Complicating delivery schedules is the dependence of harvesters and processors on other fisheries. Many of the large processors in the crab fisheries also have interests in the Bering Sea pollock fisheries. Since the roe season in that fishery coincides with the Bering Sea *C. opilio* fishery, processors have had to juggle production across the two fisheries. In some instances, crab fishermen have been less than satisfied with the priority given crab landings. On the other side, many crab fishermen also participate in Pacific cod fisheries. Recent high cod prices, together with the flexibility offered by the share allocations in the rationalization program, have induced increased participation of harvesters in the fall and winter Pacific cod fisheries. In some instances, processors have been frustrated by harvesters' reluctance to accommodate their delivery timing preferences due to conflicts with Pacific cod fishing.[61] These conflicts with other fisheries are likely to continue in the future as differences in delivery preferences persist.

Given the individual scheduling preferences of harvesters and processors, delivery timing issues are by necessity complex. Yet, if participants believe these issues require resolution by an arbitrator, it is likely that an arbitrator could reasonably consider the different interests and provide an arbitrated outcome. Likely, each of the last best offers would balance price against delivery preferences. Across the first few years of the program, participants have resolved delivery schedule issues without need to resort to the arbitration system.

In the first few years of the program, the challenge of achieving coordination has been exacerbated because of uncontrollable events. In all three years of the program, unanticipated ice conditions slowed fishing in the Bering Sea *C. opilio* fishery. Both sectors were burdened by the costs of standing by until conditions improved. In the second year, a fire that disabled one processing platform intended to operate in the North region caused substantial rescheduling of landings. Although the fire affected only a single platform, almost all processors were affected because of custom processing arrangements and attempts to move landings at other platforms in both the North and South to mitigate added operational costs which can be attributed to the disabled platform. These processing capacity problems were compounded by ice conditions in the fishery. Difficulties redistributing deliveries have been compounded by the rigidity of the regionalized Class A IFQ/IPQ matching requirements and the application of those limitations to such a large portion of the harvest share pool. Given the share matching structure, movement of a landing requires the share holders (the Class A IFQ holder and the IPQ holder) to find both available Class A IFQ and available IPQ with consistent regional designations or the harvester to use Class B IFQ. Given that the system requires full share matching in the preseason to accommodate the arbitration structure, redistributing deliveries using Class A IFQ must involve both the holder of the substituting Class A IFQ and the holder of the substituting IPQ. Alternatively, Class B IFQ could be used to resolve these delivery coordination conflicts; however, use of Class B IFQ for this purpose could obviate their use by harvesters for additional negotiating leverage or to achieve operational efficiencies.

To help alleviate the complications arising from unforeseen circumstances preventing deliveries in a region, the Council has directed staff to analyze alternatives allowing an exemption from the regional delivery requirements. The alternatives use civil contracts between harvesters, processors, and regional or community representatives to define the terms of the exemption from the regional landing requirement. The civil contracts are intended to facilitate, clarify and streamline the process that may result from NOAA Fisheries administration of the exemption. The process could require the holder of the IFQ for which the exemption is sought to submit an affidavit attesting to certain conditions under which the exemption is granted.

[61] Some harvesters also have questioned whether delays in completing crab negotiations were used strategically to allow other harvesters time to complete cod harvests prior to the fleet beginning crab fishing.

Harvester standdowns

One of the primary expectations of the Council in advancing the arbitration program was that early season harvester standdowns would be averted. Prior to implementation of the program, harvesters periodically organized fleetwide standdowns, delaying the start of fishing at the season opening, to induce processors to offer a higher price (NPFMC/NMFS, 2004b). By providing an arbitration option to harvesters it was thought that standdowns, which may result in costly delays in deliveries of products to markets, could be avoided. However, under the program, harvesters that are members of the Inter-Cooperative Exchange have organized standdowns in a few instances. These standdowns have targeted select processors that the group believed had offered an inadequate minimum price to be paid at the time of landing for Class A IFQ deliveries. In these instances, harvesters maintained the right to arbitrate under the lengthy season approach; therefore, the delays in fishing complemented any negotiating leverage derived from the arbitration system. The harvesters focused the standdowns on the price paid at the time of landing (prior to any adjustments based on the first wholesale price received for the crab). This price is important to both sectors because it serves as a minimum price, which, under most pricing arrangements, is subject to an upward adjustment, depending on the price received by the processor when the crab is sold.

From the harvesters' perspective, the use of delays in fishing to induce processors to offer a higher minimum price serves a few purposes. By achieving a satisfactory minimum price, harvesters reach a level of confidence to begin fishing, even if all pricing issues are not resolved. This enables production from the fishery to begin for markets that are time sensitive, most importantly the winter red king crab market in Japan.[62] The higher minimum prices under this structure are also argued by harvesters to provide a signal to the market in general. Some participants believe that the first wholesale price often reflects the ex vessel price. They argue that improving ex vessel prices (even recognizing that those are minimum prices) sends a signal of the strength of the market to sellers. Whether the use of delays in fishing in this manner is detrimental depends on one's position in the fishery and whether these market effects actually occur. If first wholesale markets are boosted by the higher price at landing, it is possible that both sectors could benefit.

Pricing structure and its effects on incentives and risk

Under the pricing structure used by most participants in the fishery, harvesters receive a payment at landing that is the minimum ex vessel price that may be later supplemented based on the market price received for the crab production. This pricing arrangement is largely a function of the arbitration standard, which specifies that ex vessel prices should preserve the historic division of first wholesale revenues.[63] To maintain that division of revenues, harvesters receive a specific portion of the revenues from crab products sold into the market. This arrangement has a few affects on both the incentives and risk exposure of participants in the fisheries.

Prior to implementation of the program, participants negotiated in the preseason, usually arriving at a single dollar price that often applied to all landings in the fishery (NPFMC/NMFS, 2004b). Under this pricing structure, all risk shifted to the processor on receipt of the landing; the processor bore all post delivery costs, including handling, shipping, and storage costs, and received all benefits arising from its production and market decisions. So, a processor's incentive to achieve success in the market was not distorted by any sharing of either the costs borne or benefits reaped from its decisions.

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[62] Most harvesters realize that substantial delays in fishing could jeopardize the potential for their harvests to serve that market, which may limit their ability to leverage their position with fishing standdowns. Since these negotiations settle only the minimum price, it is unlikely that harvesters will standdown for a period that constrains a processors ability to serve high valued markets.

[63] The initial price formula developed for the golden king crab fisheries suggested this approach to pricing based on the arbitrators' interpretation of the arbitration standard (NEI, 2005).

Under the structure adopted for most landings currently, harvesters typically receive a minimum payment at delivery, which is supplemented by a share of first wholesale revenues in excess of a threshold amount based on that minimum price. The processor continues to bear all post delivery costs and any risk of loss for sales that generate revenues that would result in an ex vessel price below the minimum price based on the sharing agreement. Under the new pricing arrangements, the processors' risk may be less than under the former pricing structure. Under the former structure the processor bore all market risk after delivery. Under the new structure, the processors risk is reduced to the extent that the minimum price is discounted in comparison to the single dollar price that would have been accepted without the sharing arrangement; however, harvesters share the benefits in the event that the first wholesale revenues for sales results in a higher final price than the single dollar price that would have been accepted on delivery. This pricing structure may reduce the processor's market risk by shifting part of that risk to harvesters. The degree to which risk is shifted depends on two factors: the minimum price (and the difference between that minimum price and the single dollar price that would have been accepted with no revenue sharing) and the sharing of the revenues in excess of the threshold amount.

A concern among participants is that the current pricing arrangement may affect market decisions and benefits derived from the program fisheries. If prices are final on delivery, a processor's activities in the market are determined by its perception of the net benefit arising from those activities. Under the current arrangement, the processor will only weigh its share of the benefits against any post delivery costs. This can create an incentive for the processor to sell sooner, as it attempts to reduce its risk and maximize its expected gain. 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 could be problematic in some circumstances.

Given that current market decisions arise out of a pricing structure in which benefits after delivery are shared among processors and harvesters, contract negotiations may be the best way to address the perceived problem. Parties could agree to a price that represents a lower portion of the realized first wholesale revenues in exchange for a higher minimum price on landing, shifting risk to the processor and firming up the processor's incentive to more aggressively pursue the best market opportunities. Alternatively, it is possible that parties with an established relationship could agree to greater market risk (or even cost) sharing with a lower minimum price. A relationship able to support this type of arrangement takes time to develop and may not develop in some instances. In addition, harvesters must feel confident that the processor will make appropriate efforts in pursuing market opportunities.[64]

As with other more subtle contractual issues, this issue could be overshadowed in arbitration proceedings, especially if the historical price formula is still disputed. Even if the issue is central to an arbitration proceeding, the arbitrator will need to weigh the different interests appropriately in making a decision (i.e., balance the costs of holding inventory against the potential higher price that could be obtained by waiting to sell the product). The degree of uncertainty concerning market conditions and expectations make this a particularly challenging issue for an arbitrator. In any case, the participants in the fishery and the Council should be attentive to this issue in assessing the success of the program in the long run. The issue, however, does not lend itself to a simple solution, given the division of revenues standard.

[64] It is important to recognize that the "historical division of revenues" standard is derived from average market success (or the average first wholesale price). While it is reasonable to insist that processors make legitimate efforts to pursue good markets, it is likely not reasonable to insist that processors pay a division based on the highest first wholesale price.

Complexity, Cooperatives, and the Inter-Cooperative Exchange

Among the greatest frustrations of participants (particularly harvesters) in the fisheries is the complexity of the program. The extent to which this complexity is attributable to certain aspects of the program is uncertain. The information needs for effective price negotiations in the fisheries would increase under any rationalization program, as participants resolve delivery and market timing issues, which are absent in limited entry derby fishery. Some participants perceive that the arbitration system adds to these information demands through an arbitration standard dependent on market pricing that accommodates the circumstances of delivery and participants. To address these complexities, many harvesters have organized their harvest activities in cooperatives, with much of the communications concerning fishing schedules and price negotiation being undertaken by the cooperative leadership.[65] In addition, most cooperative leaders participate in the Inter-Cooperative Exchange, which represents its members in the arbitration process. Information sharing is one of the primary roles served by these coordinated efforts. Participants in the Inter-Cooperative Exchange are permitted to exchange information obtained from negotiations with each individual processor. Consequently, the Inter-Cooperative Exchange is likely to have more complete information about competing processors' activities than the processor with whom it is negotiating. Costs of acquiring information and negotiation are also reduced by consolidation of this activity in a single entity.

The organization of activities in cooperatives and the Inter-Cooperative Exchange has engendered some controversy. Some harvesters are frustrated that these representative entities have distanced them from decision making in the fishery. These frustrations to some extent are self imposed, as harvesters have voluntarily elected to enter cooperatives and the Inter-Cooperative Exchange and agreed to the structure of those organizations. Direct relationships with processors would be the best way to overcome this distance. Processors share some of the harvest sector's frustration, as they find themselves negotiating with representatives of harvesters, as opposed to the harvesters themselves. As with harvesters, the most effective way for processors to overcome this distance is through better direct relationships with harvesters. Some fishermen were frustrated by strong positions taken by processors during first year negotiations. For example, some processors offered higher minimum prices in exchange for waivers of arbitration rights. Harvesters perceived these offers as unfair and processors have largely discontinued this practice. More direct harvester/processor relationships must be built on trust, which could take time to develop. The potential for these more direct relationships will also increase over time, as the effects of the arbitration process become more certain and predictable.

In the first three years of the program, it is not surprising that participants have adopted an adversarial approach in negotiations, as they attempt to influence the interpretation of the arbitration standard and the development of that process. Some harvesters and processors have suggested that the processor-by-processor negotiations have contributed to the confrontational nature of negotiations. Harvesters are frustrated that processors are reluctant to match high price offers, while processors are frustrated that harvesters contend that a single price (equal to the highest price paid by any processor) is appropriate. The extended time available for negotiations and arbitration (particularly under the lengthy season approach) has likely compounded this frustration.

Notwithstanding any future efforts on the part of individual harvesters and processors to engage in more direct negotiation, cooperatives are likely to continue to have a large role in fleet coordination. Given the complexity of coordinating landings in the rationalized fishery (particularly the compounding of that complexity with A share/IPQ landing requirements), cooperatives are likely to be important for

[65] Some harvesters have expressed concern that delivery scheduling within the fleet is complicated by efforts of some harvesters (and cooperatives) to use scheduling to gain a competitive advantage over other members of the fleet.

coordinating timing of fishing and landings. The need for the Inter-Cooperative Exchange depends, in large part, on the extent to which participants develop relationships under which harvesters perceive little advantage from their membership. In the near future, the entity seems very likely to continue in its current role. In the long run, it is possible that its role may evolve to primarily information sharing, with a less prominent role in negotiations. This evolution depends on the extent to which the arbitration system develops predictability and harvesters perceive that they are able to achieve reasonable success in direct negotiations with processors.

