with...but it goes back to buying quota share. There's some people out there that have huge amounts of money compared to what I have and so, let's say quota share comes up for \$50 a pound and I can pay that 50. Well, they can pay 55, no problem.” (Quota shareholder, vessel owner and skipper, *Respondent008*)
- “[Unless you were] issued original quota for free it's pretty much cost-prohibitive [to purchase quota] and it's gotten worse because of the fact that you got to compete with [some] that don't care. They will pay top dollar and they don't have to worry about interest rates. It really drives the price up astronomically. I've heard that red king crab now goes for 50 bucks a pound. You can't service that kind of debt.” (Vessel owner and skipper, *Respondent086*)

Table 10-3 presents price and transfer information, to the extent that it is reported at the time of transfer, in terms of pound in which the annual IFQ yields in the year of transfer. While technically these transfers represent the acquisition of the long-term harvesting privilege (CVO or CVC) in QS units, CR Program QS is typically bought and sold in terms of pounds, as this is a more relatable metric. While participants realize the risk involved in purchasing QS and changing amount of pounds it can represent depending on the TAC,

prices and purchases trends tend to be influenced by the TAC of the year the transaction occurs (along with a number of other factors). Therefore, it is appropriate to present these statistics in terms of pounds in order to incorporate some of the influence associated with a changing TAC.

As can be seen in Table 10-3, while median price per pound has some variation and anomalies in different fisheries, there is generally an upward trend of increasing price throughout the time series. Of the prices that can be reported, Bristol Bay red king crab CVC QS median prices have seen an increase from under \$18 per pound (in 2007/2008) up to about \$40 per pound in the most recent year included (2014/2015). In Bristol Bay red king crab CVO QS the median price has reached \$55 per pound in the most recent year included (2014/2015). Bering Sea snow crab and Tanner crab QS are unsurprisingly less expensive than Bristol Bay red king crab, given the higher ex vessel price one could receive for red king crab. Bering Sea snow crab CVC QS prices have seen an increase from about \$7 per pound (during the first 6 years of the fishery) up to about \$23 per pound in the most recent year included (2014/2015). There were 23 transfers of Bering Sea snow crab CVO QS in 2014/2015 with a lower median value (approximately \$20 per pound) than the CVC QS. Bering Sea Tanner crab QS might be considered riskier due to several years in which the fishery did not open. In the last season (2014/2015) Eastern Bering Sea Tanner and Western Bering Sea Tanner CVO QS were both approximately \$11 per pound, based on reported prices.

Some of the anomalies are present in Table 10-3 correspond with years in which there are a smaller number of transfers (i.e. smaller sample size). Additionally, some sales of QS may be bundled, including multiple species of crab QS, or the annual allocation of IFQ. In general, the inclusion of IFQ is expected to be a function of the timing of the transfer relative to the crab fishing season and operational considerations of the buyer and seller. The sale of crab QS may also be bundled with other assets, like a vessel. Even if the analysts can parse out the price of specific QS based on EDR data, the contents of the bundle of assets for sale could influence the buyer's overall interest, in addition to its selling price.

In addition to generally being more expensive, CVO QS tends to be bundled in larger quantities and involve greater median cost per transfer. Past transfer data demonstrates that the median quantity of Bristol Bay red king crab CVO QS in a single transfer ranged from 2,800 pound (in 2005/2006) up to 54,306 pounds (in 2013/2014). Past transfers of Bristol Bay red king crab CVC QS have cost median amounts of between \$70,000 (2005/2006) up to approximately \$1,015,000 in 2013/2014. This is in contrast to Bristol Bay red king crab CVC QS for which the median transfer involves 1,000 to 2,000 pounds of QS and with median costs between approximately \$12,000 and \$77,000. These trends are similar for Bering Sea snow and Tanner crab, but on a different scale.

Table 10-3 QS transfers and estimated transfer cost (2005/06 to 2014/15) BBR, BSS, EBT, and WBT fisheries

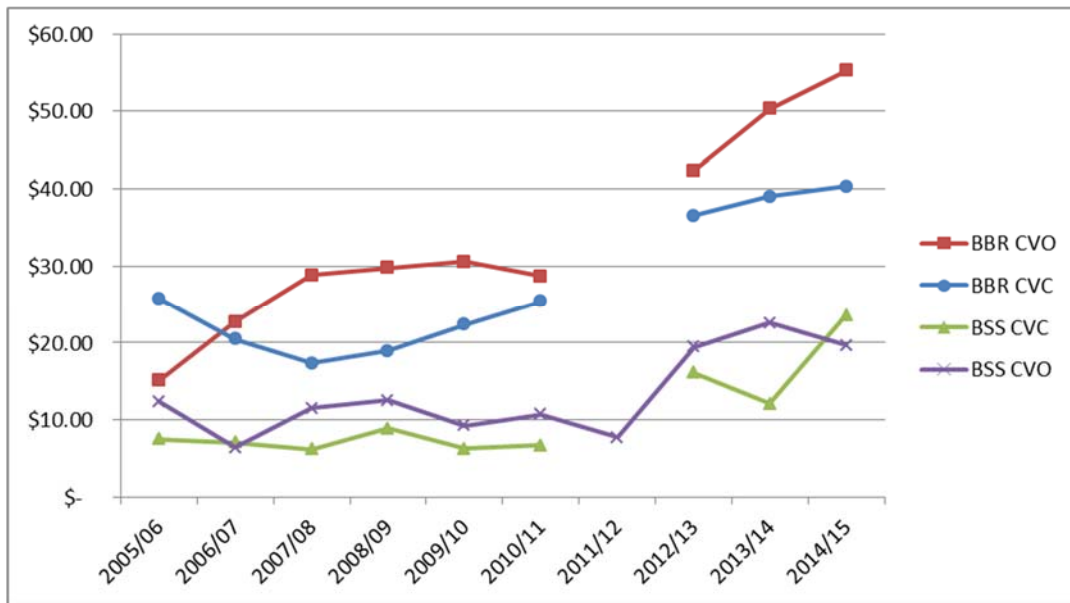
Fishery	Season	Crew Quota Shares (CVC)					Owner Quota Shares (CVO)				
		Transfers (transferors, transferees)	Total pounds transferred	Median pounds per transfer	Median price per pound (\$)	Median cost per transfer	Transfers (transferors, transferees)	Total pounds transferred	Median pounds per transfer	Median price per pound (\$)	Median cost per transfer
BBR	2005/2006	21(19,14)	32,474.3	1,497.6	\$ 25.74	\$ 51,362	14(6,10)	181,370.4	2,800.2	15.04	\$ 70,907
	2006/2007	24(20,17)	28,245.1	1,013.8	\$ 20.42	\$ 26,233	27(17,11)	615,548.6	11,626.4	22.7	\$ 543,831
	2007/2008	10(8,5)	11,515.8	1,233.4	\$ 17.35	\$ 47,354	21(11,13)	156,608.5	6,329.1	28.82	\$ 372,711
	2008/2009	9(7,7)	11,293.8	1,195.8	\$ 18.89	\$ 43,487	25(16,19)	356,543.3	7,334.8	29.79	\$ 324,636
	2009/2010	9(6,7)	12,009.1	1,067.2	\$ 22.31	\$ 30,368	12(10,11)	127,762.4	10,454.0	30.56	\$ 326,680
	2010/2011	5(5,5)	12,487.1	1,877.1	\$ 25.41	\$ 32,018	33(15,22)	614,128.0	8,059.0	28.67	\$ 180,245
	2011/2012	3(3,2)	**	**	**	**	3(3,3)	**	**	**	**
	2012/2013	4(3,3)	6,597.8	1,804.5	\$ 36.54	\$ 12,905	21(9,16)	390,139.2	7,305.8	42.36	\$ 105,774
	2013/2014	9(8,7)	13,964.4	1,756.5	\$ 39.03	\$ 25,576	7(6,4)	277,410.0	54,306.5	50.3	\$ 1,015,135
2014/2015	10(8,6)	21,554.8	2,146.3	\$ 40.34	\$ 43,368	18(8,11)	396,247.5	3,815.3	55.23	\$ 107,310	
BSS	2005/2006	25(14,12)	84,529.2	3,315.4	\$ 7.48	\$ 27,144	22(9,12)	742,508.7	13,527.4	12.38	\$ 251,275
	2006/2007	35(17,15)	73,486.4	1,864.9	\$ 7.07	\$ 12,268	36(17,8)	1,258,545.2	14,194.3	6.4	\$ 193,443
	2007/2008	12(5,5)	14,780.6	938.5	\$ 6.21	\$ 14,678	26(10,13)	461,605.7	19,119.1	11.51	\$ 503,842
	2008/2009	10(5,6)	14,516.9	920.2	\$ 8.87	\$ 22,905	15(9,11)	280,407.9	8,484.0	12.49	\$ 207,760
	2009/2010	15(6,8)	23,990.3	1,146.5	\$ 6.25	\$ 13,657	14(8,10)	144,372.3	8,059.0	9.27	\$ 141,713
	2010/2011	11(6,6)	16,101.3	1,061.9	\$ 6.70	\$ 34,828	56(17,24)	544,605.8	4,805.3	10.72	\$ 118,995
	2011/2012	2(1,1)	**	**	**	**	21(10,12)	164,778.6	3,620.4	7.7	\$ 164,780
	2012/2013	9(4,5)	16,259.9	1,686.0	\$ 16.06	\$ 77,031	40(9,18)	296,668.1	3,480.8	19.43	\$ 149,559
	2013/2014	12(6,6)	12,094.6	563.4	\$ 12.05	\$ 23,223	50(15,18)	413,583.8	2,194.7	22.6	\$ 117,456
2014/2015	9(5,3)	11,006.2	759.2	\$ 23.55	\$ 23,643	23(13,14)	479,896.5	6,486.2	19.64	\$ 471,617	
EBT	2006/2007	17(14,14)	35,918.1	1,819.6	\$ 5.50	\$ 1,025	17(13,8)	496,292.8	27,552.5	5.83	\$ 32,212
	2007/2008	5(4,3)	11,755.6	2,274.2	\$ 5.83	\$ 3,106	9(7,8)	235,380.2	31,328.2	13.37	\$ 63,800
	2008/2009	4(4,4)	16,238.6	4,670.1	\$ 93.58	\$ 22,938	14(8,9)	682,128.2	30,127.5	13.37	\$ 61,355
	2009/2010	3(2,3)	**	**	**	**	5(4,5)	137,438.3	28,337.7	7.24	\$ 6,552
	2010/2011	3(3,3)	--	--	--	--	6(6,2)	**	**	**	**
	2011/2012	--	--	--	--	--	2(2,2)	**	**	**	**
	2012/2013	2(2,2)	**	**	**	**	12(5,10)	69,824.2	5,515.4	14.03	\$ 2,167
	2013/2014	6(5,6)	12,087.6	1,246.9	\$ 7.02	\$ 1,220	10(5,6)	110,635.5	7,939.2	7.75	\$ 8,512
	2014/2015	8(8,7)	4,001.8	492.5	\$ 4.03	\$ 4,987	15(7,11)	110,619.0	4,003.0	11.11	\$ 64,106
WBT	2006/2007	16(13,13)	57,638.0	3,118.6	\$ 9.42	\$ 781	22(18,9)	1,200,129.7	41,086.3	5.77	\$ 20,397
	2007/2008	5(4,3)	18,857.1	3,600.5	\$ 5.77	\$ 1,941	8(6,7)	406,662.4	56,317.4	16.03	\$ 42,534
	2008/2009	4(4,4)	19,121.7	7,537.1	\$ 14.42	\$ 4,917	14(8,9)	600,092.0	52,090.0	16.03	\$ 39,341
	2009/2010	2(2,2)	**	**	**	**	5(4,5)	--	--	--	\$ 4,368
	2010/2011	3(3,3)	--	--	--	--	5(5,2)	**	**	**	**
	2011/2012	--	--	--	--	--	1(1,1)	**	**	**	**
	2012/2013	2(2,2)	**	**	**	**	11(5,9)	62,080.3	4,903.7	11.09	\$ 1,769
	2013/2014	6(5,6)	11,339.3	1,256.9	\$ 5.55	\$ 1,220	10(5,6)	106,834.0	9,779.7	6.93	\$ 8,563
	2014/2015	6(6,5)	3,638.2	661.2	\$ 5.96	\$ 4,648	16(8,12)	150,771.9	5,776.9	11.17	\$ 62,556

Source: AKR RAM Division quota shareholder files

Table notes: This table only includes transfers with reported prices, share types in which four or more transfers occurred in a season, and the transfers involved four or more different entities. Fisheries not included contain confidential data. This table also excludes transfers with a listed price of \$0. Values are adjusted by GDP deflator to 2014 US dollars, to control for general price trends. In some cases, IFQ is transferred along with QS.

Figure 10-2 further illustrates what is presented in Table 10-3 by depicting the reported price per pound for CVC versus CVO QS in the Bristol Bay red king crab and Bering Sea snow crab fisheries. With a few exceptions in the reported data, these figures demonstrate catcher vessel owner QS are typically priced higher than catcher vessel C shares in these fisheries. This may be, in part, because of the active participant requirements applicable to C shares. This figure demonstrates a trend of increasing prices in the Bering Sea snow crab, both for owner shares and C shares. The Bristol Bay red king crab fishery demonstrates a greater rate of change.

Figure 10-2 CVC median price per pound from transactions with reported prices, 2005/06 through 2014/15



Source: AKR RAM Division quota shareholder files, sourced through AKFIN

Table notes: Includes only priced transfers for share types in which four or more transfers occurred in a season, and the transfers involved four or more different entities. This table excludes transfers with a listed price of less than \$5. Values are adjusted by GDP deflator to 2014 US dollars, to control for general price trends.

While this review does not attempt to identify an appropriate price or rate of change for QS price, fisheries participants view the increases in QS price throughout the course of the program as prohibitive and limiting in terms of new entrants coming into the crab fisheries. The following quotes from AFSC’s 2015 interviews are representative of this view (Himes-Cornell and Legendre-Fixx unpublished).