Costs of Cooperatives and Arbitration

Some participants have expressed concern that the costs of participation in the arbitration system are excessive. Arbitration administration costs, cooperative membership fees, costs associated with the Inter-Cooperative Exchange, and arbitration organization fees all reduce net revenues from the program fisheries.

Over the first three years of the program, the annual costs of the arbitration organizations and arbitration administration have declined as the administrative aspects of the arbitration system become more established and consolidated. The arbitration organization for harvesters that have no processor affiliation (i.e., independent harvesters) charges each member $500.[66] Costs of membership for the processor and affiliated harvester organization are not known, but are likely to be greater on a per member basis because the sector has fewer share holders over which to disburse costs.

By regulation, arbitration administrative expenses are split evenly between the harvester and processing sectors. Processors advance the costs, recouping the harvesters' half of the expenses through an assessment on landings. In the first year of the program, harvesters were assessed a penny per pound to cover their half of the expenses (approximately $225,000), which combined with an equal contribution by processors resulted in approximately $450,000 to cover the arbitration administration costs. These charges greatly exceeded the first year actual arbitration administration costs (approximately $162,000). The remainder was applied to the second year's arbitration administration costs; therefore, harvesters paid no fee for arbitration administrative expenses in that year. In the third year, a landing charge of one-half penny per pound was assessed on all harvests. This amount (together with excess funds from previous seasons) was adequate to cover the costs of the arbitration system in the third year. Considering the first three years' experiences, it is likely that administrative costs of the arbitration program will remain below one cent per pound (including processor contributions) in the future.[67]

Cooperative memberships have also increased costs for a large portion of the fleet. These groups are likely beneficial under any rationalization for coordination of harvest activity. Yet, a portion of the activities (and costs) of cooperatives in this program arise from the added need to match Class A IFQ to IPQ. Information concerning these costs are currently unavailable on the magnitude of these costs is available at this time.[68]

In addition, to harvest cooperatives, many harvesters bear indirect costs through their cooperative's memberships in the Inter-Cooperative Exchange. Many harvesters view participation in the Inter-Cooperative Exchange as necessary and beneficial at this time. Membership is reported to be stimulated

[66] Because of the different information needs of non-affiliated harvesters and the need to limit flow of that information to affiliated harvesters, separate arbitration organizations are mandated by regulation.

[67] Processors are not permitted to participate collectively in arbitration. Consequently, each processor must fully fund its own participation in arbitration.

[68] Economic data reports include information on cooperative costs. Once issues concerning the quality and confidentiality of data in those reports have been adequately addressed, information concerning cooperative costs may be available.

by both the complexity of the arbitration system and the relatively large portion of the harvest allocation that is subject to the IPQ landing requirements and arbitration. Many fishermen believe that accountants and lawyers are necessary to guide negotiations due to the complexity of the system and the expense of gathering market information needed for effective negotiation. The structure of the Inter-Cooperative Exchange has helped distribute its costs through general membership dues based on share holdings. Members are charged these dues regardless of whether their shares are subject to specific negotiation disputes or arbitration.[69] The exact level of these charges is confidential; however, considering the relatively small landing fees that fund the arbitration system's administration, it seems reasonable for harvesters to join the Inter-Cooperative Exchange (at its current membership level) if they believe the organization increases ex vessel prices by even a few cents per pound.

Notwithstanding that the Inter-Cooperative Exchange may be a cost effective organization, concerns have been raised that some harvesters who are not members of the Inter-Cooperative Exchange "free ride"—approaching a processor independently after the Inter-Cooperative Exchange has completed negotiations, and obtaining its settled price, without paying for membership in the Inter-Cooperative Exchange. Processors may encourage this behavior, if they believe that inducing more harvesters to leave the Inter-Cooperative Exchange reduces its funding and effectiveness. Along the same lines, processors may wish to induce persons to leave the Inter-Cooperative Exchange if they believe that negotiations with the cooperative are contentious or harm their relationships with their fleets.

8.8 Pricing and terms of Class B IFQ and C share IFQ deliveries

Since 90 percent 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 percent of the annual catcher vessel owner IFQ allocation as B shares, which may be landed with any processor. 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.[70] In addition, C share IFQ, available to be held by active crew in the fisheries, are free from processor share landing requirements.

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.[71] Since that time, many harvesters have adapted to the program and used their cooperative associations to pool Class B IFQ to be

[69] Given the negotiation strategy of using one processor's offer to induce other processors to match the price, this distribution of charges is generally perceived as fair and beneficial by Inter-Cooperative Exchange members. The incentive to arbitrate, in turn, is likely affected if costs are shared by persons who are not party to the arbitration. To the extent that success in arbitration boosts prices from other processors (either through the feedback of the price formula in the following year or through the cooperative's reputation for successful negotiation), non-parties who are members of the Inter-Cooperative Exchange likely benefit from those proceedings.

[70] Affiliation under the regulation exists in the case of either functional control of the QS holder or common ownership in excess of 10 percent (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.

[71] 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 an 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.

marketed separately from Class A IFQ. As a result, it is believed that most harvesters have been able to develop some competition for their Class B IFQ landings.

Data distinguishing ex vessel prices by IFQ type are not currently available.[72] Anecdotal evidence, however, suggests that harvesters have been able to gain a premium on landings of Class B and C share IFQ catch over landings Class A IFQ catch. These premiums are said to range from approximately 5 cents to approximately 20 cents, with variation across fisheries, processors, and time (including within seasons).[73] Premiums are thought to have been at a low during the first year of the program, when crab product markets were particularly weak. Processors, concerned about their weak position in the market, were generally less willing to buy crab to add to existing inventories. In addition, harvesters becoming familiar with the program were likely less well-prepared to coordinate activities to generate competition for Class B and C share IFQ catches. In the second and third years, markets have improved and harvesters are said to have become better organized, stimulating more competition for Class B and C share IFQ landings. The magnitude of premiums are said to vary across processors and through the seasons. In some cases, the premiums are thought to be raised when a processor has identified a specific market for its product. Although premiums are believed to increase with the value of the crab species—Bristol Bay red king crab receiving the greatest premium and Bering Sea *C. opilio* receiving the smallest—exceptions exist with processor market opportunities. The magnitude of the premium also depends on the price for Class A IFQ catches. If those prices change in the future (with changes in the price formula or its application), the magnitude of the premium on Class B and C share IFQ will also change.

In addition to anecdotal price information, several sources of evidence suggest that harvesters have developed competition for Class B and C share IFQ landings. In many cases, harvesters have been able to make deliveries of crab harvested exclusively with Class B and C share IFQ (see Table 8-7). The data suggest that harvesters have increasingly coordinated the harvest of allocations to allow deliveries of Class B and C share IFQ harvests independent of harvests of Class A IFQ. In the third year of the program, in excess of 60 percent of Class B and C share IFQ harvests were delivered independent of Class A IFQ harvests. In addition, the size of these deliveries has increased substantially since the first year of the program, suggesting that harvesters are achieving greater efficiency in the harvest of these shares. The growth in the percentage of the Class B and C share IFQ pools that are delivered separately from Class A IFQ landings suggest that harvesters have been able to negotiate separate delivery terms for these shares. Although these deliveries suggest that competition has been generated for these landings, other data may also suggest competition.

[72] The only currently available data showing price by share type are elandings data collected by NOAA Fisheries. These data are collected at the time of landing and do not include any post-landing adjustments or bonuses, which are reported to be an important part of pricing under current practices. Since the first year of the program, Economic Data Reports have included ex vessel price by IFQ Class, but those data are currently undergoing a review and are unavailable for use at this time.

[73] 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 8-7 Deliveries of crab harvested exclusively with Class B and C share IFQ (2005-2006 through 2007-2008).

Fishery	Season	Total number of deliveries	Total pounds landed	Total B/C IFQ** landed	Deliveries of B/C IFQ exclusively					
					Number of deliveries	Percent of deliveries	Total pounds delivered	Percent of B/C IFQ pool	Average delivery	Median delivery
Bristol Bay red king crab	2005-2006	228	15,725,723	1,968,154	25	11.0	593,484	30.2	23,739	15,282
	2006-2007	168	13,248,036	1,663,571	22	13.1	488,638	29.4	22,211	6,109
	2007-2008	219	17,497,740	2,220,327	33	15.1	1,360,461	61.3	41,226	38,209
Bering Sea *C. opilio*	2005-2006	257	30,233,056	3,830,350	19	7.4	1,202,393	31.4	63,284	31,301
	2006-2007	228	29,710,449	3,775,748	33	14.5	2,345,567	62.1	71,078	57,299
	2007-2008	392	51,627,697	6,602,252	59	15.1	4,693,859	71.1	79,557	69,718
Eastern Aleutian Islands golden king crab	2005-2006	28	2,442,550	308,474	2	7.1	*	*	*	
	2006-2007	24	2,565,435	320,223	2	8.3	*	*	*	*
	2007-2008	27	2,564,271	322,581	1	3.7	*	*	*	*
Eastern Bering Sea *C. bairdi*	2006-2007	51	1,214,997	129,288	8	15.7	3,010	2.3	376	102
	2007-2008	50	1,365,796	179,568	7	14.0	145,065	80.8	20,724	18,360
Western Aleutian Islands golden king crab	2005-2006	19	1,266,167	163,226	2	10.5	*	*	*	*
	2006-2007	9	880,286	162,106	0	0.0	0	0.0	0	0
	2007-2008	16	1,126,051	163,214	3	18.8	48,066	29.4	16,022	11,851
Western Bering Sea *C. bairdi*	2005-2006	68	759,073	65,861	17	25.0	12,148	18.4	715	311
	2006-2007	55	611,417	62,597	12	21.8	6,556	10.5	546	38
	2007-2008	43	457,193	36,653	5	11.6	24,276	66.2	4,855	7,278

Source: RAM IFQ landings database.
* withheld for confidentiality.
** includes Class B IFQ and C share IFQ landings.

Examining buyers of Class B and C share IFQ catches and the extent to which buyers of those catches purchase larger portions of the Class B and C share IFQ catches than Class A IFQ catches suggest that some processors are aggressively competing for landings of Class B and C share IFQ catch (see Table 8-8). In the Bristol Bay red king crab and Bering Sea *C. opilio* fisheries, more persons have purchased Class B and C share IFQ catches than Class A IFQ catches. This difference suggests both competition for Class B and C share IFQ landing and the entry to the fisheries of persons through purchases of Class B and C share IFQ landings. Examining processors who purchased a greater share of the Class B and C share IFQ landings than Class A IFQ landings also suggests that a few buyers have competed for these landings. In both the Bristol Bay red king crab and the Bering Sea *C. opilio* fisheries, a large portion of the Class B and C share IFQ catches have been purchased by a few buyers who have purchased a small share of the Class A IFQ catches. In all cases, the poundage of Class A IFQ catches purchased by these buyers has exceeded their purchases of Class B and C share IFQ catches. This differential in the distribution of landings suggests that harvesters have been able to stimulate competition for these Class B and C share IFQ catches.

Table 8-8 Purchases of IFQ landings by share type (2005-2006 through 2007-2008).

Fishery	Season	Class A IFQ landings		B/C* IFQ landings		Buyers purchasing a greater percent of B/C IFQ pool than of the Class A pool				
		Number of buyers	Total pounds landed	Number of buyers	Total pounds landed	Number of buyers	Percent of Class A IFQ pool purchased	Percent of B/C IFQ pool purchased	Pounds of Class A IFQ landings purchased	Pounds of B/C IFQ landings purchased
Bristol Bay red king crab	2005 - 2006	9	13,757,569	10	1,968,154	4	18.2	62.3	2,505,097	1,226,332
	2006 - 2007	10	11,584,465	12	1,661,730	5	27.6	54.3	3,200,529	902,304
	2007 - 2008	13	15,277,413	15	2,220,327	6	18.6	86.8	2,838,886	1,928,226
Bering Sea *C. opilio*	2005 - 2006	9	26,402,706	10	3,830,350	5	32.5	59.6	8,579,616	2,281,550
	2006 - 2007	12	25,934,701	14	3,772,320	5	13.3	73.8	3,454,996	2,782,536
	2007 - 2008	11	45,025,445	15	6,602,252	7	13.1	71.2	5,914,751	4,699,000

Source: RAM IFQ database.
* includes Class B IFQ and C share IFQ.
Data for other fisheries cannot be shown because of confidentiality protections.

In the smaller fisheries, data concerning the differences in purchases of Class B and C share IFQ catches and Class A IFQ catches cannot be revealed because of confidentiality protections; however, the number of buyers of catches by share type can be revealed. In only the Eastern Bering Sea *C. bairdi* fishery have more persons purchased Class B or C share IFQ catches than Class A IFQ catches. In all other fisheries, the same number of persons have purchased catches from these two different share types. The absence of

buyers of only Class B and C share IFQ catches does not mean that harvesters have not generated competition for these landings, but raises the question of whether persons who do not have IPQ will have the ability to enter these fisheries. Given the relatively small TACs in these fisheries, they are less likely to support processor entry in any case. In all fisheries, only a few buyers have purchased a greater percentage of the Class B and C share IFQ catches than Class A IFQ catches. These numbers suggest that to some extent harvesters have directed landings to persons willing to pay the most for those catches in these fisheries. The extent of competition cannot be discerned.

Table 8-9 Buyers of catches by share type and fishery (2005-2006 through 2007 2008)

Fishery	Season	Number of buyers of landings of		Number of buyers buying a lesser percent of the Class A IFQ landings than B/C IFQ landings
		Class A IFQ	B/C* IFQ	
Eastern Aleutian Islands golden king crab	2005 - 2006	4	4	2
	2006 - 2007	5	5	1
	2007 - 2008	3	3	1
Eastern Bering Sea *C. bairdi*	2006 - 2007	7	8	3
	2007 - 2008	6	7	2
Western Aleutian Islands golden king crab	2005 - 2006	4	4	2
	2006 - 2007	4	4	1
	2007 - 2008	3	3	1
Western Bering Sea *C. bairdi*	2005 - 2006	7	7	4
	2006 - 2007	8	8	4
	2007 - 2008	7	7	2

Source: RAM IFQ database.
* includes Class B IFQ and C share IFQ.

In addition to data shortcomings, several other factors complicate any consideration of the degree to which the 10 percent Class B IFQ and 3 percent C share IFQ allocations create a competitive market. In considering the extent of competition for Class B and C share IFQ landings, it is important to recognize that the predominance of Class A IFQ/IPQ landings in the fisheries. As should be anticipated, with a large majority of the catch subject to the IPQ landing limitations (and potentially the arbitration system), it is possible that available markets for landings of Class B and C share IFQ are limited. Three factors could contribute to this reduction in competition: choices of IFQ holders to use Class B and C share IFQ to achieve harvester production efficiencies (instead of attempting to market those IFQ competitively), any loss of incentive to pursue product market opportunities arising from the Class A IFQ/IPQ allocations and arbitration system, and any disincentive for entry arising from the magnitude of the Class A IFQ/IPQ allocation.

Although less prevalent in the second and third years of the program, some harvesters are believed to have elected to use Class B and C share IFQ to improve harvesting production efficiencies, making those IFQ unavailable for competitive marketing. Driven by IFQ holders' decisions, this use of shares will limit the extent of competition for landings of Class B and C share IFQ. Harvesters may realize efficiencies in harvesting by using Class B and C IFQ harvests to supplement a partial delivery of Class A IFQ harvests, reducing the need for an additional trip to harvest (and independently market) the Class B and C IFQ catch. Also, when making Class A IFQ harvests, some harvesters use Class B and C share IFQ to avoid underages that would require an additional trip, knowing that Class B and C shares can be used to cover any Class A IFQ harvest overage. These uses of Class B and C share IFQ clearly benefit harvesters, but

detract from the use of Class B and C shares to pursue competitive markets. Yet, harvesters adopting this practice may be better off, particularly with Class A IFQ landings bringing prices relatively close to Class B and C share landings.

The Class A IFQ/IPQ share allocations effects on processor entry could also reduce competition for Class B and C share IFQ landings. To enter a fishery at all a processor likely must purchase some minimum level of landings. With the large share of the TAC committed to IPQ holders as Class A IFQ, it is possible that some potential entrants view the Class B and C share IFQ pool as too small to support their entry. In other words, although some processors have entered the fishery through purchase of Class B and C share IFQ landings, that pool of landings may be too small to support entry by all processors that wish to enter. So, it is possible that Class B and C share IFQ ex vessel prices are somewhat dampened by the election of potential processors not to enter the market for these landings. It is important to consider that this reduction in entry and competition is an expected effect that arises from the Class A IFQ/IPQ allocations. The Class A IFQ/IPQ pool is intended to protect investments of existing processors, in a manner similar to the protection of harvester investments by IFQ. In addition, entry to processing in the crab fisheries is challenging in any case and is likely limited by the nature of the fisheries. The remote processing locations and limited TACs require that a processor have processing activities in other fisheries (including groundfish fisheries) to support processing investments. So, reductions in competition for Class B and C share IFQ landings arise not only from the Class A IFQ allocations in the fishery, but also from the characteristics of the fisheries themselves.

Competition for Class B and C share IFQ landings may also be inhibited to the extent that the allocations under the program inhibit product developments. A few competing factors shed light on whether the program's share allocations have inhibited product developments. In the second and third years of the program, one processor that holds no PQS has been active in the processing sector through the purchase of Class B and C share IFQ landings and has leased IPQ. This processor has developed relatively high quality red and golden king products, choosing to separate legs during primary production, rather than producing bulk packs of sections that are later separated during secondary processing. The development of these products exclusively by a processor without PQS could be interpreted to suggest that PQS may be inhibiting product development. On the other hand, these production developments might be most efficiently adopted by an entering processor; and the advantage of an entering processor may be greatest when the market is relatively small. The entering processor may be able to have all of its production go to this small market, whereas an existing processor with larger production amounts may need to maintain two lines of production to adapt to a small niche market. Juggling production and personnel across two lines by an existing processor could increase production costs. An entering processor may be able to configure its production line from scratch. Modification of existing lines may be more costly and may not be worth the tradeoff for a larger processor with an existing line and larger scale production, particularly for development of a small niche market. In addition, examining world markets sheds light on whether the product developments are lagging in the program fisheries. If products are being developed elsewhere that are neglected here, the share allocations under the program may be creating a disincentive for innovation. To date, no evidence of such a lag has been suggested.

The potential for institutional disincentives to limit the motivation for PQS holders to aggressively pursue new markets suggests that continued attention should be given to the prospect of market developments in applying the arbitration standard. As such, it important that both formula arbitrators and contract arbitrators look beyond production in program fisheries to fisheries throughout the world when considering whether processors are making reasonable efforts to pursue available market opportunities. When undertaking this consideration, arbitrators should consider the potential for the development of markets, as well as gauging reasonable efforts, expenditures, and investments to pursue those markets given a processor's existing production and PQS holdings. Costly revamping of production might be an unreasonable expectation for potential markets that may not succeed. On the other hand, processors might

be expected to make minor and experimental production changes that could be used to explore the potential for new products and markets. In applying the arbitration standard, it should be expected that a processor recoups its additional costs for these production changes prior to being expected to share any added production revenues with harvesters. It should be noted that if a harvester bore additional harvest costs to enable the processor to diversify its production, the harvester should be expected to recoup these costs prior to the processor realizing added gains from the production.

9 ENTRY OPPORTUNITIES

This section examines entry opportunities to the crab fisheries and how those opportunities changed under the rationalization program. The section begins with a brief discussion of harvester entry opportunities under the License Limitation Program, which preceded the rationalization program, which is followed by a discussion of entry opportunities under the rationalization program. The section then goes on to discuss entry to the processing sector under the LLP and the rationalization program.

9.1 Entry to 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 to the fisheries. In addition, historically low GHLs in the early 2000s, made investments to the fishery less attractive. The nature of the fisheries also increase 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 GHL.

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 rationalization 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 rationalization program was implemented (see Table 9-1).

Table 9-1 Transfers of crab LLP licenses (2002-2004).

Year	Number of transfers							
	Total	Bristol Bay red king crab	Bering Sea *C. opilio* and *C. bairdi*	Pribilof red and blue king crab	St. Matthew Island blue king crab	Aleutian Island red king crab	Aleutian Island golden king crab	Catcher processor
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.
Includes only transfers with change of named license holder.

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 skippers. With most vessels employing approximately 5 deck crew, the opportunity for advancement to skipper 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. This progression from skipper to vessel owner was also available only to a few skippers, who had strong relationships with a vessel owner who was interested in sharing an interest in the vessel. Some vessel owners were unwilling to accept investments in the years leading up to the rationalization 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.

9.2 Entry to the harvest sector under the rationalization program

Since the crab fisheries were greatly overcapitalized on implementation of the rationalization program, any absence of entry to the fisheries in the first few years of the program is fully expected. The restructuring of harvest privileges under the rationalization program has changed the nature of entry opportunities substantially. Entry can occur through the purchase of harvesting QS without ownership of an interest in a vessel or a supporting license. Annual IFQs can then be fished liberally through leasing arrangements. Since QS are divisible, gradual entry into the program fisheries is permitted. The cost of entry is determined by QS prices, which depend on TACs, crab markets and other factors.

QS can be purchased directly from QS owners or through brokers. 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 and the relatively new market is continuing to develop. 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 tend to be large, requiring substantial access to capital (see Table 9-2). The average transaction for owner QS (based on available price information and the average transfer size) exceeded $300,000 in the Bering Sea *C. opilio* fishery in the first two years of the program. At the extreme, in the second year of the program, the average owner QS transaction in the Bristol Bay red king crab fishery was for slightly less than $1 million. Although these large QS purchases are subject to risks associated with TAC fluctuations, they have substantially less risk than the purchase of licenses and vessels under the derby-style LLP fishery.

Full scale entry requires ownership of a vessel in addition to this quota acquisition. Yet, cooperative harvest of IFQ and leasing create an opportunity for a more gradual entry without a vessel. A person can lease IFQ yielded by held QS over a period of years, then acquire a vessel to achieve full scale entry. The separation of accessible harvest privileges from vessel ownership also allow persons to enter by purchasing a vessel without QS. Through the leasing market a person who is able to run an effective vessel operation may be able to enter the fishery without substantial QS holdings. As under the LLP, full scale entry opportunities to the fisheries are limited and remain costly. Yet, the divisibility of interests in the rationalization program allows more paths of entry and may reduce risk depending on the method of entry chosen.

Table 9-2 QS transfers and estimated transfer costs (2005-2006 to 2007-2008)

Crab Fishing Year	Fishery	Sector	Price per QS unit*	Total QS units transferred**	Number of transfers	Average QS units transferred	Average cost of transfer ($)
2005 - 2006	Bristol Bay red king crab	CVC	0.72	1,434,287	24	59,762	43,029
		CVO	0.56	15,337,188	24	639,050	357,868
	Bering Sea *C. opilio*	CVC	0.24	3,082,755	30	102,759	24,662
		CVO	0.39	40,969,076	44	931,115	363,135
	Bering Sea *C. bairdi*	CVC	0.19	563,706	18	31,317	5,950
		CVO	0.29	11,870,491	20	593,525	172,122
2006 - 2007	Bristol Bay red king crab	CVC	0.68	1,237,670	27	45,840	31,171
		CVO	1.2	28,744,461	35	821,270	985,524
	Bering Sea *C. opilio*	CVC	0.19	3,049,661	36	84,713	16,095
		CVO	0.26	60,901,248	50	1,218,025	316,686
	Bering Sea *C. bairdi*	CVC	0.11	181,990	4	45,498	5,005
	Eastern Bering Sea *C. bairdi*	CVC	0.05	491,486	20	24,574	1,229
		CVO	0.07	17,195,877	33	521,087	36,476
	St. Matthew Island blue king crab	CVC	0.17	79,301	11	7,209	1,226
	Western Bering Sea *C. bairdi*	CVC	0.03	491,486	20	24,574	737
		CVO	0.08	17,195,877	32	537,371	42,990
2007 - 2008	Bristol Bay red king crab	CVO	0.94	4,734,563	16	295,910	278,156
	Bering Sea *C. opilio*	CVO	0.27	18,434,596	23	801,504	216,406
	Eastern Bering Sea C. bairdi	CVO	0.06	2,886,182	9	320,687	19,241

Notes: Includes only transfers through November of 2007. All transfers of Bering Sea *C. bairdi* occurred prior to division of those allocations into two areas and therefore include ransfers of both Eastern and Western Bering Sea *C.bairdi* . The crab fishing year begins on July 1 and ends on June 30. A portion of these transfers included accompanying IFQ for the current season.
Source: Restricted Access Management, NOAA Fisheries.
* Based on transfers for which price information are available and may be released.
** Includes all transfers in this season of this fishery and sector.

While large scale entry is challenging, C share QS have opened new avenues for small scale entry by eligible crew. C share QS typically sell for less than owner QS, in part, because of the active participant requirements applicable to C shares. 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. Available transfer information from the first three years of the program suggests that the average transfer in all fisheries is valued at less than $50,000. Notwithstanding these relatively small scale transactions, some crew report that access to capital remains problematic, as a planned federal loan program has yet to be launched.