- “Number one, if you’ve got enough money to buy your way into this fishery, you should just retire.” (Quota shareholder and skipper, *Respondent012*)
- “[My crewman] still hasn’t pulled the trigger because it’s a commitment, and it’s pretty substantial. When I went to the bank to buy my partners out, I had to hock everything. My life, stress and everything else, a lot of guys just don’t want to go down that road.” (Quota shareholder and vessel owner, *Respondent110*)

- “From a purely financial standpoint, it’s a poor investment. And there’s so many risks. What if there’s no fishing quota, or the quota goes down? Well what happens? It’s wonderful if quota goes up, but, you know, it’s a crapshoot.” (Quota shareholder and vessel owner, *Respondent057*)

Purchasing CR Program QS must be considered a long-term investment. In most crab fisheries, there is such a large difference between the selling price per pound and the quota share price per pound that many interview respondents thought to break even on the quota would take at least ten years. *Respondent017* provided an example,

- “The price of a king crab quota right now is about roughly \$60 a pound and we only get \$7 a pound for the product per season, so I mean you can do the simple math, if it costs you 30 or 40% to go fish it, you know, paying your fuel and your crew and your bait and then you’re only getting \$7 a pound, how many years does it take to make up \$60? And it’s no different with Opilio. Opilio is now at \$25 a pound, and you’re talking about selling this crab for \$2 a pound. I mean, simple math. Even if you didn’t have expenses it’s already 10 years breaking even.” (Quota shareholder and vessel owner)

To get some sense of expected rate of return on crab QS holdings, the 2015 Economic Stock Assessment and Fishery Evaluation (SAFE) report compares IFQ lease prices in the last 3 years (2012/13 through 2014/15) to QS prices converted into price per pounds (based on the year’s QS units to IFQ pounds ratio) (Gaber-Yonts & Lee 2016). In principal, in a well-functioning competitive market, price per pound of IFQ reflects QS holders and fishery participant’s expectations regarding the surplus to be produced from fishing the leased quota during the current season, taking account of uncertainty regarding factors that influence fishing costs and ex-vessel revenue. Changes over time in this index can suggest changing expectations of future value of the fishery, e.g. a negative change in over time would indicate a reduced perceived risk of declining stock productivity, product prices, or other adverse management or market conditions.

The economic SAFE demonstrates that as a result of increasing Bristol Bay red king crab QS prices over the last three years noted above, concurrent with declining lease price, the IFQ:QS ratio values for Bristol Bay red king crab CVO quota dropped from 0.12 to 0.08, and the Bristol Bay red king crab CVC quota value ratio dropped from 0.14 to 0.11. The ratio for Bering Sea snow crab CVO quota declined more steeply, from 0.15 to 0.05, while CVC has remained at 0.08 (Gaber-Yonts & Lee 2016).

As a capital asset, the expected rate of return on QS is comparable to that of other investments of comparable risk, e.g. bond yields. As such if it is lower than the market rate, the holder could expect to earn more over time by selling the QS and investing in alternative assets. Comparable yield rates for alternative investments over the period 2008-2013 on bonds of different risk and maturity have generally varied between 3% and 9%; only high risk (C-rated) investment bonds reaching yield rates as high as 15% (Federal Reserve Economic Data 2013). This provides an indication of the relative value of retaining QS shares and the associated stream of royalties. However, these comparisons are also in the context of a stream of revenue royalties that may be declining, based on recent years, in comparison with the benefit of selling (Gaber-Yonts & Lee 2016).

10.2.3.2 Access to Finance Opportunities

The Fisheries Finance Program (FFP) was established under the authority of the 1996 Sustainable Fisheries Act and is administered by the NMFS Financial Services Division. Effective January 18, 2011, the previous FFP was expanded to include Federal loan opportunities for captains and crew actively engaged in CR Program fisheries and seeking to purchase or refinance debt from the purchase of QS (75 FR 78619). The program started in 1998 for the halibut and sablefish fishery IFQ fishery with a \$5 million annual loan authority and has since increased to \$24 million. This loan authority is the combined total available for halibut, sablefish and BSAI crab IFQ's. The loan authority is annual and if a portion of the loan appropriation is not obligated during the fiscal year, the remaining loan authority is lost.

By statute, the FFP may only finance up to 80% of the cost of purchasing crab (or halibut or sablefish) QS. This means that there is a minimum 20% down payment requirement for loans through the program. The loans are fixed interest rates with rates that are 2% over the U.S. Treasury's cost of funds. For example, if at the time of loan closing, the cost of borrowing from the Treasury has a 2.18% interest rate, the total interest rate for the borrower would be 4.18%. The loans are long-term with maturities not exceeding 25 years. There is also an application fee of 0.5% of the loan amount applied for that the applicant has to pay at the time that they file their application for a loan.⁷¹ This opportunity is available to captains and crew participating in the CR Program fisheries, with eligibility verified by NMFS RAM Division.

As with any lending institution, the FFP will evaluate the risk of lending. The agency requires proof of income including tax returns, financial statements, and catch reports to establish that the applicant's income is sufficient and the individual is credit-worthy. Factors such as diversity in other fisheries or other sources of income bolster the NMFS IFQ loan program FFP's view of applicant ability to repay the loan. In some case, the applicant may need pledge additional collateral above the value of the QS. An applicant can consider anything of value to be collateral (e.g. vessel equity, land, home, other QS or fishing permits, or collateral from a co-signer).

During the first nine years of the program, lending through the FFP reached its annual allowable limits. In recent years, the program has been nowhere near its lending capacity. This is in part due to the significant increase in loan authority after 2007, and in part due to the decline in loans issued for halibut and sablefish QS. Decreasing catch limits in the halibut IFQ fisheries over the last several years have led to the FFP implementing stricter credit criteria for those fisheries (Earl Bennett, personal communication, April 13, 2016). Although some of the decreases in catch limits have been offset by ex-vessel price increases, the value of the QS and the revenue it can produce may no longer meet the loan requirements on its own. The lower catch limits have also produced thinner markets for halibut QS, possibly linked with the inability to find financing opportunities, but also likely linked with the uncertainty in future resource abundance and catch limits.

However, usage of the crab crew loans opportunity has never been high. Between 2011 and 2014, the FFP has issued 10 captain and crew loans worth a total of \$3.26 million (\$325,000 on average). A representative

⁷¹ However, sometimes staff with the FFP will advise applicants of the likelihood of success prior to the application fee (Earl Bennett, personal communication, April 13, 2016).

of FFP indicated that to his knowledge, no applicants had yet been turned down from the crab crew loan program (Earl Bennett, personal communications, 4/13/2016).

Very few of the people that AFSC interviewed said they had looked into the loan program offered through the FFP. A number of respondents specifically noted that the NOAA FFP was not available when the BSAI CR Program began, which delayed or impeded their use of federal financing for quota share purchases. This was exemplified by *Respondent005*, who commented,

- “One of the things that really put [crew] behind the 8 ball is that NMFS was supposed to have this loan program going when the rationalization happened. They didn’t. And so banks, they were just getting their feet under themselves. They didn’t know how to treat this stuff and everything. Crew didn’t have as many options and also NMFS loans are more favorable than anything you can get commercially. And they weren’t ready for a long time. And there were a lot of opportunities that crew maybe could’ve had a swing at but they didn’t because they didn’t have funding together at that point.” (Quota shareholder)

Those respondents that did have experience with the NOAA loan program commented that they found it to be difficult to navigate. The following individual’s experience with the loan program summarizes this sentiment.

- “The federal loan [program], I’ve been talking to the people, I should have probably followed through and filled it out last year but I did a bunch of work on my other boats that I own and I got sick of filling out loan paperwork... If they’re really going to make the money more available for people, I guess once you’re approved, you’re approved for 5 years or something but it seems like they want you to do it early. I don’t understand I guess I just need to fill it out and be patient. I guess if I did that I would understand more about it, and I guess once you fill it out then you have the money available. You have to put down 1% of what you’re asking for I think, which I guess is alright, but I guess that means you’re committed.” (Skipper, *Respondent056*)
- “People I’ve talked to thought that it was pretty tough to navigate through that system. And you’re talking [about] people who are out there physically working most of the year, and to come home and try to sit on a loan, it’s just tough for these guys.” (Crewmember, *Respondent004*)
- “I think that the government funding is pretty onerous, especially for you know, if you can imagine somebody that’s never done anything like that before.” (Quota shareholder, *Respondent128*)

However, many respondents also conveyed to AFSC that even if they had a FFP loan or some other kind of financing, it would not make sense to invest in QS. These quotes also identify that it can be difficult to understand and predict the return on investment, which includes the cost of financing. For example,

- “I have a loan with NOAA and I’ve had it since September 6th of 2011, and I guess we could touch on that I mean, for \$350,000. So if you factor that plus whatever 20% more would be for my down payment plus this, it’d probably around \$500 grand and as being a captain, with the price of quota share right now, I don’t think it’s a smart play to buy any.” (Quota shareholder and skipper, *Respondent031*)

- “[Quota] are expensive, and it doesn’t cash flow, so unless you have the cash, it doesn’t cash flow, even with the loan program. Just because it’s so darn expensive so it’s good - if you’ve got the cash sitting on the sidelines to go out and buy quota it’s not a bad place, the return on investment’s okay but it’s hard to make it all make sense if you’re using borrowed money.” (Quota shareholder and skipper, *Respondent033*)
- “Because if you finance it, you’re going to go broke. You’re going to lose in the first year, you’re going to default.” (Quota shareholder and skipper, *Respondent105*)
- “It takes time to build up and to build that equity, which we’ve seen in the other quota fisheries too. It doesn’t happen overnight, it’s a long process, and sometimes those loan payments have to be backed up by either non-fishing income or crew income as well, it’s not just going to cash flow its own payment, especially if you don’t have a hefty down payment to begin with.” (Loan officer, *Respondent006*)

10.2.4 Willingness to Investment

The willingness of crew to buy into the crab fisheries may also be a reason for a change in entry rates in the CR fisheries. The AFSC interviews found that crew members have to dedicate their life to the crab fisheries and often must make sacrifices to participate as a long-term career. *Respondent017*, a quota shareholder and vessel owner, commented that “where we lose a lot of crew members is usually for family reasons.” A fisherman could be at sea “seven [or] eight months out of the year” (Quota shareholder, vessel owner and skipper, *Respondent147*). Other respondents in the AFSC interviews talked about crew members that are “happier being a crewmember on deck” (Quota shareholder, *Respondent068*). Either they don’t have any interest in gaining the experience to be a skipper, or they don’t want the responsibilities that come with being a skipper, vessel, and quota shareholder. Many just want to “go do their job and spend their money, and go out and do their job again and spend their money. That’s pretty standard for a deckhand” (Quota shareholder, vessel owner and skipper, *Respondent073*). An old skipper said, “Not all of them want to be a skipper, you know. They use that for a stepping stone. Half my crew own their own gillnetters and salmon boats in Bristol Bay and Cook Inlet, and a couple of them are trying to get into seining in the sound” (*Respondent073*).

Despite these obstacles, some crew members are expressing interest to progress in the crab fisheries and buy quota. One quota shareholder, vessel owner and skipper exclaimed, “Glad to say, two of my crew now have quota” (*Respondent073*). There are a few who are showing interest and buying quota using the ROFO program. Owning quota is very important for upward mobility in the crab fisheries, because a crew member can “raise [his] value on the boat [he’s] working on” by “[owning] some quota and [leasing] it back to the boat that [he’s] working on,” (Quota shareholder and vessel owner, *Respondent058*). An experienced quota owner, vessel owner and skipper gave this advice:

- “If I was a young person now, I’d be buying quota as I was able to and I would have the time to watch it pay off. And I’d be leveraging that into raises and better positions on the boat, until I was eventually a captain who was bringing in 40,000, 50,000, or 60,000 pounds of opilio with me and,

you know, 10,000 pounds of king crab, and I'd be more concerned with that, than I would be with owning a boat. I think owning a boat is going to be problematic. It's more owning the quota that's going to be important" (Quota shareholder, vessel owner and skipper, *Respondent026*).

10.2.5 Perceptive on the Role of CR Program in Entry Opportunities

Overall, there are differing perceptions of role of the CR Program in entry opportunities for the crab fisheries.

Quite a few respondents held the opinion that new entry into the crab fisheries was "impossible" (Quota shareholder and vessel owner, *Respondent057*; Crewmember, *Respondent017*) or nearly impossible due to consolidation. "Very few guys sell [quota shares] because they're making so much money off of leasing them...and now that the fleet is more condensed, there aren't as many job availabilities" (Crewmember, *Respondent017*). *Respondent012* also commented that, "[The rationalization program] doesn't give anybody new the opportunity to come in, because if you got that kind of money, you ain't coming. You're going to go do something else" (Quota shareholder and skipper). The costs are simply too high for a young person to establish himself in the Bering Sea crab fisheries. As *Respondent 057* explains, "The bottom line is: it's just too expensive...It's a poor business, and it's a poor investment" (Quota shareholder and vessel owner).

On the other hand, there were also respondents in the AFSC interviews that maintained that while "it's not quite as easy as it was before rationalization" (Quota shareholder and vessel owner, *Respondent098*), it is still possible to enter, progress, and be successful in the crab fisheries. There are still opportunities in the crab fisheries for those that work for them. "In a lot of boats, they've got greenhorns all the time" (Quota shareholder and vessel owner, *Respondent098*). It was also a fairly common perception that "rationalization has not made it any harder" (Quota shareholder, vessel owner and skipper, *Respondent026*), and "as far as getting into the fisheries, [there has not been] really any changes. People can still find jobs, and they find them the same way they [did]. [By hitting] the docks, [cultivating] some friendships, [and by getting] to know some people" (Quota shareholder, vessel owner and skipper, *Respondent026*). *Respondent073* echoed this sentiment, "If somebody really wants to do it, they can do it, and, it's like with anything. They need to put the time in. They need to sell themselves. They need to start from the ground floor and work their way up and have the patience to do that. And they'll do it" (Quota shareholder, vessel owner and skipper). "It's always been difficult to become a shareholder in the industry. It wasn't easy to become a vessel owner many years ago. Nothing really has changed...It's always been cost prohibitive" (Quota shareholder, vessel owner and skipper, *Respondent147*).