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 who acquired shares in a fishery in which they hold no shares and entrants who acquired shares who hold shares in none of the program fisheries. Considering owner QS first, data suggest that entrants of either type have acquired approximately 10 percent of the owner QS in most fisheries (see Table 9-3). As many as 17 new holders, who did not receive an initial allocation in any fishery, have acquired QS in the first three years of the program. Yet, given that many persons hold owner QS indirectly, through corporations or partnerships, it is likely that a portion of this suggested entry is simply restructuring of holdings of persons who received allocations.

Table 9-3 New holders of owner QS since the initial allocation

Fishery	New QS holder in the fishery			New QS holder in all fisheries		
	Number of entrants	QS units acquired	Percent of QS pool acquired	Number of entrants	QS units acquired	Percent of QS pool acquired
Bristol Bay red king crab	27	47,822,236	12.3	17	37,472,319	9.6
Bering Sea *C. opilio*	27	101,712,035	10.4	17	84,322,232	8.7
Eastern Aleutian Islands golden king crab	1	1,021,237	10.5	1	1,021,237	10.5
Eastern Bering Sea *C. bairdi*	17	18,449,875	9.5	17	18,449,875	9.5
Pribililof red and blue king crab	10	2,806,769	9.6	4	2,215,703	7.6
St. Matthew Island blue king crab	17	3,048,882	10.4	8	1,988,321	6.8
Western Aleutian Islands golden king crab	2	879,760	2.3	2	879,760	2.3
Western Aleutian Islands red king crab	6	9,054,708	15.6	3	8,822,797	15.2
Western Bering Sea *C. bairdi*	17	18,482,166	9.5	17	18,482,166	9.5

Source: RAM QS database.

Since C share QS may only be held by individuals, C share data may better illustrate the extent of new entry (see Table 9-4). Yet, since some entering C share holders may hold owner QS indirectly, estimates of entry may be misleading. Although C shares improve the opportunity for entry, few persons have entered the fisheries through C share acquisition since the initial allocation. The few persons that have entered the fisheries have acquired relatively large holdings of C shares, with the average entrant in most fisheries exceeding one-half of one percent of the C share QS pool. In the Western Aleutian Islands golden king crab fishery, the one new entrant acquired in excess of 5 percent of the C share QS pool. Given that only a few vessels participate in that fishery, the large share acquisition is not surprising.

Table 9-4 New holders of C share QS since the initial allocation

Fishery	New C share QS holder in the fishery			New C share QS holder in all fisheries		
	Number of entrants	QS units acquired	Percent of QS pool acquired	Number of entrants	QS units acquired	Percent of QS pool acquired
Bristol Bay red king crab	14	1,077,535	9.0	5	315,487	2.6
Bering Sea *C. opilio*	11	2,303,296	7.6	5	1,127,003	3.7
Eastern Aleutian Islands golden king crab	0	0	0.0	0	0	0.0
Eastern Bering Sea *C. bairdi*	6	153,660	2.6	6	153,660	2.6
Pribililof red and blue king crab	1	27,116	3.0	0	0	0.0
St. Matthew Island blue king crab	8	108,660	12.1	1	13,137	1.5
Western Aleutian Islands golden king crab	1	75,643	6.3	0	0	0.0
Western Aleutian Islands red king crab	0	0	0.0	0	0	0.0
Western Bering Sea *C. bairdi*	6	153,660	2.6	6	153,660	2.6

Source: RAM QS database.

9.3 Entry to the processing 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 *C. opilio* fisheries. Under lower GHLs 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 rationalization program, entry to the processing sector as only a crab processor was 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. Consequently, entry to the processing sector is affected by a processor's potential to enter groundfish fisheries and secure a portion of that production. With groundfish processing 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 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 9-5 New holders of PQS since the initial allocation

Fishery	New PQS holder in the fishery			New PQS holder in all fisheries		
	Number of entrants	QS units acquired	Percent of QS pool acquired	Number of entrants	QS units acquired	Percent of QS pool acquired
Bristol Bay red king crab	3	53,867,976	14.1	2	51,756,662	13.6
Bering Sea *C. opilio*	4	86,194,722	8.6	2	84,798,627	8.5
Eastern Aleutian Islands golden king crab	3	1,365,308	25.2	2	1,272,608	23.4
Eastern Bering Sea *C. bairdi*	1	3,676,006	1.8	1	3,676,006	1.8
Pribililof red and blue king crab	1	4,155,008	13.9	0	0	0.0
St. Matthew Island blue king crab	2	2,397,581	8.0	1	12,955	0.0
Western Aleutian Islands golden king crab	2	2,269,884	8.1	1	2,165,711	7.8
Western Aleutian Islands red king crab	2	19,415,902	32.3	1	3,248,567	5.4
Western Bering Sea *C. bairdi*	1	3,676,006	1.8	1	3,676,006	1.8

Source: RAM PQS database.

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.

In a few instances, processors are believed to have entered the fishery through purchases of Class B and C share IFQ landings (see Table 8-9). This entry has been relatively small scale, as Class B and C share IFQ represent a relatively small portion of the IFQ pool. These entering processors have been active in other fisheries, supplementing those activities with processing of crab. The potential of any of these entrants to expand operations depends on their willingness to continue to compete for Class B and C share IFQ landings and to acquire PQS to sustain that participation.

10 MONITORING AND ENFORCEMENT

The system of share-based fishing established by the program includes several fishing privileges and obligations that must be overseen by NOAA Fisheries managers and enforcement agents. Several aspects of participation in the program must be monitored to ensure compliance with the regulatory requirements. These requirements present extensive and unique challenges to NOAA Fisheries Restricted Access Management and Office of Law Enforcement.

Several sets of accounts authorizing fishing and processing activities must be monitored. Using plant observers and electronic reporting, landings can be attributed to the appropriate accounts. To date, only a few, minor overages have occurred under the program (see Table 4-4). Overall, managers and enforcement believe that fishing and processing activities are in compliance with the allocation of privileges for those activities as intended by the program.

Beyond oversight of fishing and processing activities, several other aspects of the program and its allocations must be monitored by NOAA Fisheries. Limits are imposed on harvester share holdings, the amount of shares that may 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. Monitoring of activities and share holdings in a relatively static environment is extremely challenging; periodic changes in interests of persons, 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. C share IFQ active participation requirements also present a monitoring 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.

The program also contains spatial limitations on landing of catch and processing. Current record keeping requirement for floating processors may not adequately track locations for purposes of ensuring complete monitoring of these requirements. Regional processing requirements limit processing of certain IPQ to designated geographic areas. On a finer scale, community rights of first refusal are triggered by the use of IPQ outside the community protected by that right. Although no controversies or disputes have arisen over whether processing of IPQ has complied with regional requirements or has triggered the right of first refusal, no formal record of processing location is made that could be used to establish the location of processing. In the absence of these records, monitoring compliance with the requirements is more challenging.

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 also reduced monitoring burdens by consolidating annual IFQ allocations into fewer accounts, effectively shifting a portion of the oversight of those accounts to harvest sector share holders. Cooperative allocations also reduce NOAA Fisheries' transfer administration burden since intra-cooperative transfers are managed within the cooperative. to the extent that these systems are intended to relieve monitoring burdens, they have largely been effective. Yet, the program continues to pose many management and oversight challenges.

11 MANAGEMENT COSTS AND COST RECOVERY

Under the Council motion adopting the program and the MSA, NOAA Fisheries collects fees to pay for the costs of management (including enforcement) arising out of the program. These costs are the incremental costs that are incurred due to the implementation of the program. The fee is charged as a percentage of the ex vessel value of each landing. The fee is split equally between harvesters and processors, with processors responsible for collecting the fee and making payment to NOAA Fisheries. Catcher processors, who catch and process their catch, do not split the fee, but pay the full amount directly to NOAA Fisheries. Fees are limited to no more than 3 percent of the ex vessel value of the fishery in a crab fishing year. At the start of each season, NOAA Fisheries publishes a fee percentage in the Federal Register, based on the previous year's ex vessel prices and management and enforcement costs. NOAA Fisheries typically publishes the fee percentage in July or early August, in time for participants in the Aleutian Islands golden king crab fishery to collect fees on their first landing.

Market and stock uncertainties, as well as variation in management costs, mean that the fees may not precisely cover management costs. TAC announcements for the largest fisheries (Bristol Bay red king crab, and Bering Sea *C. opilio*) 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. Fees are due by June 30 (the end of the crab fishing year) but many processors delay payment for at least one month. NOAA Fisheries cannot assess penalties until at least 30 days after a payment is due. For example, although NOAA Fisheries collected more than the amount required to cover program costs for the 2007-2008 season, the specific amount of fees collected was not fully known prior to the publication of the fee percentage notice for the 2008-2009 season. Because of these uncertainties, a formulaic approach to setting the fee percentage is used. Regulations require that NOAA Fisheries establish the fee percentage based on the prior year's costs and ex vessel values, instead of projections which can be highly subjective.

Although, NOAA Fisheries 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. Because fee collection for the 2007-2008 season exceeded costs, NOAA Fisheries will have to subtract the remaining balance from the estimated costs, prior to calculating the fee percentage for the 2009-2010 season (effectively reducing the fee percentage for the 2009-2010 season).

For the first three years of the program the fee percentage was set at the maximum level, 3 percent of ex vessel value. NOAA Fisheries has lowered the fee percentage for the 2008-2009 season to 1.05 percent of ex vessel value, primarily because the 2007-2008 costs were about half of their levels in prior years. Lower costs were realized through staffing vacancies, multi-year contracts included in prior year costs, and more efficient use of staff time as NOAA Fisheries staff developed familiarity with the program.

Although some program costs have fluctuated in the first three years of the program, most categories of management costs have declined (see Table 11-1). These declines, together with the large TAC increases and strengthening markets in the third year of the program led to the decline in the fee percentage in the fourth year of the program.

Table 11-1 Management costs and cost recovery fees (2005-2006 through 2007-2008.

Office	Restricted Access Management	Sustainable Fisheries	Operations Management and Information	General Counsel	Appeals	Office of Law Enforcement	Office of Law Enforcement and Joint Enforcement Agreement	ADF&G (State)	Alaska Fisheries Science Center	Pacific States Marine Fisheries Commission	Total
Primary source of expenditures	Quota management	Regulations	Cost accounting	Legal guidance	Appeals	General Enforcement	Joint enforcement (with State of Alaska)	Extended Jurisdiction/Observers/ CDQ	Economic Data Reporting	Economic Data Reporting/Joint Electronic Reporting	
2005/2006	$ 945,969	$ 912,615	$ 8,580	$ 89,077	$ 6,800	$ 398,502	$ 516,519	$ 864,614	$ 83,703	$ 444,500	$ 4,270,881
Percent of total costs	22.15%	21.37%	0.20%	2.09%	0.16%	9.33%	12.09%	20.24%	1.96%	10.41%	100.00%
Fees for cost recovery (3% fee)											$ 3,124,999
% of costs recovered											73%
2006/2007	$ 541,158	$ 189,519	$ 35,848	$ 34,536	$ 122,547	$ 1,602,073	$ 162,608	$ 824,008	$ 106,397	$ 321,148	$ 3,939,841
% of total costs	13.74%	4.81%	0.91%	0.88%	3.11%	40.66%	4.13%	20.91%	2.70%	8.15%	100.00%
Fees for cost recovery (3% fee)											$ 3,045,344
% of costs recovered											77%
2007/2008	$ 233,146	$ 94,310	$ 34,117	$ 30,642	$ 47,466	$ 568,647	$ -	$ 725,405	$ 111,725	$ 288,300	$ 2,133,758
% of total costs	10.93%	4.42%	1.60%	1.44%	2.22%	26.65%	0.00%	34.00%	5.24%	13.51%	100.00%
Fees for cost recovery (3% fee)											$ 6,517,204
% of costs recovered											305%

2008/2009 - Fee Percentage set at 1.05 % of ex vessel value

12 FISHING VESSEL SAFETY

12.1 Fatalities in BSAI crab fisheries

Commercial fishing is one of the most dangerous jobs in the United States, and the BSAI crab fisheries are particularly hazardous because harvesting of crab species generally takes place during the winter when air and water temperatures are colder; high winds, snow, sleet, and ice are more prevalent; daylight hours shorter; and high seas are more common (National Institute for Occupational Safety and Health, 1997). In addition, crabbing fishing gear consists of steel pots weighing up to 800 pounds each, which require cranes and hydraulics for setting, retrieval, and stowage. Lines also pose a substantial risk to inattentive crew. Crab pots stacked on deck can severely compromise vessel stability, especially if accompanied by icing conditions. The derby-style BSAI crab fisheries contributed to these dangers by often encouraging participants to fish in unsafe weather conditions, work continuously for long periods without rest, and possibly overload their vessels with pots (National Institute for Occupational Safety and Health, 1997).