10.3 Entry to the Processor Sector

Unlike the harvest sector, entry to the processing sector was not limited under the LLP. As a result, processor participation fluctuated greatly in the years leading up to the implementation of the rationalization program. In the early 1990s more than 50 processors operated in the Bristol Bay red king crab and Bering Sea snow crab fisheries. Under lower GHs in the late 1990s and early 2000s, processing participation dropped to fewer than 20 plants in those fisheries.

Both prior to and since implementation of the CR Program, entry to the processing sector as only a crab processor has been very challenging. Processors that also process groundfish are able to keep plants operating for a greater period of time, spreading capital costs across larger scale production. Of the plants that current process CR Program crab, all are currently diversified in at least one other fishery.

Consequently, entry to the processing sector is affected by a processor's potential to enter groundfish fisheries and secure a portion of that production. When groundfish processing is fully capitalized, entry opportunities in the crab processing sector are also limited. In addition, to the extent that other management programs (such as the AFA Bering Sea pollock cooperative program, Bering Sea and Aleutian Island cod sector allocations, and the Amendment 80 cooperative program) directly or indirectly limit the ability of processors to enter those fisheries, entry to the crab fisheries is more constrained, regardless of the limits on entry created by the crab management program.

Share holdings data suggest that a few processors have entered the fisheries since implementation of the program, in some cases with development of substantial holdings (Table 10-4). In the Western Aleutian Islands golden king crab fishery, a majority of PQS is now held by entering processors, while over 20% of the PQS in the Bristol Bay red king crab and Bering Sea snow crab fisheries are held by entering processors. In some instances, this suggested entry has arisen from simple changes in the structure of holdings. In at least one case, however, a substantial interest has been acquired by a new entrant. Although that entrant has not processed landings directly, the lease of those shares has supported processing by an entering processing platform. Table 10-4 indicates that in the past 5 years, PQS acquisition by new entrants has been extremely limited.

Table 10-4 New holders of PQS since 2010 and since initial allocation

Since initial allocation				
Fishery	New PQS holder in fishery		New PQS holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR	6	33%	5	32%
BSS	6	32%	5	31%
EBT	5	22%	4	22%
WBT	5	22%	4	22%
EAG	4	24%	3	23%
WAG	4	53%	3	53%
WAI	3	62%	2	35%
SMB	5	35%	4	27%
PIK	3	30%	2	16%
Since 2010 season end				
Fishery	New PQS holder in fishery		New PQS holder in all fisheries	
	Count of entrants	Share of QS type acquired	Count of entrants	Share of QS type acquired
BBR				
BSS				
EBT				
WBT				
EAG				
WAG				
WAI				
SMB	1	4%	1	4%
PIK	1	13%		

Source: AKR RAM Division quota shareholder files, sourced through AKFIN Econ SAFE Table 4.37

In addition to entry as PQS or IPQ holders, processors may also enter the fishery through purchases of landings of Class B or C share IFQ crab. Entry as a processor acquiring IPQ annually or purchasing landings of Class B or C share IFQ crab can reduce risk, since acquisitions are annual (representing no longer term investment as PQS). These annual purchases will not subject the new entrant to risks such as annual TAC changes or long term changes in product markets. Table 7-11 through Table 7-17 demonstrate the regional patterns of B and C share processing over time.

11 SOCIAL AND ECONOMIC COMMUNITY IMPACTS

Social and economic community impacts are analyzed in *Appendix A: BSAI Crab Rationalization Ten-Year Program Review Social Impact Assessment* (hereafter called the SIA). The SIA, focusing on changes that have occurred since the 5-year CR Program review, updates the SIA from that earlier CR Program review. Following an overview and approach section, the SIA provides, within the bounds of data confidentiality constraints, a quantitative participation description by community, including harvest trends by crab fishery, local community fleet participation, catcher vessel crab harvest volume and value by community, local

community processor participation, processor volume and value by community by share type, and quota share distribution by community for Alaska, Washington, Oregon, and other U.S. states combined.

Following this quantitative description of the distribution of sectors across communities, the SIA provides a series of summaries the social impacts of crab rationalization by community, including discussions of vessel participation, catcher vessel owner shareholdings, crew participation, catcher vessel crew shareholdings, locally operating processors, support services, and local governance and revenues. These summaries are provided for Alaska communities identified as having the most substantial engagement in and dependence upon the BSAI crab fisheries in the pre-implementation SIA, the 3-year CR Program review SIA, and the 5-year program review SIA: Unalaska/Dutch Harbor, Akutan, King Cove, Kodiak, Sand Point, Adak, St. Paul, and St. George. Of these communities, all but Sand Point were determined to be Eligible Crab Communities under the CR Program community protection features. The relevant crab-related changes to the other two Eligible Crab Communities, False Pass and Port Moller, are described separately in a different section of the SIA. Given the focus of describing change since the 5-year CR Program review, detailed community profiles, included in the 5-year CR Program review, have not been updated for the 10-year CR Program review.

Summaries of other Alaska communities by participation type along the dimensions of local vessel ownership, the location of shore-based processing, and the holding of catcher vessel owner and/or catcher vessel crew shares are provided for relevant communities in South-Central Alaska (Anchor Point, Big Lake, Cordova, Dillingham, Kenai, Ninilchik, Seward, Soldotna, Wasilla, Valdez, Seldovia, Anchorage, and Homer) and Southeast Alaska (Juneau, Pelican, Petersburg, Sitka, Yakutat, and Ketchikan). Other summaries are provided in the SIA for the following types of fishery participation by Alaska communities/regions: crew employment, catcher processor-related participation, CDQ group participation, and the participation of cooperatives. Brief summaries are also provided for Seattle and other communities outside of Alaska.

The SIA concludes with two additional sections. The first is an updated summary of other social impact-related issues originally identified in the CR Program pre-implementation EIS, including skipper and crew issues, processing employment, harvester and processor relationships, community preclusion issues, and the social impacts of the divisiveness of the CR Program itself. The second is a summary treatment of larger fishery and economic trends that includes the engagement of crab vessels in other fisheries, Alaska local fleet sizes, season lengths and average days fished per vessel, and changes in the national and state economies, all of which provide a context for cumulative social impacts related to the CR Program.

The social and community impacts presented in the SIA are also informed by the analysis in *Appendix B: Community Fisheries Engagement Indices Throughout the BSAI Crab Rationalization Program*. Appendix B develops fisheries engagement indices for communities involved in harvesting and processing crab species as part of the CR Program. These indices show how engaged in these fisheries each community is and how their relative position has changed over time (using aggregate values for all variables across all CR crab fisheries). Two basic types of CR crab fisheries involvement were considered, commercial processing and commercial harvesting, and numerical indices of engagement were created for each of them. Processing engagement represents the scale of the processing industry in the community and represents landings being made in the community while harvesting engagement represents the communities where the

revenue that harvesters are earning from CR crab fishing is likely being spent and is expected to have some economic impacts. Indices of overall harvesting and processing engagement were also created to provide a comparison between the changes in engagement in the rationalized crab fisheries changes specifically and changes in overall commercial fisheries engagement in general. These indicators provide a quantitative measure of community involvement in the CR crab fisheries which will help provide information about which communities have been most affected by the implementation of the CR Program. In addition to its own stand-alone findings, the results of the Appendix B study were used to cross-check the communities included in the SIA discussions of engagement and dependence as well as the overall conclusions of the SIA.

12 MANAGEMENT, MONITORING, AND ENFORCEMENT

The Magnuson-Stevens Act directs LAPPs to include an effective system of management, monitoring, and enforcement. The system of share-based fishing established by the CR Program includes several fishing privileges and obligations for its stakeholders that require specialized management, monitoring, and enforcement elements. Several aspects of participation in the program must be administered and monitored to ensure compliance with the regulatory requirements. These requirements present unique challenges to NOAA Fisheries Restricted Access Management (RAM), ADF&G, the Office of Law Enforcement (OLE), and the U.S. Coast Guard (USCG).

12.1 Management

The CR Program is primarily administered through NOAA NMFS and Restricted Access Management (RAM). Specifically, RAM:

- administered the application process to receive initial QS and PQS at the onset of the program;
- and continues to process applications for transfer of QS or PQS;
- calculates and issues annual IFQ and IPQ to eligible QS/ PQS holders or cooperative;
- identifies the QS use and vessel use caps for the year given the TAC;
- receives applications for and issues hired masters permits;
- receives applications for and issues registered crab receiver (RCR) permits;
- receives applications for and issues Federal crab vessel permit (FCVP);
- receives information on cooperative membership and cooperative contacts; and
- produces a wide range of in-season and post-season fisheries reports and program overviews.⁷²

Due to recent years of stability in the way the program is administered, representatives of RAM have noted a smooth process with limited Federal management challenges (Tracy Buck, personal communications, 2/18/2016).

⁷² http://www.nmfs.noaa.gov/ole/docs/2015/ole_fy2015_annual_report.pdf

Several amendments have been made to the program to reduce management burden. For example Amendment 31 changed the schedule for the IFQ appeals process. Prior to this amendment, there was a potential for delay in the issuance of IFQ and IPQ due to the prioritization of the appeals process. Particularly if holders of substantial portions of the owner QS or PQS, this delay in allocation could create a mismatch in processor and harvester quota available. When Amendment 31 was implemented it changed the application deadline to allow time creating a lower probability that this instance will occur.

Additionally, more options have been made available for the online submission of applications and forms. This expedites the process and creates benefits from both an administrative and applicant perspective. However there are some types of applications that still need to be submitted by mail or fax, given the types of information required to be provided. For example, this is the case for the hired master's permit. This additional step can slow down the process.

12.2 Monitoring

The CR Program fisheries contain a number of monitoring tools necessary for different objectives in the program including, ensuring compliance with fisheries regulations and safety standards, providing USCG the ability to respond for search and rescue, and gathering important information central in evaluating the health of the target and non-target species. Multiple agencies are involved with monitoring tools in the CR Program fisheries. Monitoring tools include:

- **VMS:** State of Alaska regulation (5 AAC 39.670(c)(1)) requires each vessel participating in CR Program fisheries to have an activated vessel monitoring system (VMS). The VMS consists of a NMFS-approved VMS transmitter that determines a vessel's position and transmits it to a NMFS-approved communications service provider. The communications service provider receives the transmission and relays it to NMFS. VMS is a necessary tool for fisheries management and enforcement. It serves a purpose for the enforcement of area closures (such as protected endangered Steller sea lion halibut) as well as aiding vessels in need of assistance, and allows ADF&G to track vessel participation.
- **State observer program:** State of Alaska regulation (5 AAC 39.645) provides ADF&G full authority and responsibility for deploying onboard observers on any vessel participating in the commercial BSAI crab fisheries as necessary for fishery management and data-gathering needs. Schwenzfeier et al. (2014) provides details on regulations pertaining to the *State of Alaska Shellfish Onboard Observer Program* and a history of that program from its inception in 1988.⁷³ These required coverage levels are summarized in Table 12-1.
 - State regulations require 100% observer coverage on vessels acting as CPs and floating processors.
 - Observers deployed on CPs conduct pot lift sampling, size-frequency sampling, legal-tally sampling and determination of average weight of retained crab for each day the vessel retained catch.
 - For CVs, the coverage requirements vary by fishery. For the Bristol Bay red king crab fishery and the Bering Sea snow crab fisheries the coverage rates are 20 and 30%

⁷³ State regulations specify provisions for *Onboard Observer Certification and Decertification* (5 AAC 39.143) and *Onboard Observer Independent Contracting Agent Certification and Decertification* (5 AAC 39.144).

(respectively). This is commonly accomplished by having 20 or 30% of the fleet carry an observer 100% of the time. It is sometimes done as 20 or 30% of the total harvest observed. In the Western and Eastern Aleutian Islands golden king crab fisheries, CV operators decide which trips within each trimester will be observed and contract with the observer companies for a crab observer. Trips can commonly last up to three weeks and vessels typically make up to five trips each trimester. The realized coverage rate on these vessels for the entire Aleutian Islands area has often ranged from 57 – 70% since rationalization (Table 4-4 *in* Schwenzfeier et al, 2014).

- The main duty for observers deployed on CVs is pot lift sampling on each day the vessel fished. When CVs deliver to a processing facility, the observer obtains a size-frequency sample, legal tally, and determines average weight of retained crab.

Table 12-1 Observer coverage levels in the CR Program crab fisheries

Fishery	Observer coverage level	
	Catcher Vessel	Catcher Processor
BBR	20% ^a	100%
BBS	30% ^a	100%
BST	30 - 100% ^a	100%
AIG	50% ^b	100%
SMB	100%	100%
PIK	100%	100%
WAI	100%	100%

Source: ADF&G

a Coverage is set as the percentage of randomly selected CVs preseason registered for each fishery (selected vessels carry an observer for 100% of their fishing effort). However, coverage could be set as a percent of total harvest by each CV during each registration year.

b Coverage is set at a percent of the total harvest on each CV during each 3-month trimester.

- **Dockside samplers:** Dockside samplers, when available, sample the retained catch of unobserved trips by CVs delivering to shoreside processing plants. Dockside samplers are ADF&G employees and their sampling duties include obtaining a size-frequency sample, legal tally, and determining the average weight of retained crab. Dockside staff are in Dutch Harbor and seasonally (during major fisheries) in Akutan, King Cove, and St. Paul.
- **Timely landings reports:** All retained crab catch must be weighed, reported, and debited from the appropriate IFQ and IPQ account. To ensure proper and timely catch reporting in the CR Program, an electronic reporting system is used. The Interagency Electronic Reporting System (IERS) and its reporting component, eLandings, is a joint system developed under the partnership of NOAA Fisheries Alaska Region, ADF&G, and the International Pacific Halibut Commission (IPHC). This system ensures that deductions are attributed to the appropriate accounts and catch is accounted for. The eLandings system allows entry of crab landings and provides a printed fish ticket as a landing receipt, plus receipts for IFQ and IPQ account debits. Data are received into a central repository database, versioned, and used to populate separate agency management and enforcement databases. There are also non-electronic mechanisms for reporting in a situation where the Internet may be unavailable.