Between 1991 and 1996, a total of 61 fatalities occurred in Alaska's crab fisheries, accounting for 42% of all commercial fishing-related fatalities in the state (National Institute for Occupational Safety and Health, 1997). During this period, the average annual fatality rate in the shellfish (primarily crab) fisheries in Alaska was 356/100,000/year, 50 times the overall U.S. occupational fatality rate of 7.0/100,000/year. Since the early 1990s, however, the number of fatalities in the BSAI crab fisheries has shown an overall downward trend (see Table 12-1).

Table 12-1 Fatalities in the Bering Sea and Aleutian Islands crab fisheries, 1990–2008

	Years prior to implementation of the rationalization program										Seasons under the rationalization program		
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2005-2006	2006-2007	2007-2008
Number of fatalities	10	1	3	7	0	1	0	1	0	6	0	0	0

Source: Lincoln (2007) and USCG Marine Safety Detachment Kodiak

Several factors have contributed to the decline in fatalities in the Being Sea and Aleutian Island crab fisheries. A progression of safety measures beginning in the early 1990s were implemented by the USCG. In particular, these safety requirements contributed to a substantial increase in the percentage of

the commercial fishermen surviving vessel sinking and capsizing. National Institute for Occupational Safety and Health (NIOSH) found that in Alaska, the number of vessels lost per year has stayed relatively constant, but the survival rate for those onboard increased from 73% in 1991 to 93% in 1998 (Lincoln, 2007).

These data suggest that the Commercial Fishing Industry Vessel Safety Act (CFIVSA) of 1988 improved survivability (Lincoln and Conway, 1999). Provisions of the CFIVSA implemented in the early 1990s required the USCG to issue new regulations for safety equipment and operating procedures for fishing, fish tender and fish processing vessels. As a result of this legislation vessels are better equipped with Emergency Position Indicating Radio Beacons (EPIRBs), life rafts, side-band radios, and survival suits. Moreover, emergency drill instructor training and mandatory monthly drills are required of all fishing vessels. In addition, the CFIVSA enabled the USCG to establish the Voluntary Dockside Examination (VDE) Program in 1992 (Medlicott, 2002). If vessels pass a safety inspection by the USCG or Coast Guard Auxiliary they are issued a dockside exam decal. In 1998, the NPFMC initiated a regulation that made the VDE or some other documentation of compliance with USCG regulations mandatory for all vessels carrying observers (Cullenberg, 2002). Furthermore, since 2005, each vessel participating in the crab fisheries has had to receive a dockside exam decal from the USCG before it is issued a fishing license by the Alaska Commercial Fisheries Entry Commission and allowed to fish in the crab fisheries in each season.

The success of the CFIVSA suggested that further improvements in safety could be made through efforts to prevent vessel loss. In Alaska, the USCG responded by implementing the vessel stability check program in 1999. The program identifies and corrects safety and stability hazards known to exist on vessels participating in Bering Sea and Aleutian Island crab fisheries. These fisheries were selected for the program because they had the highest fatality rate of any fisheries in the state. Each vessel participating in one of the two major crab fisheries (historically in October and January) is checked by the USCG prior to its participation to ensure the vessel meets basic stability and loading standards. A NIOSH evaluation of the stability check program showed a decline in fatalities in the Bering Sea and Aleutian Island crab fisheries from an annual average of 7.2 fatalities in the ten years preceding the program's implementation to 1.2 per year in the years since its implementation through 2007 (Lincoln, 2007).

To further improve safety, prior to rationalization the USCG stationed a helicopter-equipped cutter on the fishing grounds during the two major crab seasons and stationed an emergency response helicopter at Cold Bay during the Bristol Bay red king crab season (in October), and at St. Paul during the Bering Sea *C. opilio* season (in January). This practice has continued under the rationalization program, but the timing of deployments is undergoing changes with the extension of crab fishing seasons and evolving needs in other fisheries. The long seasons pose a financial challenge to the USCG, as it restructures its rescue equipment and crew deployments. Also prior to implementation of the program, the USCG and State of Alaska signed an agreement in 2001 allowing the Alaska Department of Fish and Game to delay opening a BSAI crab fishery for up to 48 hours to let bad weather pass if the USCG's ability to conduct search-and-rescue missions is significantly impaired.

12.2 Effects of the program on fishing vessel safety

The downturn in fatalities in BSAI crab fisheries began before the implementation of the rationalization program in 2005. In the first three years of the program, there have been no fatal events in the program fisheries. However, it is not possible to ascertain with certainty the extent to which the program contributed to the improved safety record in the fisheries.

Prior to implementation of the rationalization program, vessels could suffer reduced catches if they chose to delay fishing because of bad weather. Fishery participants report that the exclusive allocations under

the program have reduced the pressure to risk unsafe weather or sea conditions by removing the need to compete for a share of the available catch of crab. In the first year of the program, for example, some boats chose to remain in port or other secure areas for three days after the Bristol Bay red king crab season opened because of bad weather. The vessels left for the fishing grounds only after weather and sea conditions improved. The gain in vessel safety from this season opening standdown under the program may have been limited by the aforementioned policy of delaying opening a fishery for up to 48 hours to allow storms to pass.

In addition to affecting captains' decisions to fish or not on a given day, the program has affected decisions made on the grounds that enhance safety in the program fisheries. In particular, captains allow crews to get more rest during fishing trips. Prior to rationalization, compression of fishing activity during a season to just a few days in a race-for-fish scenario meant that crewmembers worked around the clock, which created extreme fatigue and increased the likelihood of accidents (Matulich, 2008). The exclusive allocations and extended season under the program have allowed captains to slow fishing, thereby allowing crews more (and more regular) rest than in the derby fishery. Vessels stop working during this rest period and "jog" in a safe, low fuel consumption mode or transit between strings of pots. By reducing fatigue among crewmembers, this daily sleep can be critical to crew safety.

Under the rationalization program, vessels are also more likely to suspend fishing on the grounds during periods of bad weather. Crews typically rest during these periods, while the vessel jogs or transits slowly between fishing areas. Some participants have reported that vessels may choose to time deliveries or not leave the dock after making a delivery to avoid severe weather. These practices have an added advantage, since crab in on-board tanks can be damaged or stressed by severe weather, resulting in higher deadloss.

On the other hand, some factors may limit the ability of harvesters to take full advantage of opportunities to fish at a slower pace to reduce crew fatigue and to avoid fishing in dangerous weather. These factors include a continued desire to minimize days at sea and persistence of the work ethic of individuals who have been historically employed largely because of their ability to work fast for long periods of time. The effects of these factors on fishing practices may subside over time, particularly if high fuel prices induce participants to slow their fishing to save on operating costs.

It is also important to note that delivery contracts between vessels and processing plants still exist and may pressure a captain to complete deliveries by a certain date to avoid ex vessel price reductions. Crab processing is labor intensive, and timing of deliveries is important for processors in order to reduce the costs to processors of keeping crews on hand, standing by to process crab. In some cases, market demands may impose time pressures on harvesters and processors. The Japanese market for king crab, which is the most important market for Bristol Bay red king crab, has a particularly strong seasonal component. The vast majority of sales of king crab take place around and before the year end holidays (Sackton, 2007a). In order to maintain this traditional Japanese end-of-year gift giving market, Alaska processors must have the crab delivered by harvesters by mid-November (Herrmann and Greenberg, 2006). While these time pressures may lead to more aggressive harvest schedules, harvesters have used these time pressures to their advantage in price negotiations. Specifically, some harvesters have organized standdowns to extract a higher price from processors. Although processors still vigorously negotiate delivery schedules in the preseason, they have become more accommodating of harvester delays inseason to the extent that those delays arose from safety concerns expressed by captains.

Fleet contraction may also have contributed to safety in the program fisheries through several ancillary effects. Prior to implementation of the program many marginally productive vessels participated in the fisheries. Vessel owners continued to fish their vessels to maintain their historic interests in the crab fisheries and to maintain some revenue stream to support loan payments and vessel and gear maintenance. The overall poor profitability of the highly capitalized fisheries with relatively low TACs may have

economically forced some owners to postpone needed vessel maintenance. Fleet contraction resulted in the removal of many of these marginal vessels from the fleet. In addition, the higher revenues per vessel in the fishery may have increased the availability of funds for vessel maintenance. Fleet contraction also resulted in a decrease in the number of and catch of smaller vessels, which can be more readily overwhelmed by heavy sea conditions (see Table 12-2 and Table 12-3).

Table 12-2 Catch by vessel length in the Bristol Bay red king crab and Bering Sea *C. opilio* fisheries (2001 through 2007-2008)

Fishery	Season	Vessels less than 85 feet LOA			Vessels greater than or equal to 85 feet LOA and less than 100 feet LOA			Vessels greater than or equal to 100 feet LOA and less than 125 feet LOA			Vessels greater than or equal to 125 feet LOA		
		Number of vessels	Harvests		Number of vessels	Harvests		Number of vessels	Harvests		Number of vessels	Harvests	
			in pounds	as a percent of total harvests		in pounds	as a percent of total harvests		in pounds	as a percent of total harvests		in pounds	as a percent of total harvests
Bristol Bay red king crab	2001	10	160,491	2.1	45	1,114,990	14.5	107	3,382,283	44.0	68	3,023,342	39.4
	2002	12	274,123	3.1	47	1,520,342	17.3	111	3,914,558	44.6	71	3,061,325	34.9
	2003	14	382,110	2.7	50	2,277,265	16.0	112	5,848,643	41.1	74	5,729,357	40.2
	2004	15	366,134	2.6	49	2,208,933	15.9	115	6,366,532	45.8	72	4,947,448	35.6
	2005-2006	1	*	*	12	*	*	45	6,471,954	39.3	31	8,378,643	50.9
	2006-2007	2	*	*	13	*	*	39	5,553,331	40.0	27	6,627,815	47.8
	2007-2008	1	*	*	11	*	*	36	7,786,012	42.5	26	8,569,799	46.8
Bering Sea *C. opilio*	2001	6	356,254	1.6	38	2,547,796	11.1	94	8,648,476	37.7	69	11,388,178	49.6
	2002	4	302,559	1.0	35	3,730,703	12.6	87	12,529,356	42.3	64	13,047,084	44.1
	2003	3	394,264	1.6	42	4,333,115	17.1	84	10,859,325	42.7	61	9,823,418	38.7
	2004	5	279,963	1.3	32	2,852,864	13.0	88	9,320,915	42.5	64	9,485,751	43.2
	2005	4	263,500	1.2	28	3,555,960	15.7	83	10,735,190	47.4	52	8,101,127	35.8
	2005-2006				9	2,546,765	7.7	37	11,811,936	35.5	32	18,889,308	56.8
	2006-2007				10	4,025,321	12.3	32	10,598,626	32.5	28	18,035,201	55.2
	2007-2008				10	6,073,006	10.7	39	24,301,061	42.8	29	26,348,333	46.5

Sources: ADFG fishtickets and NMFS RAM catch data (for 2005-2006, 2006-2007, and 2007-2008)

Table 12-3 Participation by vessel length in the Aleutian Island golden king crab and Bering Sea *C. bairdi* fisheries (2001-2002 through 2007-2008)

Fishery	Season	Vessels less than 85 feet LOA	Vessels greater than or equal to 85 feet LOA and less than 100 feet LOA	Vessels greater than or equal to 100 feet LOA and less than 125 feet LOA	Vessels greater than or equal to 125 feet LOA
Eastern Aleutian Island golden king crab	2001-2002	0	3	9	7
	2002-2003	0	3	9	7
	2003-2004	0	3	8	7
	2004-2005	0	3	9	8
	2005-2006	0	0	3	4
	2006-2007	0	0	2	4
	2007-2008	0	0	2	2
Eastern Bering Sea *C. bairdi*	2006-2007	0	5	17	14
	2007-2008	1	3	10	6
Western Aleutian Island golden king crab	2001-2002	0	0	3	6
	2002-2003	0	0	3	3
	2003-2004	0	0	3	3
	2004-2005	0	0	3	3
	2005-2006	0	0	1	2
	2006-2007	0	0	1	2
	2007-2008	0	0	1	2
Western Bering Sea *C. bairdi*	2005-2006	0	5	20	18
	2006-2007	0	5	15	16
	2007-2008	0	6	14	7

Sources: ADFG fishtickets and NMFS RAM catch data (for 2005-2006, 2006-2007, and 2007-2008)

Some participants also believe that fleet consolidation has contributed to safety in the fisheries by improving crew skills and professionalism. In the years leading up to the rationalization program, crews

in the fisheries would actively fish crab for only a few weeks each year.[74] Under the program, most crews are active in the crab fisheries for a period of months. This extended employment provides crew with more (and more regular) experience deploying and hauling gear. Although some turnover occurs, most crews reportedly have more continuity under rationalization. This lower turnover (including reduced movement among vessels) allows crew to better learn to work together as teams and learn the crew practices of a particular boat as well as acquire a better understanding of safety equipment and practices. Other participants in the fisheries, however, have expressed concern that it may have become more difficult to hire and keep qualified crew because experienced crewmembers are unwilling to work under the extended seasons under the program.