- **Regulatory limits and caps:** Limits are imposed on harvester share holdings, the amount of shares that may be harvested by a single vessel, and the amount of shares that may be held by or processed by a processor (see Section 2.3.2). These limits are monitored through applications for QS and PQS transfer, as well as through monitoring of annual harvesting and processing activity (IFQ and IPQ).
- **Safety compliance checks pre-season:** The USCG encourages and facilitates a pre-season shoreside Safety Compliance Check (SCC) for vessels registered for the crab fisheries. These checks provide a spot check of primary lifesaving equipment for vessels with a current Commercial Fishing Vessel Safety (CFVS) decal and ensure compliance with vessel stability specifications. It is not mandatory that vessels receive an SCC; however, the value of these SCCs is highlighted in the significantly improved safety conditions as detailed in the NIOSH report attached in Appendix C.
- **Catch Monitoring Plan (CMP) Standards:** RCRs receiving unprocessed crab must operate under a CMP, which details how and where crab are sorted and weighed. NOAA Fisheries reviews a CMP with plant management annually to ensure the CMP standards continue to be met. CMPs that meet all the standards are approved for one year, unless during the year there were dramatic changes to plant operations that affected their CMP.
- **Scale certification:** All crab, including parts and dead or otherwise unmarketable crab, delivered to an RCR must be sorted and weighed by quota category on a scale certified by the State of Alaska and equipped with a printer to record the vessel name, the weight of each load in the weighing cycle, the time and date the information was printed, the total weight for the delivery, and the total cumulative weight of all species weighed on the scale.
- **Daily automatic hopper scales (CPs):** Vessel operators that harvest and process their catch at sea must weigh crab on NOAA Fisheries-certified, motion-compensated scale prior to processing. NOAA Fisheries staff have inspected and approved 3 motion-compensated hopper scales in the Puget Sound area of Washington and in Dutch Harbor for all participating crab CPs.
- **Onshore Offload (CPs):** All CPs must offload at a shoreside location accessible by road or commercial air flights. All product offloaded must be weighed on scales certified by the state in which the offload occurs. Each scale must be equipped with a printer that records the weight of each load in the weighing cycle, the total weight in the offload, and the date and time of the offload. CPs must submit an offload report, including the gross and net weights of the crab product offload and an attached scale printout.
- **Economic Data Reports (EDR):** The EDR program collects production, cost, earnings, and employment information from the harvesting and processing sectors of crab fisheries. A third party, Pacific States Marine Fisheries Commission (PSMFC), through a contract with the Alaska Fisheries Science Center (AFSC), carries out EDR administration. This information allows the stakeholders of the fishery, as well as the Council to evaluate the economic and socio-economic effects of the CR Program over time. These types of data are represented in the annual production of a Crab Economic SAFE.

A monitoring burden was identified for the entities required to submit EDRs early on in the program. In response to these concerns, Amendment 42 eliminated redundant reporting requirements, standardized reporting across participants, and reduced costs associated with data collection.

Some aspects of the program have effectively created systems of self-monitoring that have relieved monitoring and enforcement burdens. The arbitration system is administered through a series of contracts that are subject to civil enforcement by the participants in that system. Participants and their representatives are required to comply with application, record keeping, and record submission requirements under the arbitration system. Despite the complexity of the system, to date, participants have generally complied with these various requirements, allowing those aspects of the program to function as intended.

The system of harvest cooperatives has reduced some of the monitoring burden by consolidating IFQ allocations into fewer accounts, effectively shifting a portion of the oversight of those accounts to harvest sector shareholders and cooperative managers. Cooperatives allocations also reduce NOAA Fisheries' transfer administrative burden since intra-cooperative transfers are managed within the cooperative.

12.3 Enforcement

Many of the monitoring tools established in the CR Program fisheries are explicitly designed to track compliance; therefore, many of these elements go hand-in-hand with enforcement. Enforcement in the CR Program fisheries is a multi-agency endeavor, with some collaborative responsibilities.

The primary role of the USCG includes safety, prevention, and response. The USCG conducts mandatory commercial fishing vessel safety examinations, preseason safety and compliance checks as described in the monitoring section, and at-sea safety boardings. The USCG leads search and rescue efforts when situations occur. In order to respond more quickly, a major cutter is deployed in the Bering Sea throughout the year and a helicopter is staged in Cold Bay during peak CR season.

NOAA Office for Law Enforcement (OLE), with assistance from NOAA RAM enforce the regulations that govern allocation of the CR Program. These NOAA agencies monitor and enforce IFQ limits, overall harvest limits, use and holdings caps, active participation requirements associated with C shares, and other elements of the program.

Much of the on-the-water compliance for the CR Program fisheries is enforced by the State of Alaska Department of Public Safety Wildlife Troopers (Troopers). Troopers look for gear compliance (for example properly marked buoys, legal tunnel dimensions, and other required escape mechanisms in pots). They would identify violations for fishing in an area or at a certain time without proper authority. Troopers also make compliance checks for documentation and licensing requirements and on occasion, will assist ADF&G with tank inspections. Wildlife Troopers conduct dock side inspections of crab offloads to look for undersized crab, female crab, or retention of crab of a closed species. The Troopers have a station in Kodiak and Dutch Harbor. Using their patrol vessel, they also make occasional trips to other crab communities like King Cove, Akutan and St Paul. With the small participation of vessels in the golden king crab fishery in the Aleutian Islands and low reports of violations, the Trooper's patrol presence in the Aleutian Islands golden king crab fishery is reduced.

OLE has created a partnership with the State of Alaska Department of Public Safety through Joint Enforcement Agreements (JEAs). These JEAs provide a mechanism for state enforcement personnel to assist OLE in enforcing CR Program requirements and other federal fishing regulations.

Representative of both OLE and the State Troopers noted that, relative to other fisheries and relative to pre-CR Program, the CR fisheries generally operate smoothly with very few compliance issues (Brent Pristas, personal communications, 2/18/2016; Jonathan Streifel, personal communications, 4/15/2016). The Troopers Deputy Commander noted that, while their role and responsibilities have not changed much pre and post CR Program, the volume of issues with compliance has been drastically reduced. OLE identified failure to submit EDRs and harvest overages as the most common violation in the recent program within their realm of responsibilities (Brent Pristas, personal communications, 2/18/2016). However, any harvest overages are calculated and identified electronically, allowing for prompt action. Through an amendment implemented in 2009, IFQ transfers are now allowed post-delivery to remedy a harvest overage. This flexibility had decreased the amount of enforcement actions with regard to harvest overages.

Despite limited violations in the fishery, the program structure still presents unique challenges for enforcement agents. As previously identified, agencies must be able to track and enforce limits that are imposed on harvester share holdings, the amount of shares that may be harvested by a single vessel, and the amount of shares that may be held by or processed by a processor. Overseeing these limitations can pose several challenges to managers and enforcement personnel. Correctly applying limits on owner QS and PQS requires full knowledge of all indirect holdings of those shares. Ownership of interests in the crab fisheries is often indirect with many persons holding overlapping interests in a variety of different fisheries. These overlapping indirect interests create a complex web that must be fully assessed to ensure compliance with limits on share holdings. Similarly, to fully ensure compliance with limits on processing activity and processing share holdings requires that use of shares and plant level processing activity be fully monitored. With the prevalence of custom processing in the fisheries, full monitoring requires tracking of production, as well as knowledge of indirect ownership of both shares and plants. These interests in share holdings and use (which includes ownership of processed products), and processing plants require a multifaceted approach to monitoring use caps in the processing sector.

Periodic changes in interests of entities, adds to the task of maintaining currency in the monitoring of accounts requiring ever greater time and staffing investments. Although the limited number of participants in the crab fisheries helps reduce the burden of these tasks, monitoring of the different limitations on ownership interests is a formidable challenge for NOAA Fisheries.

In addition to the changing QS and PQS ownership, enforcement agents are tasked with identifying entities over a regulatory cap in a dynamic regulatory environment. There have been several amendments to the CR Program that have created exemptions to regulatory limits. For example, Amendment 27 created an exemption for custom processing of crab in the calculation of processor use caps. As explained in Section 2.3.3, a processing share cap had previously prevented any person from holding or using in excess of 30% of the outstanding PQS in any program fishery. These types of amendments can add to the complexity of identifying the proper poundage to weigh against a regulatory cap. For example, under Amendment 27, OLE and RAM need to identify the IPQ that is custom processed and held by an unaffiliated company, versus the IPQ associated with PQS held by the company that owns the processing facility. The Council is

currently considering a similar exemption that would apply to custom processing in the Bering Sea Tanner crab fishery.

C share IFQ active participation requirements also present a monitoring and enforcement challenge. These requirements are monitored through a system of affidavits. Verification of affidavits could be problematic in the event that assertions in those affidavits are questioned.

13 COST RECOVERY

Effective in 2005, Section 313(j) of the Magnuson-Stevens Act provided supplementary authority to Section 304(d)(2)(A) and additional detail for cost recovery provisions specific to the CR Program. As a LAPP, the CR Program must follow the statutory provisions set forth by section 304(d) and section 313(j) of the Magnuson-Stevens Act. Section 313(j) requires the Secretary to approve a cost recovery program for the CR Program, conducted in accordance with the existing Halibut and Sablefish IFQ cost recovery program. Similar to the IFQ cost recovery program, the CR cost recovery program allows for the collection of actual management and enforcement costs up to 3% of ex-vessel gross revenues and a loan program using 25% of the fees collected. Section 313(j) of the Magnuson-Stevens Act includes specific cost recovery requirements for the crab processing industry. Additionally, section 313(j) requires cost recovery fees to be paid in equal shares by the harvesting and processing sectors. The processing sector, specifically Registered Crab Receivers (RCR), are responsible for collecting the fee liability from the harvesters and submitting this and their own self-collected liability to NMFS. Catcher/processors, vessels that harvest and process crab, pay the full fee percentage. The cost recovery regulations for the CR Program were published on March 2, 2005 (70 FR 10174).

The fee liability is calculated by determining the incremental management costs of the CR Program, that is, costs that would not have been incurred but for the CR Program. These costs cover the management, data collection, and enforcement of the CR Program by NMFS, ADF&G, and the Pacific States Marine Fisheries Commission. To arrive at these costs every year, each management unit calculates their CR Program-associated costs. These costs are broken out by cost categories including personnel/overhead, travel, transportation, printing, contracts/training, supplies, equipment, and rent/utilities. The value of the fishery is then calculated using information from the Ex-vessel Volume and Value Report that is submitted annually by RCRs. This report includes the CR Program crab pounds purchased and the ex-vessel value paid. The overall ex-vessel value of the fishery is calculated by summing the value of all pounds purchased of CR crab. Additionally, the Ex-vessel Volume and Value Report is used to calculate standard prices by month and by crab species. These standard prices are multiplied by the landings of catcher/processors to determine the ex-vessel value for that sector.

NMFS then computes the annual fee percentage by dividing the management costs by the total ex-vessel value of crab landings in money, goods, or services. The annual fee percentage is published in the Federal Register at the start of the crab fishing year and is used by CR Program permit holders and RCRs to collect cost recovery fees throughout the season. The CR Program calculates the fee percentage based on the previous year's management costs and ex-vessel value and applies it to the upcoming crab fishing year.

The annual fee percentage is applied to all landings of CR crab. NMFS provides a summary of fee liabilities to all RCR permit holders during the last quarter of the crab fishing year. The summary explains the fee liability determination, including the current fee percentage, and the details of raw crab pounds debited from CR allocations by permit, port or port-group, species, date, and prices. The RCR permit holder is responsible for submitting payment to NMFS on or before the due date of July 31, following the crab fishing year in which payment for the crab is made. Funds collected under the CR Program vary yearly because annual ex-vessel value and management costs fluctuate. The regulations specify payment methods as personal check drawn on a U.S. bank account, money order, credit card through the pay.gov system, or an electronic transfer through the Fedwire system (81 FR 23645).

If an RCR owes fees and fails to submit full payment for the previous crab fishing year by July 31, the Regional Administrator may disapprove any transfer of IFQ, IPQ, QS, or PQS to or from the RCR and may withhold issuance of any new CR crab permits, including IFQ, IPQ, Federal crab fishing vessel, or RCR permits for the subsequent crab fishing year.

Market and stock uncertainties, as well as variation in management costs, mean that the fees may not cover management costs. TAC announcements for the largest fisheries (Bristol Bay red king crab and Bering Sea snow crab) are not made until after the fee percentage is set. In addition, ex-vessel prices will fluctuate with market conditions, so the basis that the fee percentage is applied to will change throughout the season. Further uncertainty arises because the fee percentage must be set before fees have been fully paid for the prior season. Due to these uncertainties, a formulaic approach to setting the fee percentage is used. Regulations require that NMFS establish the fee percentage based on the prior year's costs and ex-vessel values, instead of projections, which can be highly subjective. Table 13-1 shows the fee percentage for the fishing years 2011/2012 through 2015/2016.

Although NMFS cannot adjust the fee percentage at the end of a season, regulations require that any debit or credit to the fee collection account must be carried forward and applied toward the fee percentage calculations for future years. Therefore, because fee collection for the 2010/2011 season exceeded the respective seasonal costs, NMFS subtracted the remaining balances from the estimated costs for the subsequent season, prior to calculating the fee percentage. This resulted in the removal of the fee in its entirety for the 2012/2013 fishing year. Lower costs have been realized through staffing vacancies and multi-year contracts for information technology program needs that were included in prior year costs. Although some program costs have fluctuated in the last five years of the program, most categories of management costs have remained steady (see Table 13-1).

Table 13-1 Cost recovery fee percentages 2010 through 2016

Fishing year costs and value fee percentage is calculated from:	Fishing year fee is applied to:	Fee percentage
2010/2011	2011/2012	1.23%
2011/2012	2012/2013	0%
2012/2013	2013/2014	0.69%
2013/2014	2014/2015	0.65%
2014/2015	2015/2016	1.48%

Source: NMFS AKR

Table 13-2 Management costs and cost recovery fees (2010/2011 through 2014/2015).