Certain procedural aspects of the program have also been criticized for compromising vessel safety. Most prevalent are assertions that the regional landing requirement has created a situation where captains have less flexibility to take sea conditions into account when deciding where to deliver crab. Processors in the North region are especially sensitive to delivery schedules, since processing crews are positioned in the Pribilofs (the only North communities with crab processing) exclusively to process crab. Unexpected circumstances in the Bering Sea *C. opilio* fishery, together with the more rigidly scheduled deliveries are argued to have led some vessels to take greater risks in all of the first three years of the program. Each year, ice in and around St. Paul harbor delayed deliveries, sometimes for several days. In the spring of 2007, icing problems were compounded by a disabling fire on one of the two floating processors scheduled to operate in the North region. With limited processing capacity scheduled for the North region, deliveries were delayed, and, at one point, three crab vessels were trapped in the ice temporarily outside St. Paul harbor.

While travelling through ice no doubt poses threats to fishing vessels and crews. Vessels are not only at greater risk of loss, but also may suffer hull, propeller, and rudder damage. In some instances, this damage may not be easily detectable. The extent to which the North region landing requirement or processor scheduling under the rationalization program have contributed to these safety risks is uncertain. Prior to implementation of the rationalization program, vessels periodically became trapped in the ice during the Bering Sea *C. opilio* season, particularly when attempting deliveries to St. Paul. In addition, most harvesters prefer to deliver catch in the Bering Sea *C. opilio* fishery to the Pribilofs to avoid the travel costs associated with deliveries to the South. Lastly, ice conditions that cause problems for deliveries to the Pribilofs are frequently accompanied by icing problems on the grounds. To the extent that harvesters are unable to make deliveries to St. Paul for an extended period, they may be unable to continue fishing. Harvesters unable to fish, however, may need to offload any crab onboard to avoid deadloss. In addition, it is possible that this issue could be addressed if a satisfactory provision for emergency relief from regionalization can be developed to alleviate risks associated with regional landing requirements.

It is also important to note that where permissible program constraints that pose safety risks have been removed. For example, safety concerns led to exemptions to the 'cooling off' provision, which required IPQ to be used in the "community of origin" (or community of the processing history that led to the initial allocation of those processing quota shares) during the first two years of the program. In both of those years, PQS holders petitioned NOAA Fisheries for an exemption from the limitation of the 'cooling off' period, claiming unavoidable circumstances prevented their processing of shares in the City of St. George. In both years, NOAA Fisheries granted the exemption concluding that an unavoidable circumstance prevented processing in the St. George harbor. Specifically, NOAA Fisheries found that

[74] Prior to rationalization some vessels fished Pacific cod before and after the shorter seasons, extending their pot fishing seasons. Although the Pacific cod fisheries allow crews to practice deploying and hauling gear. Many vessels in the crab fisheries have continued to fish in the Pacific cod fisheries since implementation of the rationalization program.

storm damage to the breakwater at the harbor in St. George prevented safe entry of processing vessels to the St. George harbor. With no other location available to safely process in St. George, NOAA Fisheries granted the waiver of the 'cooling off' requirement.

13 BIOLOGICAL MANAGEMENT ISSUES

This section discusses the effects of the crab rationalization program and resulting changes in fishing patterns on crab mortality and population sustainability, and the biological management of the crab stocks.

13.1 Crab fishery harvest

Catch in excess of the harvest targets was difficult to prevent in the derby-style fisheries that predated the crab rationalization program. Even with good in-season assessment and catch reporting, catches can change rapidly. A large efficient fleet can quickly surpass a harvest target when they locate high concentrations of crab. Between 2000 and 2004, the guideline harvest level for Bristol Bay red king crab was exceeded in two out of five years; the GHL for Bering Sea *C. opilio* was exceeded in five out of six years; and the GHL for Aleutian Islands golden king crab was exceeded in two out of five years (NPFMC 2007). Since the implementation of the crab rationalization program, the total allowable catch (TAC) for these target fisheries has never been exceeded (Table 13-1). The Bering Sea *C. bairdi* fishery has not been open for directed fishing since 1996, and the fishery was under a rebuilding plan from 1999 through the 2005 season. Only the western portion of the fishery opened in 2005-2006, as the TAC calculated under the harvest strategy was below the minimum threshold TAC for the eastern portion. Since then, IFQs have been separately allocated to the Eastern and Western *C. bairdi* fisheries, and consequently the minimum TAC threshold has been eliminated, so that both Western and Eastern fisheries are open.

Table 13-1 Guideline harvest level, or total allowable catch, and harvest, for crab fisheries, 2000-2008, in millions of pounds

Season	Bristol Bay red king crab		Bering Sea *C. opilio*		Aleutian Islands golden king crab		Bering Sea *C. bairdi*	
	GHL/TAC	Harvest	GHL/TAC	Harvest	GHL/TAC	Harvest	GHL/TAC	Harvest
2000	7.7	7.5	26.4	30.8	5.7	6.0	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			19.4	23				
2005 - 2006	16.5	16.5	33.5	33.3	5.1	5.0	1.6	1.0
2006 - 2007	13.9	13.9	32.9	32.7	5.1	4.7	3.0	2.1
2007 - 2008	18.3	18.3	56.7	56.7	5.1	4.9	5.1	1.9

For seasons prior to 2005-2006, seasons are designated by the year in which they opened prior to rationalization.
All GHL/TACs and harvests are for general fishery, excluding CDQ.
Source: NPFMC 2007.

13.2 Deadloss

Deadloss is the amount of dead crab landed at the dock. 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. Deadloss is exacerbated when vessels are not able to off-load quickly, due to longer trips or backups at the dock, and fewer crab survive the wait in the tank.

Deadloss in the Bristol Bay red king crab and the Aleutian Islands golden king crab fisheries has decreased post-rationalization, compared to the seasons immediately preceding implementation of the program (Table 13-2). In the Bering Sea *C. opilio* fishery, the rate of deadloss is comparable to that which occurred in the two most recent years before rationalization.

Table 13-2 Deadloss in the crab fisheries, 2000-2008

Fishery	Season	Catch** (in pounds)	Deadloss* (in pounds)	Deadloss per pound of catch
Bristol Bay red king crab	2000	7,468,240	32,118	0.004
	2001	7,681,106	57,294	0.007
	2002	8,770,348	32,177	0.004
	2003	14,237,375	228,270	0.016
	2004	13,889,047	160,563	0.012
	2005 - 2006	16,472,400	77,507	0.005
	2006 - 2007	13,887,531	98,720	0.007
	2007 - 2008	18,324,046	131,954	0.007
Bering Sea *C. opilio*	2001	22,940,704	429,884	0.019
	2002	29,609,702	585,288	0.020
	2003	25,410,122	662,409	0.026
	2004	21,939,493	224,377	0.010
	2005	22,655,777	224,139	0.010
	2005 - 2006	33,248,009	322,594	0.010
	2006 - 2007	32,699,911	379,132	0.012
	2007 - 2008	56,722,400	500,156	0.009
Eastern Aleutian Islands golden king crab	2000 - 2001	3,086,890	55,999	0.018
	2001 - 2002	3,128,409	50,030	0.016
	2002 - 2003	2,765,436	55,425	0.020
	2003 - 2004	2,900,247	76,006	0.026
	2004 - 2005	2,846,273	43,576	0.015
	2005 - 2006	2,569,209	23,791	0.009
	2006 - 2007	2,692,009	31,311	0.012
	2007 - 2008	2,690,377	21,042	0.008
Western Aleutian Islands golden king crab	2000 - 2001	2,902,518	53,158	0.018
	2001 - 2002	2,693,221	43,519	0.016
	2002 - 2003	2,605,237	32,101	0.012
	2003 - 2004	2,637,161	49,321	0.019
	2004 - 2005	2,639,862	43,560	0.017
	2005 - 2006	2,382,468	26,500	0.011
	2006 - 2007	2,002,186	19,768	0.010
	2007 - 2008	2,246,040	23,183	0.010

Sources: *ADFG Annual Management Report and **fishtickets and **NMFS RAM catch data (for 2005-2006, 2006-2007, and 2007-2008)

13.3 Crab bycatch and discards

The rationalization program has had a few effects on bycatch and discards in the crab fisheries.

13.3.1 High grading

High grading is the sorting through legal crab for the most valuable (typically the largest and 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. This can lead to additional fishing mortality of legal males in excess of IFQ allocations. Highgrading is an environmental concern because it may alter stock composition and hinder the reproductive capabilities by removing only the largest, cleanest crab. The large, clean crab are thought to be the most successful at mating. High grading may also affect mortality of female and sublegal crab, if more pot lifts are required to catch the TAC. High grading is driven by market forces and preferences for clean-shelled crab, as processors may pay less for or refuse to accept dirty crab. Also, fishermen discard damaged crab that may die in the tank, because the dead crab decrease the survival rate of the live crab around them.

During the first year under rationalization of the Bristol Bay red king crab fishery, the number of legal male crabs captured during the fishery and subsequently discarded was dramatically higher than discard rates in previous years (Table 13-3), and represented approximately 20 percent of legal male red king crab caught. ADF&G identified concerns about resource sustainability under their harvest strategy, given these levels of discards. The discards were linked to the shell condition of the crab (Barnard and Pengilly 2006); the 2005 NOAA Fisheries 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 in the catch (and the lower price that crab would fetch) was likely a key contributor to the widespread high grading.

In an effort to address the biological concerns raised by ADF&G, industry instituted a number of voluntary proposals to address the issue of discards. Under the organization of the Pacific Northwest Crab Industry Advisory Committee (PNCIAC), a number of proposed solutions were offered in a discussion paper, and subsequently adopted by PNCIAC members (PNCIAC 2006). 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. In addition, beginning in the 2006-2007 season, most harvesters and processors changed their pricing structure to reflect their support for a full retention policy, and moved to a single price that does not distinguish for shell condition, in order to remove the incentive to high grade.

ADF&G reacted to the 2005-2006 discard issue by downwardly adjusting the TAC determination for the 2006-2007 season, thus resulting in an economic penalty for the share holders in that season. As discarding of legal males did not occur on a similar scale in 2006-2007, no further downward adjustment was made for the 2007-2008 season (Vining and Zheng 2008).

High grading and increased in discard rates have not been an issue in fisheries or seasons, other than the 2005-2006 Bristol Bay red king crab season (Table 13-3). New shell condition is particularly important in the Bering Sea *C bairdi* and Bering Sea *C. opilio* fisheries, and in addition the *C. opilio* fishery has a strong selectivity for males with a 4 inch or greater carapace width, due to processors standards for delivered crab, although the legal size is 3.1 inch carapace width. However, the harvest strategies for both fisheries account for these selectivities and the resulting bycatch in setting the harvest rate (NMFS 2004).

Table 13-3 Bycatch in the crab fisheries, 2000 through 2007-2008 (Bristol Bay red king crab, Bering Sea *C. opilio*) and 2005-2006 though 2007-2008 (Aleutian Islands golden king crab, Bering Sea *C. bairdi*)

Fishery	Season	Total bycatch (in pounds)		
		Legal, non-retained	Sublegal	Female
Bristol Bay red king crab	2000	24,773	3,985,628	439,745
	2001	67,022	3,759,015	1,190,144
	2002	138,355	4,707,986	71,016
	2003	247,602	9,393,910	3,377,311
	2004	160,724	4,033,506	1,373,949
	2005 - 2006	4,602,011	8,543,364	3,543,455
	2006 - 2007	94,905	1,853,035	221,506
	2007 - 2008	45,651	3,554,052	830,882
Bering Sea *C. opilio*	2001	6,248,154	112,440	5,546
	2002	7,473,653	99,376	3,742
	2003	15,923,087	297,104	32,580
	2004	19,989,353	384,528	9,670
	2005	5,398,033	85,558	3,475
	2005 - 2006	10,434,115	196,584	12,826
	2006 - 2007	17,777,807	507,809	10,272
	2007 - 2008	21,820,036	549,861	157,270
Eastern Aleutian Islands golden king crab	2005 - 2006	17,691	202,329	118,969
	2006 - 2007	19,210	219,463	202,924
	2007 - 2008	20,697	199,897	127,616
Western Aleutian Islands golden king crab	2005 - 2006	11,881	301,343	257,468
	2006 - 2007	6,012	256,059	281,018
	2007 - 2008	4,614	335,255	414,134
Bering Sea *C. bairdi*	2005 - 2006	3,926	540,582	69,206
	2006 - 2007	22,225	1,348,877	392,236
	2007 - 2008	39,517	5,270,165	370,532

Sources: NPFMC 2007 (2000-2005); Barnard and Burt 2007 (2005/2006); Barnard and Burt 2008 (2006/2007); ADFG (2007/2008)

13.3.2 Rail dumping

Rail dumping is the practice of emptying captured 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 in terms of the number, size, and sex of the captured crab. Pre-rationalization, rail dumping would occur when vessels were left with pots soaking after the season had ended, which was legally permitted only if fewer than 24 hours notice of a closure was provided. These short notices occurred occasionally in the Bristol Bay red king crab fishery prior to implementation of the program. On those occasions, it is believed a the number of fishing pots left on the grounds that were rail dumped were at least comparable to current rail dumping levels. Under the rationalization program, rail dumping has been practiced by some vessels when retrieving their pots in order to avoid the risk of exceeding their available IFQ, and the penalties that would result from such overages.

Rail dumping has occurred in all the crab fisheries. Observers attempt to estimate the number of rail dumped pots, although they cannot track their contents. The proportion of rail dumped pots, as compared to total harvested pot lifts, ranges from 0.3 percent to 2.6 percent, and is variable by season within each fishery (Table 13-4). Although it is not possible to know the contents of the emptied pots, as they are not observed, an estimate could be made using the average annual catch per unit effort and crab weight for the fishery. For the Bristol Bay red king crab fishery in 2006-2007, if an average catch per unit effort (34

crab per pot) and crab weight (6.3 pounds) is applied to each pot, the total amount of legal male crab dumped would equal approximately 375,000 pounds. For legal male crab that are brought on deck and then discarded, a 20 percent mortality rate is assumed for purposes of assessment and calculated in the TAC setting process. The mortality rate for rail dumped crab could well be lower, however, as the crab are not subject to additional handling on deck. Because rail dumped crab are not brought on deck and accounted for, any mortality associated with the practice is not currently considered in the stock assessment or TAC setting process. As the fishery evolves cooperative fishing arrangements may reduce rail dumping, as vessel level overages are addressed by transfers.

Table 13-4 Estimated rail dumped pots in the crab fisheries, 2005-2006 through 2007-2008

Fishery	Season	Rail dumped pots*	Rail dumped pots as a percent of total pot lifts
Bristol Bay red king crab	2005 - 2006	NA	NA
	2006 - 2007	1,745	2.6
	2007 - 2008	813	1.2
Bering Sea *C. opilio*	2005 - 2006	600	0.9
	2006 - 2007	1,581	2.4
	2007 - 2008	1,057	1.6
Aleutian Islands golden king crab	2005 - 2006	243	0.4
	2006 - 2007	1,193	1.8
	2007 - 2008	527	0.8
Bering Sea *C. bairdi*	2005 - 2006	NA	NA
	2006 - 2007	216	0.3
	2007 - 2008	142	0.2

Source: ADFG.

13.3.3 Handling mortality

In addition to the direct loss from retained catch, harvesting also reduces stock abundance due to bycatch mortality. Large numbers of crabs are handled and discarded during crab fisheries due to restrictions on size, sex, season, and target species. 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 crab are harvested affects the crab survival rate. Fishing seasons are designed to close during seasons of molting or mating of crab to avoid additional mortality during these biologically-sensitive periods. Estimates of total catch for TAC determination include a calculation for mortality of crab that is brought on deck, sorted, and then discarded. The mortality calculation is based on experimental studies of crab survival, and for Bristol Bay red king crab, the mortality rate is assumed to be 20 percent; for *C. opilio*, 50 percent.

Under rationalization, the season length has extended considerably, thereby slowing the pace of fishing and allowing fishermen to improve fishing methods, including sorting of catch by the gear and sorting on deck. To some extent, these changes may affect handling mortality. Additionally, evidence indicates that crabs captured in extremely cold and windy weather suffer higher rates of handling mortality (NMFS 2004). Under rationalization, fishermen have more flexibility about 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 before rationalization. While it is possible that some of these considerations may have affected handling

mortality under the program, ADF&G currently has no plans to reevaluate the handling mortality percentages.

13.3.4 Soak times and catch per unit effort

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 and Pengilly 2006). Catch per unit effort 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 in the years leading up to implementation of the program from an average of 18 hours in 1999 to an average of 31 hours in 2004. Soak times have increase further since the program was implemented, averaging 65 hours and 51 hours, respectively, in the first two seasons of the program (Bowers et al 2008). Over this same period, catch per unit effort has increased from an average of 18 legal male crab per pot lift (2000-2005) to an average of 25, 34, and 28 legal crab per pot lift, respectively, in the first three seasons of the program. For the *C. opilio* fishery, the average soak time in the 2004 and 2005 season was 21 hours, and increased to 65 hours and 63 hours, respectively, in the 2005-2006 and 2006-2007 seasons (Bowers et al 2008). Catch per unit effort averaged 189 legal male crab per pot lift in the 2004 and 2005 seasons, and 204, 332, and 349, respectively, in the first three seasons of the program. Anecdotal reports note that the catch per unit effort in the 2005-2006 season was likely affected by the extent of sea ice which kept fishermen off the most productive grounds during much of the season.

While a definite correlation between extended soak times and legal male catch exists, Table 13-3 appears to indicate that the levels of sublegal and female catch under the rationalization program remain within the range of bycatch levels from previous years.

13.3.5 Lost pots and ghost fishing

Mortality is also caused by ghost fishing of lost crab pots. Mortality of crab caused by ghost fishing is difficult to estimate with precision 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 has been estimated that 10 percent to 20 percent of crab pots were lost each year (NPFMC 2007), although lack of observer coverage precluded accurate recording. All pots currently fished in Bering Sea crab fisheries contain degradable escape mechanisms allow catch to escape after an extended period of time to reduce ghost fishing.

Although pot limits were increased from 200 or 250 pots allowed per vessel, depending on vessel length, to 450 pots per vessel in the Bristol Bay red king crab and Bering Sea *C. bairdi* and *C. opilio* fisheries, under the rationalization program, in practice, the average number of pots fished per vessel remains less than that allowed pre-rationalization (see Table 4-22) Combined with the decrease in the number of vessels participating in the crab fisheries, this means that overall there is less gear on the fishing grounds post-rationalization. Although the pots are used more frequently during a fishing season, the higher catch per unit effort under rationalization still results in an overall reduction in gear.

In the last two years, records of lost pots indicate that they have represented approximately 1 to 1.4 percent of total registered pots in the Bristol Bay red king crab fishery, and between 2 and 6 percent of total registered pots in the Bering Sea *C. bairdi* and *C. opilio* fisheries were lost (Table 13-5). One factor that may affect the rate of lost gear in these latter fisheries is the longer fishing season. Longer soak times mean that the time between setting and retrieving the gear is extended, and combined with the three to

four month season, increase the risk of a change in the weather and unforeseen encroachment of sea ice preventing the vessel from successfully retrieving its gear.

In the Aleutian Islands golden king crab fishery, the depths and steep bottom topography of the inter-island passes necessitate the use of longline pot gear, which is the only legal gear type. There are fewer participants in these fisheries as a result of rationalization, and fewer pots overall are registered in the fishery, although the number of pots per vessel has increased substantially. ADFG records of lost pots represent 1 percent or less of the total registered pots in the fishery in the last two years.

Table 13-5 Lost pots by fishery (2006-7 though 2007-2008)

Fishery	Season	Lost pots
Bristol Bay red king crab	2006 - 2007	154
	2007 - 2008	167
Bering Sea *C. opilio*	2006 - 2007	228
	2007 - 2008	599
Aleutian Islands golden king crab	2006 - 2007	135
	2007 - 2008	37
Bering Sea *C. bairdi*	2006 - 2007	88
	2007 - 2008	175

Sources: ADFG

13.3.6 Season length and temporal and spatial dispersion

Under the program, the season length for the fisheries has lengthened considerably (see Table 4-18 and Table 4-19). In the years leading up to the implementation of the program, the Bristol Bay red king crab fishery lasted at most 3 to 4 days, opening on October 15. Under the program, the fishery opens on the same date, with most of the harvest is completed by mid-November, although some landings continued through the season closing on January 15. The Bering Sea *C. opilio* fishery has spread out over the full seven months of its opening, although much of the harvest is still caught during the traditional period of the fishery in late January and early February. Although Bering Sea *C. bairdi* had a small directed fishery, most of the harvest was incidental to the *C. opilio* fishery in the western portion, or the Bristol Bay red king crab fishery in the eastern portion. The Eastern Aleutian Islands golden king crab fishery is primarily prosecuted between August and December, while the western Aleutian Islands fishery extends through the May 15 closure.

Longer seasons 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.

Under the program, the spatial distribution of catch in the Bristol Bay red king crab fishery has diversified. In 2003, while landings were reported in 15 statistical areas (plus some miscellaneous landings), but the vast majority of catch came from only four areas (ADFG 2004). In 2006-2007, catch was reported in 12 statistical areas (plus some miscellaneous landings), with 90 percent of total pot lifts and total harvest occurring in seven statistical areas (extending out from the popular fishing grounds of 2003) (Bowers et al. 2008). Dispersing the fishery both geographically and temporally will reduce any localized fishing pressure impacts on the crab stocks.

In the Bering Sea *C. opilio* fishery, the majority of fishery catch has occurred in the southern portion of the *C. opilio* range, even in years when ice cover has not restricted the fishery from moving farther north. In 2003 and 2004, 66 percent and 78 percent of the catch, respectively, was south of 58.5° N. (Turnock and Rugolo 2007); the same pattern is apparent in the last three years. Under rationalization, harvest location has shifted to the southeast, however. A high percentage of the catch is taken out of statistical areas to the west of the Pribilof Islands, one of which accounted for the statistical area with the greatest effort in 2005-2006 season (approximately 16 percent of that season's total harvest), and four of which accounted for 74 percent of the total harvest for 2006-2007 (Bowers et al 2008). These statistical areas represented a relatively small percentage of the overall *C. opilio* harvest in 2003 (14 percent of the total harvest, ADFG 2004).

Fishing effort in the eastern Aleutian Islands golden king crab fishery focused 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.

14 SIDEBOARD LIMITS IN OTHER FISHERIES

Recognizing that a change to a share-based management program may provide opportunities for participants to alter their behavior to increase participation in other fisheries, the Council typically considers sideboards to limit participants in the share-based fishery to their historic participation levels in other fisheries. In adopting the rationalization program, the Council imposed sideboards on harvesters receiving QS allocations. The Council is currently considering revisions to these sideboards, as well as new sideboards on the processing of Pacific cod by processors that received PQS allocations.

14.1 Harvester sideboards

Knowing that the harvesters in the crab fisheries may alter fishing patterns to increase catch in other fisheries, the Council included sideboard limits on catches of Gulf of Alaska groundfish and Gulf of Alaska Pacific cod for vessels and licenses with Bering Sea *C. opilio* history that contributed to an initial QS allocation. Sideboards under the program also prohibit participation in the Pacific cod fisheries by vessels that contributed to for Bering Sea *C. opilio* quota that landed less than 50 metric tons of groundfish harvested in the Gulf during the Bering Sea *C. opilio* qualifying period (January 1, 1996, and December 31, 2000). In addition, vessels with limited Bering Sea *C. opilio* catch (i.e., less than 100,000 qualifying pounds) and show sufficient Gulf Pacific cod dependence (i.e., more than 500 metric tons of Gulf Pacific cod during *C. opilio* qualifying period) are exempt from the Gulf Pacific cod sideboard limits. Sideboard limits are based on Gulf groundfish and Gulf Pacific cod retained catch of crab vessels subject to the limits during the *C. opilio* qualifying period. 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.

Figure 14-1 provides a diagram of the structure of these sideboard limits. Since vessels participating in the American Fisheries Act are already subject to sideboards in Gulf groundfish fisheries, those vessels are exempt from these crab program sideboards.