Office	Restricted Access Management	Sustainable Fisheries	Operations Management and Information	Information Services Division	General Counsel	Appeals	Office of Law Enforcement	Alaska Department of Fish and Game	Alaska Fisheries Science Center	Financial Services Division	Pacific States Marine Fisheries Commission	Total
Primary source of expenditures	Quota management	Regulations	Cost accounting	Technical support	Legal guidance	Appeals	General enforcement	Extended jurisdiction/ Observers/ CDQ	Economic data reporting	Loan program and buyback	Economic data reporting/ Joint electronic reporting	
2010/2011	\$214,378	\$170,353	\$57,773	\$152,620	\$9,794	\$47,310	\$1,259,261	\$887,668	\$202,508	\$10,625	\$197,900	\$3,210,190
Percent of total costs	6.68%	5.31%	1.80%	4.75%	0.31%	1.47%	39.23%	27.65%	6.31%	0.33%	6.16%	100%
Fees for cost recovery (1.23% fee)												\$3,208,791
2011/2012	\$255,738	\$171,856	\$48,232	\$417,716	-	\$52,428	\$1,126,110	\$915,427	\$173,588	\$14,248	\$189,100	\$3,364,443
Percent of total costs	7.60%	5.11%	1.43%	12.42%		1.56%	33.47%	27.21%	5.16%	0.42%	5.62%	100.00%
Fees for cost recovery (0% fee)												N/A
2012/2013	\$357,545	\$278,140	\$58,685	\$127,138	-	\$59,286	\$1,163,479	\$1,083,649	\$223,316	\$15,354	\$150,000	\$3,516,592
Percent of total costs	10.17%	7.91%	1.67%	3.62%		1.69%	33.09%	30.82%	6.35%	0.44%	4.27%	100.00%
Fees for cost recovery (0.69% fee)												\$1,591,719
2013/2014	\$83,067	\$182,122	\$35,183	\$114,952	-	\$28,603	\$964,481	\$1,236,019	\$179,078	\$9,757	\$262,090	\$3,095,352
Percent of total costs	2.68%	5.88%	1.14%	3.71%		0.92%	31.16%	39.93%	5.79%	0.32%	8.47%	100.00%
Fees for cost recovery (0.65% fee)												\$1,352,185
2014/2015	\$141,815	\$173,266	\$43,995	\$192,348	-	\$6,693	\$1,350,643	\$1,122,578	\$193,853	\$23,395	\$143,700	\$3,392,286
Percent of total costs	4.18%	5.11%	1.30%	5.67%		0.20%	39.82%	33.09%	5.71%	0.69%	4.24%	100.00%
Fees for cost recovery (1.48% fee)												\$3,392,286

14 FISHING VESSEL SAFETY

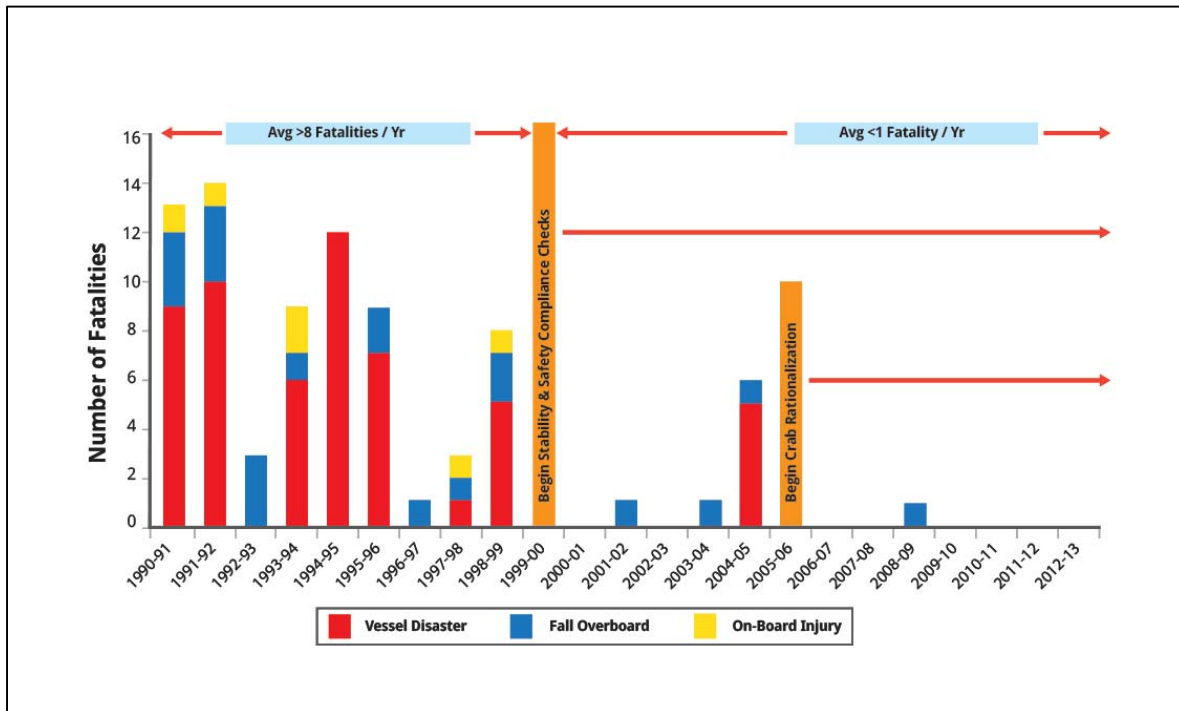
The BSAI crab fleet was identified as the most hazardous commercial fishery in the United States during the 1990s. These heightened safety concerns that existed pre-CR Program was one of the primary drivers for implementation. One of the implied goals of the program was to:

(5) *[Eradicate] the high levels of occupational loss of life and injury.*

During the 1990s, 73 crewmembers in the fleet died as a result of vessel disasters, falls overboard, or on-board injuries. Safety concerns were a primary impetus for CR Program implementation.

Fatal injuries in the BSAI crab fleet have decreased substantially through the combined and cooperative efforts of the fishing industry, Coast Guard, and National Marine Fisheries Service (see Figure 14-1). Taking into account reductions in the number of vessels and crewmembers, this represents more than a 60% decline in the risk of fatal injuries.

Figure 14-1 Fatalities by season and incident type, BSAI crab fleet, 1991/1992 through 2012 (n=82)



Source: for 1990 through 2009 (Lincoln et al. 2013); for 2010 through 2013 (NIOSH Commercial Fishing Incident Database 2014)

Although fewer fatalities have occurred, these fisheries do take place in a harsh environment, in the winter, in remote locations on uninspected vessels, sometimes transiting through ice. Efforts to prevent nonfatal

injuries, fatalities, and vessel casualties should be continued by considering the recommendations in the report. Recommendations based on the analysis included:

- Participate in the USCG “At-the-Dock Stability and Safety Compliance Check” program prior to each crab season.
- All crewmembers should take an 8-hour marine safety class at least every five years to maintain the skills needed in an emergency.
- Create or update PFD policies to require all crewmembers to wear PFDs at all times while on deck.
- Review and adjust procedures for securing and moving pots.

Appendix C includes a report from the National Institute for Occupational Safety and Health (NIOSH) that provides a detailed analysis of work-related injuries and vessel safety issues within the BSAI crab fleet to identify both hazards and opportunities for safety improvements within the fleet.

15 SIDEBOARD LIMITS IN OTHER FISHERIES

In developing the CR Program, the Council anticipated that flexibility inherent in the CR Program would allow crab fishermen to expand their fishing operations into other fisheries. Because the Bering Sea snow crab and many economically valuable GOA groundfish fisheries were conducted concurrently from January through March the Council was particularly concerned that increased flexibility for recipients of Bering Sea snow crab QS would give these participants an incentive to increase effort in GOA groundfish fisheries, putting pressure on the operations of the historical participants in these fisheries. Therefore, the Council determined that the CR Program should include sideboards for most GOA groundfish fisheries to prevent Bering Sea snow crab QS recipients from increasing their participation in those fisheries.

Sideboards are a management tool often implemented within limited access privilege programs to prevent negative spill-over effects on other fisheries. In effect, sideboards limit or prevent participants who benefit from receiving exclusive harvesting privileges from shifting effort into fisheries that are not managed within a limited access program.

The Council included sideboard limits on the harvest of GOA groundfish as well as GOA Pacific cod specifically, for vessels and licenses with enough of a history in the Bering Sea snow crab fishery to qualify for initial allocation of Bering Sea snow crab QS. The CR Program did not establish sideboard limits for American Fisheries Act (AFA) vessels with historical participation in the Bering Sea snow crab fishery because these vessels are subject to GOA harvesting and processing restrictions under the AFA and the implementing regulations for the AFA (§ 679.64(b)). This section is focused on the remaining vessels with history in the Bering Sea snow crab fishery that are not AFA vessel (referred to here as non-AFA vessels).

15.1 GOA Groundfish Sideboard

Program sideboard limits apply to non-AFA vessels that harvest any species of groundfish in GOA⁷⁴ and meet one or both of the following criteria: (a) made a legal landing of Bering Sea snow crab between January 1, 1996, and December 31, 2000, that generated any amount of Bering Sea snow crab QS; or (b) the vessel is named on a GOA groundfish license limitation program (LLP) license that was generated by the fishing history of a vessel that also generated Bering Sea snow crab QS.

If the vessel meets one or both of these criteria, harvest of GOA groundfish is limited to a designated sideboard ratio for all groundfish species (except GOA Pacific cod which is a special case discussed next and sablefish IFQ which is rationalized), regardless of the vessels or license history in the GOA groundfish fisheries. As is the case for all others directed fishing GOA groundfish, these vessels must carry a GOA groundfish LLP license authorizing their participation. The sideboard ratio for all GOA groundfish (excluding Pacific cod and sablefish) is calculated as the 1996 through 2000 non-AFA crab vessel landings/ 1996-2000 total GOA groundfish landings. The sideboard restrictions apply in the State of Alaska parallel groundfish fisheries to vessels with a Federal Fisheries Permit or LLP license. Since LLPs can move among vessels, it is possible that the sideboard limits on a vessel could differ from those associated with the license assigned to that vessel. In these cases, the more restrictive sideboard is applied.

In July 20, 2011, Amendment 34 to the king and Tanner crab Fishery Management Plan, created exemption criteria specifically for vessels and licenses that had historical participation in the Bering Sea snow crab fishery, that also had historical dependence on the GOA pollock fishery (Figure 15-1). To qualify for an exemption from GOA pollock sideboards (previously contained under the umbrella GOA groundfish sideboards), the catch history of the vessel must be less than 0.22% of all Bering Sea snow crab landings from 1996 through 2000. In addition, these vessels/ licenses needed to be associated with more than 20 landings of GOA pollock between 1996 and 2000.

15.2 GOA Pacific Cod Sideboard Categories

Persons who wish to participate in the directed fishery for Pacific cod in the Bering Sea and/or Aleutian Islands with pot or hook-and-line gear must have a gear- and operation-type specific Pacific cod endorsement on the LLP license that names their vessel. In addition to fishing under the GOA groundfish sideboard ratio, most non-AFA vessels that had Bering Sea snow crab history are prohibited from directed fishing for GOA Pacific cod under the regulations of the CR Program, even if they were to obtain a Pacific cod endorsed LLP license. Sideboards under the program prohibit participation in the GOA Pacific cod fisheries by non-AFA vessels with Bering Sea snow crab history that contributed to a quota allocation and that landed less than 50 metric tons of groundfish harvested in the Gulf during the Bering Sea snow crab qualifying period (January 1, 1996, and December 31, 2000).

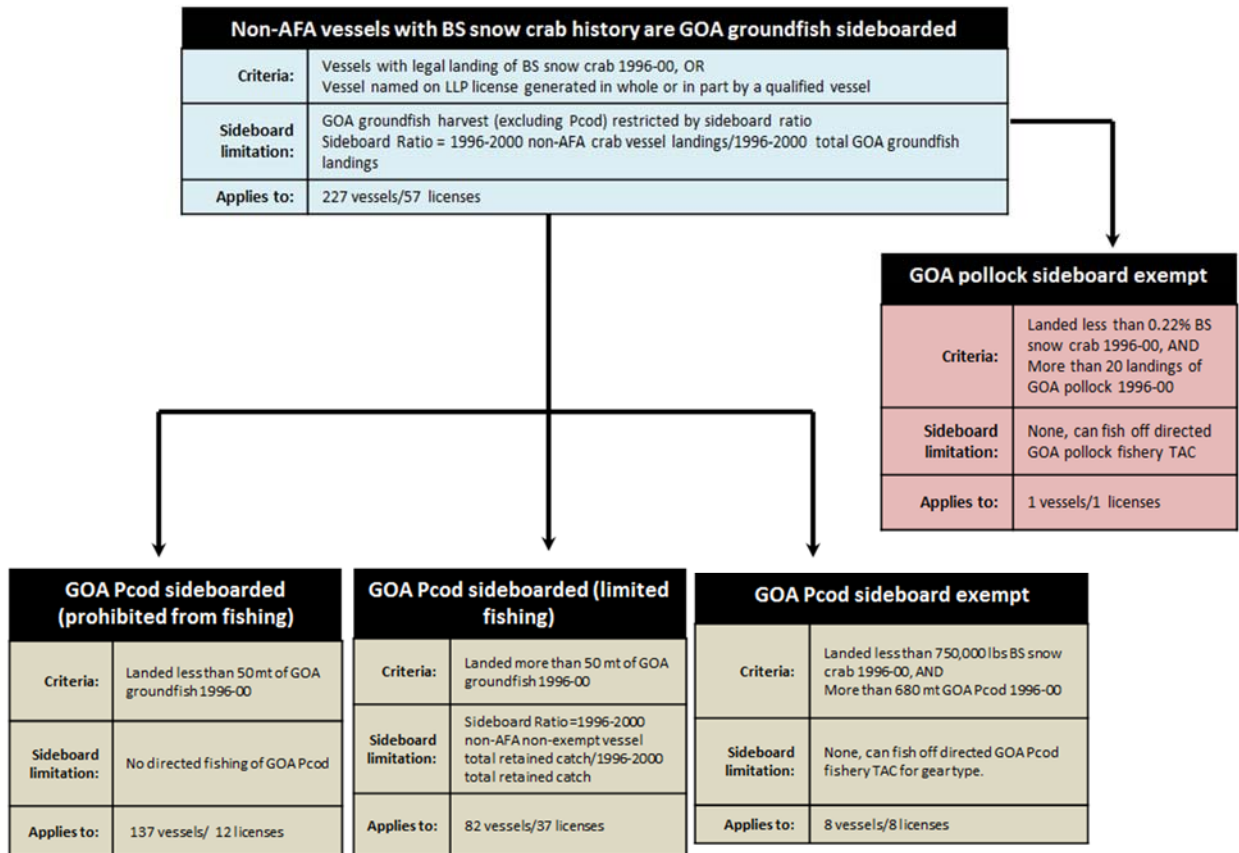
⁷⁴ With the exception of sablefish harvested with fixed gear. Sablefish harvested with fixed gear is managed under its own limited access privilege program (the halibut/ sablefish IFQ program) and therefore there is no need to include sideboards.

However, some Bering Sea snow crab QS recipients had significant historical participation in the GOA Pacific cod fishery, and limited participation in the Bering Sea snow crab fishery. As a consequence, the Council established criteria to identify vessels with limited Bering Sea snow crab history and sufficient GOA Pacific cod dependence in order to exempt vessels – and vessels named on these LLPs - from the GOA Pacific cod fishing prohibition. The Council also established a secondary sideboard threshold, based on minimal level of historical dependence for which vessels – and vessels named on these LLPs – may fish under (Figure 15-1).

Originally, the qualification for the exemption was less than 100,000 pounds of catch history of in the Bering Sea snow crab fishery during the qualifying period, and more than 500 metric tons of GOA Pacific cod during the qualifying period. Amendment 34 also modified this qualification criterion, to exempt additional recipients of Bering Sea snow crab quota share from GOA Pacific cod. Specifically, the new qualification criteria for exemption of GOA Pacific cod sideboards is if the catch history of the vessel is less than 750,000 pounds of Bering Sea snow crab from 1996 to 2000 and more than 680 metric tons of GOA Pacific cod during the same qualifying years.

Figure 15-1 provides a diagram of the structure of the GOA groundfish sideboard ratio, the sideboard criteria for GOA pollock, and the three categories of GOA Pacific cod sideboards.

Figure 15-1 Diagram of non-AFA crab vessel sideboards for GOA



Under the program, 227 non-AFA crab vessels received an initial allocation of Bering Sea snow crab QS and are subject to the GOA groundfish sideboard limits; 137 of these vessels are prohibited from fishing for GOA Pacific cod; 82 vessels are subject to the GOA Pacific cod sideboard limits; 8 vessels are exempt from the GOA Pacific cod sideboard limits; and 1 vessel is exempt from GOA pollock sideboard limits. Also, 57 groundfish LLP licenses originated on non-AFA crab vessels and are subject to the GOA groundfish sideboard limits; 12 of these licenses are prohibited from use for directed fishing in the GOA Pacific cod fisheries; 37 licenses are subject to the GOA Pacific cod sideboard limits; 8 licenses are exempt from the GOA Pacific cod sideboard limits; and 1 license is exempt from the GOA pollock sideboard limits.

Amendment 83 to the GOA FMP implemented GOA Pacific cod sector allocations for non-AFA vessels that superseded the inshore/offshore sideboard limits established under the AFA and CR Program. Prior to implementation of GOA Pacific cod sector allocations in 2012, NMFS managed the sideboard limits for GOA Pacific cod by setting an inshore sideboard limit and an offshore sideboard limit. These sideboard limits were calculated by adding up the catches of vessels subject to the sideboard limits during the 1996 through 2000 period and dividing that by the catches of all vessels in the fishery to yield a sideboard ratio. The sideboard ratio was multiplied by the TAC for that year; the sideboard limit was also divided into seasons. Those amounts were then made available to all vessels in the respective sector subject to the sideboard limit, on a seasonal basis, at the beginning of the year. All targeted or incidental catch of the sideboard species made by the non-AFA vessels subject to the sideboard was applied to the applicable sideboard limit.

As part of the GOA Pacific cod sector allocation in 2012, the Council recommended operation type and gear type sideboard limits for non-AFA crab vessels based on participation in the GOA Pacific cod from 1996 through 2000. The recalculated sideboard ratios and annual limit for 2015 are provided in Table 15-1. Since 2012, with the exception of the pot CV sideboard limit, NMFS determined that all other non-AFA sideboard limits for GOA Pacific cod were insufficient to support a directed fishery, so these fisheries were closed for the entire year.

Table 15-1 GOA Non-AFA crab vessel groundfish harvest sideboard limits for Pacific cod (mt), 2016

Species	Season/gear	Area/component/gear	Ratio of 1996-2000 non-AFA crab vessel catch to 1996-2000 total harvest	Final 2015 TACs (mt)	Final 2015 non-AFA crab vessel sideboard limit (mt)
Pacific cod	A Season January 1 - June 10	W Hook-and-line CV	0.0004	17,011	7
		W Pot CV	0.0997	17,011	1,696
		W Pot C/P	0.0078	17,011	133
		W Trawl CV	0.0007	17,011	12
		C Jig	0	22,190	-
		C Hook-and-line CV	0.0001	22,190	2
		C Pot CV	0.0474	22,190	1,052
		C Pot C/P	0.0136	22,190	302
	C Trawl CV	0.0012	22,190	27	
	B Season Jig Gear: June 10 – December 31 All other gears: September 1 - December 31	W Jig	0	11,341	-
		W Hook-and-line CV	0.0004	11,341	5
		W Pot CV	0.0997	11,341	1,131
		W Pot C/P	0.0078	11,341	88
		W Trawl CV	0.0007	11,341	8
		C Jig	0	14,794	-
		C Hook-and-line CV	0.0001	14,794	1
		C Pot CV	0.0474	14,794	701
	Annual	E inshore	0.011	5,930	65
		E offshore	0	659	-

Notes: The Pacific cod A season for trawl gear does not open until January 20. The Pacific cod B season for trawl gear closes November 1.

In June 18, 2015, Amendment 45 to the King and Tanner crab FMP was implemented which establishes a 1 year time limit (starting on the date implementation) that would permanently remove Pacific cod sideboard harvest limits for hook-and-line CPs in the Central and Western GOA if each eligible participant in that sector signs and submits a request to remove these sideboard limits. With the implementation of Amendment 83, the crab program GOA Pacific cod sideboard limits in the Central and Western GOA are calculated using the apportionments of Pacific cod TAC established for specific gear types and by operation type. As a result, the non-AFA crab sideboard limits for Central and Western GOA for vessels using hook-and-line gear and operating as CPs are now much smaller than they were prior to Amendment 83. As noted above, since the GOA Pacific cod sideboard limits for the hook-and-line CPs are so small, NMFS has prohibited directed fishing for Pacific cod in the Central and Western GOA by participants in the hook-and-line CP sector so as not to exceed the sideboard limit, which affects eight vessels and five LLP licenses.

Amendment 45 provided participants in the Central and Western GOA hook-and-line CP sectors with an opportunity to cooperatively coordinate harvest of Central and Western GOA Pacific cod through private arrangement to the participants’ mutual benefit, which would remove the need for sideboard harvest limits for this sector. NMFS received an affidavit that all eligible fishery participants in the Western and Central GOA recommended removal of these sideboard limits. Therefore, NMFS permanently removed the sideboard limits and did not establish 2016 and 2017 Pacific cod sideboard limits for the hook-and-line CP sector (see Table 15-1).

Table 15-2 provides an annual vessel count of the non-AFA crab vessels, by sideboard category in the GOA Pacific cod fishery from 2003 through 2015 that caught GOA Pacific cod. The number of Pacific cod exempt non-AFA crab vessels ranged between 4 and 6 during this period. For Pacific cod sideboard non-AFA crab vessels, the vessel numbers ranged from 4 in 2015 to 21 in 2006. Finally, the number of other vessels that caught GOA Pacific cod has ranged from 268 in 2005, to 350 in 2012.

Table 15-2 Number of vessels fishing in the GOA Pacific cod fishery by sideboard category

Year	Pacific cod exempt vessels	Pacific cod sideboard vessels	Other Pacific cod vessels	Total
2003	6	18	317	345
2004	6	20	316	348
2005	6	17	268	301
2006	6	21	269	302
2007	6	15	272	295
2008	6	18	297	322
2009	6	13	276	297
2010	6	13	319	338
2011	6	14	347	369
2012	4	11	350	366
2013	4	7	298	309
2014	4	7	301	312
2015	4	4	291	299

Source: Crab_sideboard(3-21)

Table 15-3 provides GOA Pacific cod catch for non-AFA crab vessels by sideboard category, while Table 15-4 provides annual percent of GOA Pacific cod caught by each vessel group. The combined directed harvest of GOA Pacific cod by all vessels ranged from 32,420 mt in 2003, to 54,491 mt in 2011. For the Pacific cod exempt non-AFA crab vessels, on average their percent of the total GOA Pacific cod catch is 5.5 percent, with a catch range of 1,027 mt in 2009 to 3,583 mt in 2011. The catch of GOA Pacific cod for other Pacific cod vessels on average accounted for 80.9% of all GOA Pacific cod catch.

Table 15-3 GOA Pacific cod catch (mt) of non-AFA crab vessel by sideboard category from 2003 through 2015

Year	Pacific cod exempt vessel catch (mt)	Pacific cod sideboard vessel catch (mt)	Other Pacific cod vessel catch (mt)	Total catch (mt)
2003	1,869	5,707	24,843	32,420
2004	1,744	6,405	27,467	35,616
2005	3,085	7,496	17,964	28,545
2006	2,228	6,692	23,396	32,317
2007	2,018	4,856	29,184	36,058
2008	1,299	4,204	30,234	35,737
2009	1,027	3,275	28,447	32,749
2010	2,163	5,111	41,428	48,702
2011	3,583	7,632	43,276	54,491
2012	3,195	6,248	42,252	51,695
2013	1,377	2,859	40,097	44,334
2014	2,095	3,814	48,244	54,152
2015	3,204	4,771	41,899	49,873

Source: Crab_sideboard (3-21)

Table 15-4 Percent of GOA Pacific cod catch by sideboard category from 1995 through 2009

Year	Pacific cod exempt vessel catch (%)	Pacific cod sideboard vessel catch (%)	Other Pacific cod vessel catch (%)
2003	5.8	17.6	76.6
2004	4.9	18.0	77.1
2005	10.8	26.3	62.9
2006	6.9	20.7	72.4
2007	5.6	13.5	80.9
2008	3.6	11.8	84.6
2009	3.1	10.0	86.9
2010	4.4	10.5	85.1
2011	6.6	14.0	79.4
2012	6.2	12.1	81.7
2013	3.1	6.4	90.4
2014	3.9	7.0	89.1
2015	6.4	9.6	84.0
Average	5.5	13.6	80.9

Source: Crab_sideboard(3-21)

16 SUMMARY AND CONCLUSION

This final section of review summarizes key changes in the CR fisheries in relation to the 8 implicit goals of the program (listed in Section 1.2). This section also highlights challenges for the management of the program highlighted previously by the Council or identified in the program review. Both sections refer to

the requirements of a LAPP (detailed in §303A(c)), and the National Standards of the Magnuson-Stevens Act (detailed in §301) and cite sections of the review that provide more detailed information on these topics.

The first portion of this section highlights evidence from the program review that can be used to identify the extent to which Council-identified problems (implicit goals) were addressed through the creation and development of the CR Program. In a general way, the CR Program has addressed many of the issues identified in the problem statement of the program. Many of these benefits were enabled by program implementation, some have developed by modifications to the program through regulatory amendments, and some benefits have been realized over the course of the program as participants adapt.

However, as previously stated, these implicit goals are broad, sometimes provide conflicting objectives, and do not identify specific metrics in order to evaluate their success. Their nature exemplifies the balancing act of the Council process; which draws from the diverse and evolving interests of the stakeholders in the BSAI crab fisheries. Therefore, the success in the program's ability to achieve specific goals is largely based on individual preferences over the distributional impacts, directly or indirectly created by the new management regime. In the following descriptions, topics are addressed in terms of 1) which program goal the issues represent, 2) how much evidence there is to support a specific programmatic result (i.e. identifying outcomes in the fisheries that are less likely to be disputed versus results that may be perceived differently depending on the criteria used to assess the goal), 3) a summary of some of this evidence, citing section of the review with greater detail, and 4) the goals are discussed in terms of areas of deficient information and potential areas for additional research methods.

Program Goal: Resource conservation, reduced bycatch mortality, and potential landings deadloss

Addresses: Program goals #1 and #2, National Standard 9

Degree of debate: It is difficult to link the shift in management of CR fisheries directly to the conservation of the resource, given other ecological factors involved. There would likely be a great deal of debate related to the broad question of how the CR management has impacted the resource as a whole. The program review evaluates more specific biological indicators (such as changes in bycatch) that can be more readily linked with changes in the management regime. These changes suggest a number of beneficial results (Section 3).

Evidence from review:

- Catch in excess of the harvest targets was difficult to prevent in the derby-style fisheries. Since implementation of the CR Program, the TAC for these fisheries has never been exceeded. (Section 3.2.1 and Table 3-1)
- There have been improvements in data quality due to regulations implemented along with the CR Program in combination with more slowly prosecuted fisheries. (Section 3.2.2)
- There have been increased agency/ industry collaborative biological research programs, particularly with the formation of the Bering Sea Research Foundation and the Aleutian King Crab Research Foundation. (Section 3.2.2)
- The program has led to decreased deadloss, and greater accountability as deadloss is deducted from IFQ holdings. (Section 3.2.4)

- The CR Program management regime has created additional opportunity to highgrade given the slower pace of fishing and the prescribed pounds of IFQ able to be harvested. In the rare occasions when this has occurred, ADF&G has been able to discourage these trends from continuing by reducing the TAC to account for discards of legal males. (Section 3.2.4)
- New techniques and a slower fishery have contributed to improved deck sorting methods to mitigate handling mortality. (Section 3.2.7)
- There is a distinct increase in the average duration of pot soak time and CPUE after the implementation of the CR Program.

Further useful information and analysis: Technical models could do a more thorough job of isolating the impact of the change in CR fisheries management on these biological indicators, while controlling for a suite of other biological and economic events that were occurring during the same time period. However, certain fishery characteristics like fleet size and duration of fishing season, changed so immediately and drastically after the implementation of the program, many of these biological indicators relate to the change in program management in a fairly convincing fashion.