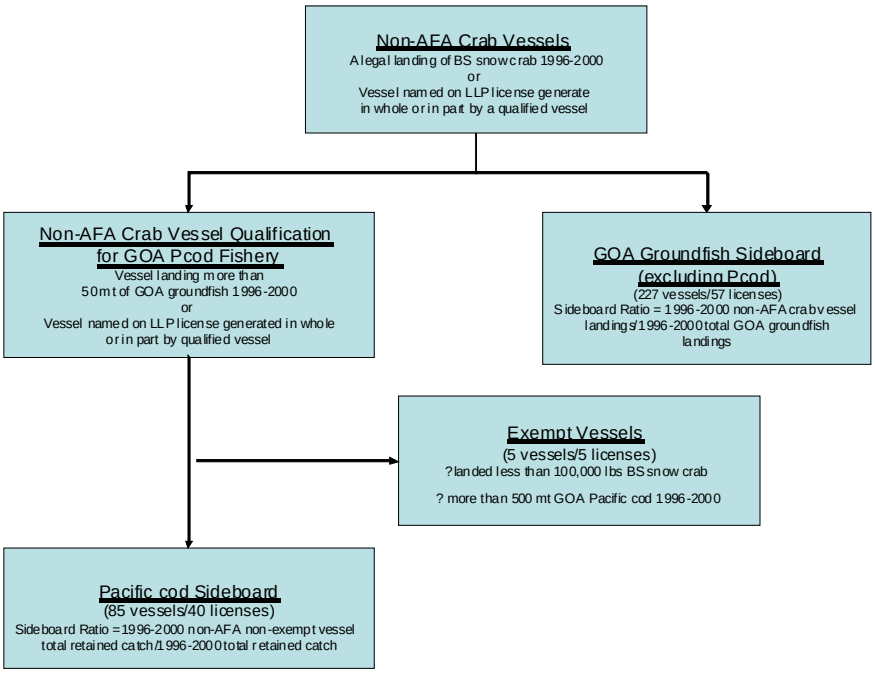

Figure 14-1 Diagram of non-AFA crab vessel sideboard program for the GOA

Under the program, 227 non-AFA crab vessels contributed to an initial allocation of Bering Sea *C. opilio* QS and are subject to the Gulf groundfish sideboard limits; 137 of these vessels are prohibited from fishing for Gulf Pacific cod; 85 vessels are subject to the Gulf Pacific cod sideboard limits; and 5 vessels are exempt from the Gulf Pacific cod sideboard limits. Also, 57 groundfish LLP licenses originated on non-AFA crab vessels and are subject to the Gulf groundfish sideboard limits; 12 of these licenses are prohibited from use for directed fishing in the Gulf Pacific cod fisheries; 40 licenses are subject to the Gulf Pacific cod sideboard limits; and 5 licenses are exempt from the GOA Pacific cod sideboard limits.

NOAA Fisheries manages the sideboard limits by setting a single sideboard cap for each Gulf groundfish species (including Pacific cod). That amount is then available to all qualified vessels subject to the cap, on a seasonal basis. All targeted or incidental catch of sideboard species made by a vessel subject to the limits is deducted from the sideboard limit. NOAA Fisheries closes directed fisheries to vessels subject to the limit when it deems that sideboard amounts are inadequate to support directed fishing and projected incidental catch in other directed fisheries. NOAA Fisheries has prohibited directed fishing by vessels subject to the sideboard in all fisheries except the Western Gulf pollock fishery and the Central Gulf and Western Gulf Pacific cod fisheries because the sideboard limits are deemed inadequate to support directed fishing.

Table 14-1 provides annual total catch of GOA Pacific cod, pollock, and other groundfish from 1995 to 2007 for non-AFA crab vessels that are subject to the GOA sideboard limits. Prior to implementation of the crab sideboard limits, total catch of GOA Pacific cod by the sideboarded non-AFA crab vessels ranged from 2,301 mt to 10,724 mt. During the 2006 fishing year, the GOA Pacific cod sideboard catch was 5,037 mt, while the limit was 3,615 mt. The reason the 2006 sideboard catch exceeded the sideboard limit was due to the sideboard regulations being implemented in March 2006, after the A season was completed.

Table 14-1 Total catch (mt) of Non-AFA crab vessels limited to sideboard limits

Year	Pacific Cod	Pollock	Other Groundfish
1995	3,293	62	66
1996	2,556	760	2
1997	2,422	580	5
1998	3,377	1,495	98
1999	6,962	1,328	45
2000	10,724	1,374	50
2001	2,301	2,547	109
2002	3,073	1,923	81
2003	4,384	1,296	173
2004	5,313	920	112
2005	5,128	2,539	80
2006	5,037	2,258	204
2007	*	1,711	61

Source: non_afa_snow_crab_cvs.xls and non_afa_snow_crab_cp5.xls from ADF&G fish tickets for catcher vessels and blend data/catch accounting for catcher processors. Data does not include State water Pacific cod catch and sablefish and halibut IFQ bycatch of Pacific cod IFQ fisheries.

Table 14-2 provides a brief summary of the Western and Central Gulf Pacific cod sideboard fishery closures during 2006 and 2007. In both areas during the A season the sideboard limit was reached in early February resulting in closure of the fishery. The B season sideboard fishery was also closed prior to the end of that fishing season, as a result of the sideboard catch reaching the limit.

Table 14-2 Sideboard fishery closure dates for Western and Central GOA Pacific cod during 2006 and 2007

Area	Season	Inshore		Offshore	
		2006	2007	2006	2007
Western GOA	A	2 Mar (TAC)	18 Feb (TAC)	19 Feb (TAC)	14 Feb (TAC)
	B	1 Sep (TAC)	14 Oct (TAC)	12 Oct (TAC)	
Central GOA	A	28 Feb (TAC)	24 Jan (TAC)	19 Feb (TAC)	14 Feb (TAC)
	B	1 Sep (TAC)	11 Oct (TAC)		

Source: NMFS

Table 14-3 provides counts of the non-AFA crab vessels, by sideboard category in the Gulf Pacific cod fishery from 1995 to 2007. The number of Pacific cod exempt non-AFA crab vessels ranged between 4 and 5 during this period. For Pacific cod prohibited non-AFA crab vessels, the numbers ranged from 15 vessels in 1995, to 2 vessels in 1997.[75] For Pacific cod sideboard non-AFA crab vessels, the vessel numbers ranged from 15 in 1997 to 60 in 2000. Since implementation of the sideboards on the non-AFA crab vessels, only 22 vessels recorded GOA Pacific cod catch. Finally, the number of other vessels that caught Gulf Pacific cod has ranged from 476 in 1995, to 258 in 2006.

[75] Note that the two Pacific cod prohibited vessels fishing in the 2006 and 2007 sideboard fishery due to the vessel appealing its sideboard restriction. While the vessels appeal their sideboard restriction, the vessels was not limited by Pacific cod sideboards.

Table 14-3 Number of vessels fishing in the GOA Pacific cod fishery by sideboard category

Year	Pacific Cod Exempt Vessels	Pacific Cod Prohibited Vessels	Pacific Cod Sideboard Vessels	Other Pacific Cod Vessels
1995	4	15	42	476
1996	5	8	28	414
1997	4	2	15	419
1998	4	6	26	412
1999	5	8	35	383
2000	5	11	60	399
2001	5	3	25	348
2002	4	7	20	287
2003	4	3	20	265
2004	4	6	21	281
2005	4	8	18	260
2006	4	6	22	258
2007	4	2	22	276

Source: non_afa_snow_crab_cvs.xls and non_afa_snow_crab_cp5.xls from ADF&G fish tickets for catcher vessels and blend data/catch accounting for catcher processors.

Table 14-4 provides Gulf Pacific cod catch for non-AFA crab vessels by sideboard category, while Table 14-5 provides annual percent of Gulf Pacific cod caught by each vessel group. Overall, the total catch of Gulf Pacific cod has declined during the 1995 to 2007 period. In 1995, the combined catch of Gulf Pacific cod by all vessels was 68,182 mt, while the combined catch in 2004 was 34,353 mt. However, catch of Gulf Pacific cod by non-AFA crab vessels does not follow this trend; rather the decline in catch appears to be limited to the other Pacific cod vessels. For the Pacific cod exempt non-AFA crab vessels, on average their percent of the total GOA Pacific cod catch is 3.5 percent, with a catch range of 2,762 mt in 1996 to 1,016 mt in 2001. For non-AFA crab vessels prohibited from targeting GOA Pacific cod, on average their percent of the total GOA Pacific cod catch is 1.3 percent, with catch ranging from 53 mt in 1998, to 1,632 mt in 2005. Since sideboard regulations were not implemented until March 2006, these vessels were permitted to participate in the 2006 fisheries. For the non-AFA crab vessels that are restricted by Pacific cod sideboards, on average their percent of the total Gulf Pacific cod catch was 8.7 percent, with catch ranging from 2,422 mt in 1997, to 10,724 mt in 2000. In more recent years, catch for this group of vessels has ranged from 3,000 mt to 5,000 mt. Finally, non-crab vessels on average account for 86.6 percent of all Gulf Pacific cod catch, which ranged from 65,214 mt in 1997, to 25,383 mt in 2005.

Table 14-4 GOA Pacific cod catch (mt) of non-AFA crab vessels by sideboard category

Year	Pacific Cod Exempt Vessel Catch	Pacific Cod Prohibited Vessel Catch	Pacific Cod Sideboard Vessel Catch	Other Pacific Cod Vessel Catch	Total Catch
1995	2,141	358	3,293	62,389	68,182
1996	2,762	62	2,556	63,447	68,827
1997	1,710	*	*	65,214	69,357
1998	2,508	53	3,377	57,470	63,409
1999	2,488	689	6,962	57,624	67,764
2000	1,388	429	10,724	41,456	53,997
2001	1,016	1,163	2,301	37,255	41,735
2002	1,077	1,142	3,073	35,429	40,721
2003	1,317	570	4,384	33,884	40,154
2004	1,080	563	5,313	34,768	41,724
2005	2,210	1,632	5,128	25,383	34,353
2006	1,807	1,434	5,037	28,186	36,464
2007	1,567	*	*	33,107	38,144

Source: non_afa_snow_crab_cvs.xls and non_afa_snow_crab_cp5.xls from ADF&G fish tickets for catcher vessels and blend data/catch accounting for catcher processors. Data does not include State water Pacific cod catch and sablefish and halibut IFQ bycatch of Pacific cod.

*Concealed for confidentiality

Table 14-5 Percent of GOA Pacific cod catch by sideboard category

Year	Pacific Cod Exempt Vessel Percent of Total Catch	Pacific Cod Prohibited Vessel Percent of Total Catch	Pacific Cod Sideboard Vessel Percent of Total Catch	Other Pacific Cod Vessels Percent of Total Catch
1995	3.1%	0.5%	4.8%	91.5%
1996	4.0%	0.1%	3.7%	92.2%
1997	2.5%	*	*	94.0%
1998	4.0%	0.1%	5.3%	90.6%
1999	3.7%	1.0%	10.3%	85.0%
2000	2.6%	0.8%	19.9%	76.8%
2001	2.4%	2.8%	5.5%	89.3%
2002	2.6%	2.8%	7.5%	87.0%
2003	3.3%	1.4%	10.9%	84.4%
2004	2.6%	1.3%	12.7%	83.3%
2005	6.4%	4.8%	14.9%	73.9%
2006	5.0%	3.9%	13.8%	77.3%
2007	4.1%	*	*	86.8%
Average	**3.5%**	**1.3%**	**8.7%**	**86.6%**

Source: non_afa_snow_crab_cvs.xls and non_afa_snow_crab_cp5.xls from ADF&G fish tickets for catcher vessels and blend data/catch accounting for catcher processors. Data does not include State water Pacific cod catch and sablefish and halibut IFQ bycatch of Pacific cod.

*Concealed for confidentiality

The Council is currently considering an amendment package to modify harvester sideboards under the program. These changes are intended to relieve vessels with strong historic dependence on non-crab fisheries from the limitations of the sideboards. The proposed alternatives would extend the sideboard exemptions to additional vessels.

14.2 Processor sideboard limitations

At the time of adopting the program, the Council elected not to adopt any processor sideboard limitations. Since that time, the Council has received public testimony suggesting that floating processors freed up as a result of the crab program could encroach on processor participants in the Aleutian Island Pacific cod fisheries. The Council is currently considering alternatives that would limit processors that contributed to allocations of PQS in the Bering Sea *C. opilio* fishery to their historic processing participation levels with the intent of protecting processors in the Aleutian Island Pacific cod fisheries.

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16 LIST OF PREPARERS

Mark Fina	Diana Evans	John McCracken	Jeannie Heltzel
Glenn Merrill	Don Schug, Northern Economics		

17 PERSONS CONSULTED

Keith Colburn	Joe Plesha	Steve Minor	Edward Poulsen
Gretchen Harrington	Einar Sorvik	John Iani	Lenny Herzog
Arni Thomson	Linda Kozak	Bing Henkel	Greg White
Joe Sullivan	John Sackton	Jake Jacobsen	Don Giles
Terry Schaff	Ken Dorris	Louie Lowenberg	Forrest Bowers
Krista Milani	Wayne Donaldson	Doug Pengilly	Stefanie Moreland
Herman Savikko	Dave Hambleton		