Program goal: Reduce excess harvesting and processing capacity

Addresses: program goal #3, LAPP requirement

Degree of debate: The extent to which crab harvesting and processing capacity was reduced is measurable, and fairly objective when considered in terms of the number of vessels and processing facilities that have participated in program fisheries over time. Moreover, the role of the CR Program in this change is fairly clear, given the speed with which the reduction in capacity occurred. Consolidation of QS/PQS is more difficult to understand, as data on the number of QS/PQS holders and transfer of QS/PQS are complicated by the varying structures of entities. The more subjective nature of this goal lies in identifying the appropriate degree of capacity reduction, which was not specified at program implementation. The program includes QS and PQS use caps, which means that it was also intended that there would be limits on the amount of consolidation that occurred. These inherently conflicting ideas clearly demonstrate a desire to balance the production efficiency that could be gained through the types of cooperation and consolidation that a catch share program allows for, with the types of social and economic benefits that come from having a larger and more diverse group of stakeholders participating in a fishery.

Evidence from the review:

- The large-scale, structural consolidation of the crab fleet that began occurring immediately during the first year after program implementation, has been well documented. (Section 5.1)
- The fleet participating in the CR Program fisheries declined from 256 vessels during the 2004/2005 season to 91 vessels during the 2006/2007 season. The numbers of vessels operating in the fisheries generally continued to decline (at a slower rate) five years following implementation. However, the number of vessels in the CR fleet has remained fairly consistent over the past 5 years. (Figure 5.1, and Table 5.1)
- The fishery capacity reduction program bought back 25 BSAI crab fishing vessels with history and 62 licenses. (Section 5.7)

- When compared with initial allocations share holdings, current owner QS holdings do not demonstrate a clear trend in a change in the number of owner QS holders or in median owner QS holdings. Patterns in QS transfer is difficult to understand given the structure of entities involved in the CR Program. (Table 4-3, Table 4-6, and Table 4-7)
- Class C share QS demonstrates a clearer trend of consolidation; visible due to the requirement for only individual use, and likely prompted due to additional active participation requirements. (Section 4, Table 4-8)
- Consolidation has also occurred in the processing sector. For example, 11 processing plants processed Bristol Bay red king crab in 2005, down from 17 plants during 2004. (Table 7-1 and Table 7-3)
- Incremental consolidation continues in both the processing sectors, with the long terms trend in numbers of plants and operating in the fisheries continuing to decline. (Table 7-1, Table 7-3 through 7-9)
- Median PQS holdings have increased in all CR fisheries since program implementation. However, the total count of PQS holding entities has increased by 2 since program implementation. Again, broad trends in PQS transfer are difficult to understand given the changing structures of entities. (Table 6-1 and Table 6-4)

Further useful information and analysis: Within an environment of complex and changing entity structures, further analysis that could deconstruct QS holder to the individual level may provide greater clarity regarding changes in QS and PQS holdings. This type of effort could also bring greater understanding to the level of new entry, which is also currently masked by the restructuring of entities.

Program goal: Greater opportunity for efficiency and efficient resource utilization

Addresses: program goal #1, 3, 6, 7 and National Standard 1 and 5

Degree of debate: There could be many ways to measure the “opportunity for efficiency and efficient resource utilization”. This review suggests several basic metrics, all which point to greater efficiency and efficient resource utilization after the implementation of the CR Program. There are several elements of the program that may diminish the opportunity for efficiency, but were implemented in order to address other social and economic outcomes of the fisheries.

Evidence from review:

- The allocation of harvesting quota, in combination with the harvest cooperative structure provides a framework for optimizing the allocation and timing of fishing effort, under which a fluid, and potentially highly efficient, quota lease market is possible. (Section 5.2)
- Harvest cooperatives also provide the tools to efficiently share resources for the sometimes time intensive and complex administrative aspects of the program. (Section 5.2.1)
- Similarly, processing privileges and leasing/ custom processing of IPQ can allow PQS holders to share costs and increase production efficiencies. (Section 6.2)
- Since program implementation, CPUE has increased, likely in part due to longer soak times and using the appropriate escapement mechanisms, benefiting operational efficiency as well as improving resource protection (Table 3-6)

Further useful information and analysis: Additional analytical methods could further identify concentration in QS, revenue, and fishing operations. For example, the Gini coefficient measures the degree of concentration in a distribution, such as revenue among QS holders or landings among vessels. The Herfindahl-Hirschman Index (HHI) is a measure of market power, and could be used to measure QS holdings in relation to the QS pool.

Program goal: Increased stability and predictability

Addresses: program goal #4, 6, 8

Degree of debate: While there are still elements of crab fishery that present uncertainty (e.g. TAC, prices, wholesale markets, costs, etc.) the program contributes several large factors of stability and predictability to fishing operations.

Evidence from review:

- The allocation of harvesting and processing privileges allows for more accurate preseason planning. (Section 2.2.2 and 2.2.3)
- Specified elements of the program (for example regional landings designations and the right of first refusal), builds an expectation of how the program will operate, which can add to predictability. (Section 2.2)
- The Arbitration System, particularly share matching and the use of the lengthy season approach, allows both harvesters and processors the ability to establish delivery arrangements in a timely manner and plan their seasons with more certainty. The system puts less pressure on pre-negotiation price and other terms of delivery, with an understanding that a binding arbitration opportunity may be available. (Section 9.2.2).

Further useful information and analysis: Further analysis of QS/PQS purchase and IFQ/IPQ lease markets and behavior could provide the basis for estimating changes in perceived investment risk in CR fisheries. The available lease market data used in the review is limited to three years (2012-2014), but as the data series grows longer and/or with additional data development, investment risk analysis could provide useful metrics to assess program performance with respect to this goal.

Program goal: A system of higher economic returns

Addresses: program goal #3, 8; National Standard 8

Degree of debate: While it may be challenging to find a single metric to evaluate this goal, evidence from the review provides strong indication of a system that allows for higher economic returns. In particular, increased stability and predictability contribute to this opportunity.

Evidence from review:

- The program presents a chance for greater economic returns through opportunities for efficiency as well as greater long-term stability and predictability. (As described in the previous goal)
- To the extent that communities are invested in the CR Program fisheries, for example through CDQ groups, the opportunity for higher economic returns also extends to communities. (Section 8.2)

- The generation of significant quota lease royalties, equivalent to 25 to 65% of the ex-vessel value of landed crab in different CR fisheries, demonstrates the generation of surplus resource rents. (Section 5.3)
- Changes in captain and crewmember compensation has been an area of much past discussion. Changes in crew wages can be understood differently depending on what metric is used for evaluation. (Figure 5-11)
- The first wholesale revenue split between harvesters and processors has intentionally not changed much since the implementation of the program due to the arbitration system. However, if significant and long-term costs have changed for either sector, their net profits may be impacted (either positively or negatively). (Section 9.2.2.1.2)

Further useful information and analysis: An additional measure of economic returns for crew members could be focused on their ability to diversify into other fisheries and other occupations throughout the course of the CR Program. Direct measurement of changes in participation in other fisheries or alternate employment would require new data collection, and may not be feasible to assess relative to pre-rationalization. While crew license data collected in the crab EDR program provides valuable information on individual crew member participation in CR fisheries, it is unique to this program. More detailed analysis of the effect of changing season lengths and number of days at sea that vessels and crew members commit to CR fisheries could identify barriers to alternate employment associated simply with timing of the CR fishery. However, rigorous evaluation would likely also require a model capable of controlling for other factors that may affect diversification (e.g. implementation of Amendment 80). Additional research on crew upward mobility may also contribute knowledge to the differences in long-term reliance on the fisheries pre- and post-CR Program implementation.

Program goal: An effective system of monitoring, management, and enforcement

Address: program goal #1, Requirements of LAPP

Degree of debate: Again, this is a broad goal which is difficult to evaluate under one specific set of criteria. The review cites changes from the program (for example a smaller overall fleet) that lead to an intuitive understanding of monitoring, management, and enforcement benefits from implementation and continued development. The CR Program management is adaptive, which can and has included amendments to better facilitate these key elements of fisheries management.

Evidence from review:

- Some aspects of the program have effectively created systems of self-monitoring that have relieved monitoring and enforcement burdens. For example, the arbitration system is administered through a series of contracts that are subject to civil enforcement by the participants in that system. (Section 12.2, Section 9.2.2)
- Several different agency representatives commented on the diminished enforcement actions occurring under the current management regime and relatively minimal administrative issues have arisen in recent years. (Section 12.3)

- OLE has highlighted the challenges associated with enforcing PQS/ IPQ caps (which apply to both PQS holdings as well as IPQ used), given the complicated and changing entity structures involved in processing CR Program crab. (Section 12.3)
- Either direct or indirect management, monitoring, and enforcement issues are examined anytime there is a proposed amendment to the program. Since Amendments 18 and 19, to the king and Tanner crab FMP (which implemented the program), there have been 24 amendments to the crab FMP. This adaptive management process allows the Council and NMFS to deal with issues when and if they arise. (Section 2.4, Table 2-5).
- Having much of the authority under the jurisdiction of the state of Alaska, allows for an expedited amendment processes for changes in management. (Section 2.1, Table 2-1).

Further useful information and analysis: Continued consideration of monitoring, management, and enforcement issues will occur through relevant actions.

Program goal: Promote stability in, as well as addressing social and economic concerns of the communities

Address: program goal #4, 6, 8, National Standard 8, Requirements of LAPP

Degree of debate: Given the distributional impacts to communities and stakeholders, the question of whether the CR Program has addressed the social and economic concerns of the communities and provided for community stability is highly sensitive to the criteria used to assess these broad goals. While there are a number of community-level metrics that can be tracked throughout the course of the program, prioritizing which of these measurements are important to the stakeholders and communities depends their relationship with the crab fisheries and their experience of the CR Program.

There are number of specific community-related issues the program sought to address with the creation of specific program elements highlighted in the review (e.g. right of first refusal, designation of regional delivery requirements, increase in CDQ allocation and creation of Adak allocation, etc.). However, the program has provided for variable impacts across communities, and among time period with many other important and sometimes interacting community influences. Therefore, the impact of the CR Program on communities does not constitute a simple assessment with an objective response.

Evidence from review:

- The program built in a number of community provisions linked with processing activity, intended to protect existing community interests. These provisions include regional landing designations and the right of first refusal. An amendment package was recently implemented to attempt to make the right of first refusal process more transparent and effective at allowing the processing privileges to be salable to the community of origin if and when a PQS transfer is considered. (Section 2.2.4, Section 7, Appendix A).
- The program increased CDQ allocation to 10% of the TAC and included an allocation of Western Aleutian Islands golden king crab for Adak. Some groups were also granted CVO QS, based on LLP licenses held in the crab fisheries. Since implementation, all groups have made additional investments in CVO or PQS. CDQ groups are also the right of first refusal holders for the communities they represent (Section 8).

- Some of the distributional impacts, particularly between CDQ and non-CDQ communities are highlight later in this section. (Appendix A)

Further useful information and analysis: Additional analysis could be done integrating social and economic impacts of crew job structure (i.e. based on duration of season, diversification opportunity, etc.) to changes in community structure and lifestyle. Additional analysis could also identify how this change in the nature of the crew jobs may change the participants' engagement and vulnerability to changes in the status of the fisheries.

Program goal: Safety at sea

Address: program goal #5; National Standard 10; LAPP requirements

Degree of debate: There is possible debate around the extent to which the program itself contributed to safety at sea (as opposed to external factors). This review does not attempt to tease out the marginal effects of each stimulus separately, but demonstrates overall improved trend in diminished personnel casualties and vessel casualties overtime.

Evidence from review:

- The BSAI crab fleet was identified as the most hazardous commercial fisheries in the United States during the 1990s. (Appendix C)
- Subsequent to the Coast Guard Stability and Safety Compliance Checks beginning in 1999/2000 and the end of the derby-style fishery in 2005, the CR fisheries have had significant reductions in falls overboard, on-board injuries, and vessel disasters (Appendix C).

Further useful information and analysis: Further analysis could be aimed at identifying the marginal effect of the program itself on safety in the crab fisheries; however, models would have low statistical power given the limited sample size of personal and vessel casualties, even in the 1990s. Additionally it is unclear how accurately the numbers of reported non-fatal injuries represents the true injury burden in the fleet. Underreporting of injuries is likely a problem, but the extent is unknown.

Issues and Challenges

The remainder of this section highlights of some of the challenges that have been presented over the course of the CR Program and in the past 5 years. This section is populated with issues that the Council has given recent attention to, and issues that have been highlighted in the program review. This section is not intended to be a comprehensive list of areas of interest for the program moving forward, nor is it a list of recommended action areas. With an adaptive management process, the Council has the latitude to consider any issues it deems worthy of action through an analytical process.

- **Active participation**
 - Stakeholders have particularly different philosophical perspectives on whether and to what extent active participation is an issue in the CR Program. Of those who view it as an issue, there are different perspectives on whether active participation requirements are a concern for just C shares or for all QS holders in the program.

- In addition, given the complex and often non-individual QS holders, it is difficult to assess changes in active participation over time.
 - An amendment implemented in 2015 (80 FR 15891) modifies the active participation requirements for issuance of IFQ derived from C shares, and ultimately for the retention of the harvesting privilege. (Section 10.2.1)
 - In the recent past (NPFMC 2013), the Council considered action to permit transfers of catcher vessel or catcher processor owner QS only to persons that fit a specified definition of active participation. The analysis demonstrated some of complications associated with the desire to compel active participation as a condition for eligibility to hold QS. For example, the intention of the action may not be realized in a case where a single shareholder owning an active vessel allows a largely passive corporate QS holding entity to be considered active. The analysis also demonstrated the potential for significant administrative costs to monitor these interests.
 - The Council chose to take no regulatory actions at that time and requested that the harvest cooperatives take measures to consider this issue of concern, including a voluntary reporting cycle.
 - Industry efforts to incorporate provisions in their respective membership agreements creating a right of first offer program to facilitate the connection of QS sellers with active crew and vessel owners. The program has facilitated a number of transfers in the past 3 years. (Section 10.2.2, Figure 10-1)
- **Crew compensation**
 - Based on analysis and discussion after the 5-year CR Program review (NPFMC 2010a), the Council became concerned with the decline in crew compensation as a fraction of gross vessel revenue.
 - Crew wages can be understood in different ways depending on what metric is used. (Figure 5-11)
 - Improved daily earnings indicate that crew members on average share in the benefits from efficiency improvements in vessel operations
 - There is some evidence to suggest that crew compensation is partially insulated from inter-annual volatility in ex-vessel price, which is beneficial during periods of low ex-vessel prices, but has shown that crew may not receive the same proportion of gains during times of high ex-vessel prices.
 - **Lease rates**
 - The Council has also expressed concern about high lease rates for QS in the crab fisheries.
 - In response, a specific initiative was undertaken by some harvest cooperatives during the past two or three seasons requesting their members to voluntarily cap their lease rate to 65% of the adjusted gross revenues for Bristol Bay red king crab QS, and 50% of the adjusted gross revenues for Bering Sea snow crab QS.
 - This review does not analyze the direct effectiveness of the voluntary limit. However, in the three years in which quality data are available (2012 through 2014), data indicate that the median values for all share types are either at or below the voluntary caps. (Table 5-14).

- In some cases, mean lease rate values, particularly for Bristol Bay red king crab QS are greater than the voluntary lease rate caps. This indicates there are likely some outlying entities pulling the mean value higher. (Table 5-14, Figures 5-4, 5-5, and 5-6)
- **Complex business structures and IPQ use caps**
 - Enforcement representatives have expressed concern over the enforceability of increasingly complex IPQ use caps, particularly in an environment with fluctuating QS holdings and industry relationships, paired with a number of specific IPQ use cap exemptions. (Section 12.3)
- **Distributional impacts on communities** (related to program goal #6, National Standard 8)
 - Some of the distributional impacts are highlighted previously in this section, under the program's goals of promoting stability and addressing social and economic concerns
 - The communities identified as experiencing the most substantial skipper and crew related social impacts at the time of the 5-year program review were King Cove and Kodiak, a situation that appears unchanged. (Appendix A)
 - Recent changes to the C share active participation requirements might provide opportunity for displaced captains and crew (Appendix A, Section 10.2.1)
 - Neither shore-based nor floating processor facilities have returned to 3 Eligible Crab Communities, so designated by their processing history during the pre-rationalization qualifying period: False Pass, Port Moller, and St. George. However, some offset has occurred with retention of processing within the borough (and shared borough-level benefits) in the first 2 cases, and CDQ group acquisition/contractual control of the related PQS in the latter case (Appendix A).
- **Right of first refusal** (related to program goal #6, National Standard 8)
 - The right of first refusal on PQS was put in place in order to protect community interests and the benefits derived from processing activity in a community.
 - Since implementation, community representatives and fishery participants have suggested that some aspects of the rights of first refusal may inhibit their effectiveness in protecting community interests.
 - A suite of issues was identified with the program leading to the development of a regulatory package intended to increase the transparency and efficacy of the program.
 - This regulatory package became effective in February 2016; therefore, it is too soon to understand the potential benefits of the package will be realized in addressing the concerns that were present in the program. (Section 7, Appendix A)
- **Consolidation of processor activity** (related to National Standard 4, LAPP requirements)
 - Benefits of agglomeration can be realized through efficient mechanisms to share processing expenses, such as consolidation of privileges, the reliance on IPQ leasing, and custom processing.
 - The consolidation of privileges, reliance on IPQ leasing and custom processing, and the merger of company interests have all led to few distant entities with ownership of processing facilities in which CR crab is processed.

- Given both the challenges to entry associated with the CR Program, as well as the overall economic obstacles associated with entry, there is little to encourage new processor entry.
- **Entry opportunities**
 - A direct and intentional result of the allocation of harvesting and processing privileges is an intrinsic barrier to entry in the fisheries. The trade-off between the benefits previously listed includes a distributional impact across generations and participants in the fisheries.
 - The data demonstrate lower transfer rates of both owner QS and C share in the most recent 5 years of the program. (Table 4.6 and 4-7)
 - This review highlights some of the entry challenges and opportunities in the harvest sector under the current management of the fisheries. (Section 10)

Overall, the most dramatic changes to the fishery occurred almost immediately after program implementation and were characterized, to a certain extent, in the 5-year program review (NPFMC 2010a). Many of the biological, social and economic trends observed in the CR Program fisheries over the last 5 years demonstrate either a leveling off or a slow continuation of those trends. The program amendments identified in this program review highlight the adaptive management process that exists in order to allow for changes to this management program when action is warranted.

17 LIST OF PREPARERS

Sarah Marrinan, NPFMC
 Brian Garber-Yonts, AFSC
 Michael Fey, AKFIN
 Mike Downs, Northern Economics
 Stephen Weidlich, Northern Economics
 Steve Kasperski, AFSC

Amber Himes-Cornell, Université de Bretagne
 Occidentale
 Keeley Kent, NMFS SF
 Karla Bush, ADF&G
 Devin Lucas, CDC/NIOSH/OD
 Jean Lee, AKFIN
 Zachary Koehn, PSMFC

18 CONTRIBUTORS

Tracy Buck, NMFS RAM
 Rachel Baker, NMFS SF
 Jennifer Lincoln, CDC/NIOSH/OD
 LCDR Corrie Sergeant, US Coast Guard
 Brent Pristas, NOAA AED
 Wayne Donaldson, ADF&G
 Heather Fitch, ADF&G
 Miranda Westfall, ADF&G
 Jonathan Streifel, Alaska Wildlife Troopers
 Ben Fissel, AFSC

Joe Sullivan
 Mark Gleason
 John Iani
 Frank Kelty
 Jake Jacobsen
 Alexis Kwachka
 Sinclair Wilt
 Ernie Weiss
 Scott Goodman
 John Hilsinger
 Craig Cross

19 REFERENCES

- Abbott, J.K., B. Garber-Yonts, and J.E. Wilen. 2010. Employment and remuneration effects of IFQs in the Bering Sea/ Aleutian Islands crab fisheries. *Marine Resource Economics*; 25(4), 333-354.
- Alaska Fisheries Science Center (AFSC). 2016. Wholesale market profiles for Alaska groundfish and crab fisheries. 134 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available at:
http://www.afsc.noaa.gov/News/pdfs/Wholesale_Market_Profiles_for_Alaskan_Groundfish_and_Crab_Fisheries.pdf
- Barnard, D. R., and D. Pengilly. 2006. Estimates of red king crab bycatch during the 2005/2006 Bristol Bay king crab fishery with comparisons to the 1999-2004 seasons. Alaska Department of Fish and Game, Fishery Data Series No. 06-23, Anchorage.
- Chilton, E.A., D. Urban, E. Krygier, A.W. Stoner. 2011. Reduction of bycatch mortality for non-target crab species in the commercial snow crab (*Chionoecetes opilio*) fishery. North Pacific Research Board Final Report 917, 16 p.
- Gulf of Mexico Fishery Management Council [GMFMC]. 2013. Red Snapper individual fishing quota program 5-year review. Tampa, Florida, March 2013.
- Kruse, G. H. and A. Kimker. 1993. Degradable escape mechanisms for pot gear: a summary report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J93-01, Juneau.
- Garber-Yonts, B., and J. Lee. 2015. Stock Assessment and Fishery Evaluation Report for King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: Economic Status of the BSAI Crab Fisheries, 2016.
- Himes-Cornell, A. 2015. Industry Perceptions of Measures to Affect Access to Quota Shares, Active Participation, and Lease Rates in the Bering Sea and Aleutian Islands Crab Fisheries. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC304.
- Himes-Cornell, A. and M. Legendre-Fixx. (unpublished interviews conducted in 2015). Perceptions on entry and upward mobility in the managed BSAI crab fisheries.
- ICE. 2016. Cooperative report to the Council for 2015. (March 2016). Lind, Washington. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/CrabCoops/ICE2016.pdf
- ICE. 2015. Cooperative report to the Council for 2014. (March 2015). Lind, Washington. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/CrabCoops/ICE2015.pdf

- Inter-cooperative exchange [ICE]. 2013. Cooperative report to the Council for 2013. (December 2013). Lind, Washington. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/CrabCoops/ICE.pdf
- National Marine Fisheries Service [NMFS]/ North Pacific Fishery Management Council [NPFMC]. 2004. Bering Sea Aleutian Islands Crab Fisheries Final Environmental Impact Statement. National Marine Fisheries Service, Juneau, Alaska, August 2004. Available at:
<http://alaskafisheries.noaa.gov/sites/default/files/analyses/crabeis0804-chapters.pdf>
- NMFS. 2012. Bering Sea and Aleutian Islands crab rationalization report; Fishing year 2011/2012, July 1, 2011 – June 30, 2012. Juneau, Alaska. September 2012. Available at:
<https://alaskafisheries.noaa.gov/sites/default/files/reports/1112crabrpt.pdf>
- National Oceanic and Atmospheric Administration [NOAA]. 2010. NOAA catch share policy. Washington, D.C. Available at:
http://www.nmfs.noaa.gov/sfa/management/catch_shares/about/documents/noaa_cs_policy.pdf
- North Pacific Fishery Management Council [NPFMC]. 2002. Impacts of the American Fisheries Act. Anchorage, Alaska, February 20, 2002.
- NPFMC. 2007. 18-month Bering Sea and Aleutian Islands crab management. Anchorage, Alaska, March 2007. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/18MonthRev.pdf
- NPFMC. 2008a. Gulf of Alaska rockfish pilot program review. Anchorage, Alaska, May 2008.
- NPFMC. 2008b. Three- year review of the crab rationalization management program for Bering Sea and Aleutian Islands crab fisheries. Anchorage, Alaska, November 2008. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/3yearreview1208.pdf
- NPFMC. 2010a. Five-year review of the crab rationalization management program for Bering Sea and Aleutian Islands crab fisheries. Anchorage, Alaska, December 2010. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/5YearRev1210.pdf
- NPFMC. 2010b. Review of the Community Quota Entity (CQE) Program under the halibut/sablefish IFQ program. Anchorage, Alaska, March 2010. Available at:
<http://www.npfmc.org/wp-content/PDFdocuments/halibut/CQEreport210.pdf>
- NPFMC. 2011. Fishery Management Plan for Bering Sea/Aleutian Islands king and Tanner crabs. Anchorage, Alaska, October 2011. Available at:
<http://www.npfmc.org/wp-content/PDFdocuments/fmp/CrabFMPOct11.pdf>
- NPFMC. 2012a. Cooperative measures to address active participation and crew issues. Discussion paper for North Pacific Fishery Management Council. Anchorage, Alaska, October 2012. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/CrabCoop1012.pdf

- NPFMC. 2012b. Initial Review Draft: Regulatory Impact Review and Initial Regulatory Flexibility Analysis of provisions defining active participation requirements for the acquisition and use of owner shares. Anchorage, Alaska, October 2012. Available at:
http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/CrabOwnerParticipation1012.pdf
- NPFMC. 2015a. Final Regulatory Impact Review and Initial Regulatory Flexibility Analysis for Amendment 31 to the Fishery Management Plan for Bering Seas and Aleutian Islands king and Tanner crabs: Active participation requirements for the acquisition and use of C shares. Anchorage, Alaska, March 2015. Available at:
<https://alaskafisheries.noaa.gov/sites/default/files/analyses/ktc31ririrfa0315.pdf>
- NPFMC. 2015b. Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015. Available at:
<http://npfmc.legistar.com/gateway.aspx?M=F&ID=1c4ec7ac-2ef6-49db-aac1-387f25ded6e6.pdf>
- Northern Economics, Inc. 2014. Five-year review of the effects of Amendment 80. Prepared for the North Pacific Fishery Management Council. Anchorage, Alaska, October 2014.
- Pacific Fishery Management Council [PFMC]. 2014. Final report: Pacific coast groundfish limited entry fixed gear sablefish permit stacking (catch shares) program review. Portland, OR. August, 2014. Available at:
http://www.pcouncil.org/wp-content/uploads/2015/06/Final_FGSPS_PrgmRev.pdf
- Pengilly, D. 2015a. Aleutian Islands golden king crab – 2015 Tier 5 assessment *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.
- Pengilly, D. 2015b. Western Aleutian Islands red king crab – 2015 Tier 5 assessment *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.
- Schwenzfeier, M., M. Salmon, E. Evans, E. Henry, and L. Wald. 2014. Annual Report of the Onboard Observer Program for the Bering Sea and Aleutian Islands Crab Fisheries, 2011/2012. Pages 191 – 249 *in* Fitch, H., M. Schwenzfeier, B. Baechler, C. Trebesch, M. Salmon, M. Good, E. Aus, C. Cook, E. Evans, E. Henry, L. Wald, J. Shaishnikoff, and K. Herring. Annual management report for the commercial and subsistence shellfish fisheries of the Aleutian Islands, Bering Sea and the Westward Region's Shellfish Observer Program, 2011/12. Alaska Department of Fish and Game, Fishery Management Report No. 14-54, Anchorage.
- Stockhausen, W.T. 2015a. 2015 stock assessment and fishery evaluation report for the Tanner crab fisheries of the Bering Sea Aleutian Islands *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled

by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.

Stockhausen, W.T. 2015b. 2015 stock assessment and fishery evaluation report for the Pribilof Island blue king crab fishery of the Bering Sea and Aleutian Islands region *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.

Szuwalski, C.S., R.J Foy, and B.J. Turnock. 2015. 2015 stock assessment and fishery evaluation report for the Pribilof Island red king crab fishery of the Bering Sea and Aleutian Islands region *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.

Turnock, B.J. and L.J. Rugolo. 2015. Stock assessment of eastern Bering Sea snow crab *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.

U.S. Senate. 2003. Committee on Commerce, Science, and Transportation, Hearings on the Bering Sea Aleutian Islands Crab Rationalization Plan, May 20, 2003. Available at: http://www.commerce.senate.gov/public/index.cfm/hearings?Id=18E751AA-6CCC-4214-BFF9-4536DE13225A&Statement_id=222894CE-51D6-4FE5-BB99-BCF843BED191

Vovchenko, E. (2015, April 29). Russian pollock fillet production spikes 43% in first quarter. *Intrafish.com*.

Zheng, J. and D. Pengilly. 2015. Saint Matthew Island blue king crab stock assessment for Fall 2015 *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.

Zheng, J. and M.S.M. Siddeek. 2015. Bristol Bay red king crab stock assessment in Fall 2015 *in* Stock Assessment and Fishery Evaluation (SAFE) Report for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Region, Compiled by the Plan Team for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands. Anchorage, Alaska, September 2015.