

**DISCUSSION PAPER ON
COOPERATIVE VESSEL USE CAPS
UNDER THE CRAB RATIONALIZATION PROGRAM**

**NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FEBRUARY 2007**

In August of 2005, fishing began under the rationalization program developed by the North Pacific Fishery Management Council for the Bering Sea and Aleutian Islands crab fisheries. In recent years preceding implementation of the program, in excess of 200 vessels typically participated in the Bristol Bay red king crab, while over 150 vessels typically participated in the Bering Sea *C. opilio* fishery. In the first year of fishing under the new rationalization program, fewer than 100 vessels participated in each of these fisheries. Under the rationalization program, the amount of crab that may be caught by a vessel is limited to a percent of the annual TAC. Vessels fishing cooperative allocations, however, are exempt from the limit. The large, rapid drop in the number of participating vessels has caused concern for economic and social disruptions in coastal communities, as well as effects on crew employment. Community disruption could occur through a few different means. Fishery support business could lose revenues, if a decline in demand for their goods and services accompanies the decline in vessels in the crab fisheries. Overall economic activity in communities may decline, if local purchases by either resident or non-resident crewmembers decline. Reduction in crew jobs could also contribute to social disruptions in remote communities, if resident crew who lose jobs are unable to find alternative employment locally.

Because the considered action relates to the recent change in management of the fishery, this paper must describe transitional changes in the fishery arising from that management change. The breadth of discussion at times may distract the reader from the issue at hand (i.e., the application of caps to vessels fishing cooperative allocations). To help the reader develop an understanding of the issue of vessel caps in the context of the current management, this paper begins with a draft problem statement and a description of the alternatives proposed by the Council. A brief description of the issues raised by the proposed action, including both potential benefits and costs, follows. The paper goes on to layout the background conditions in the fisheries relative to the consolidation intended to be addressed by the proposed vessel caps. The paper concludes with a discussion of potential effects of the vessel caps. These conclusions are very preliminary and will be further scrutinized and developed, if the Council elects to proceed with this action and directs staff to prepare regulatory analyses of alternatives.

Draft Problem Statement/Objective:

A starting point for any analysis of alternatives to modify management is the development of a problem statement. The following is a draft problem statement that the Council could consider for development of alternatives for this action:

[The Bering Sea crab fisheries began fishing under a rationalized management program in August of 2005. The Environmental Impact Statement analyzing that program included a discussion on fleet consolidation. In the previously rationalized halibut and sablefish fishery, consolidation occurred in the first few years following implementation of the rationalization program. Some displacement of crew took place. Fleet consolidation under the cooperative management of the crab rationalization program took place immediately on implementation of the program. Although the program contains limits on the amount of crab that a vessel may harvest, vessels fishing cooperative allocations are exempt from those limits. This exemption may have contributed to the magnitude and speed of consolidation of catch. The rapid consolidation may have resulted in economic and socioeconomic disruption for displaced crew and coastal communities. This action considers applying harvest caps to vessels fishing cooperative allocations to mitigate potential negative impacts of consolidation.]

Range of Alternatives:

Currently, the rationalization program limits vessels fishing individual allocations to the following percentages of the respective fishery TACs:

- 2.0 percent for Bering Sea *C. opilio*
- 2.0 percent Bristol Bay red king crab
- 2.0 percent Bering Sea *C. bairdi*
- 4.0 percent for Pribilof red and blue king crab
- 4.0 percent for St. Matthew blue king crab
- 20 percent for EAI (Dutch Harbor) brown king crab
- 20 percent for Adak (WAI) brown king crab
- 20 percent for Adak (WAI) red king crab west of 179° West longitude

The Council has initially proposed examining a range of possible vessel caps from the same caps applicable to vessels fishing IFQs (outside of cooperatives) to 150 percent of the caps applicable to vessels fishing IFQs (outside of cooperatives). So, the Council is currently considering the following caps:

Alternative 1 – status quo

Vessels fishing cooperative allocations are exempt from vessel use caps.

Alternative 2 – cooperative vessel use caps

Vessels fishing cooperative allocations are subject to a use cap selected from the following ranges (100 – 150 percent of the individual caps):

- 2.0 – 3.0 percent for Bering Sea *C. opilio*
- 2.0 – 3.0 percent Bristol Bay red king crab
- 2.0 – 3.0 percent Bering Sea *C. bairdi*
- 4.0 – 6.0 percent for Pribilof red and blue king crab
- 4.0 – 6.0 percent for St. Matthew blue king crab
- 20 – 30 percent for EAI (Dutch Harbor) brown king crab
- 20 – 30 percent for Adak (WAI) brown king crab
- 20 – 30 percent for Adak (WAI) red king crab west of 179° West longitude

Issues:

As is frequently the case, this action will require the Council to balance competing considerations (or impacts). Part of the rationale for imposing vessel caps is to increase or maintain employment in the fisheries. Contraction of the fleet when the rationalization program was implemented resulted in the loss of several fishing jobs. The loss of these jobs has a particularly acute impact on remote communities with few job opportunities. Vessel use caps can be used to disperse fishing activity across a larger fleet. If the number of vessels in a fishery is increased, the number of crew employed in the fishery will also rise. Adding crew jobs could have a few effects, beyond the obvious employment of more persons. Increasing the number of persons employed could also create additional demand that changes negotiating leverage of crew. This effect is likely to have a greater influence on more experienced and skilled crew, who could be in shorter supply. A second competing effect is that dispersion of catch across more vessels (and more crews) will decrease the average harvests of each crew. Deriving crew shares from lower average vessel revenues would tend to reduce the pay of the average crew. The extent to which these effects are realized depends on the specific cap levels and the tendency of participants to consolidate catch in general.

Although the transition to a rationalized fishery often results in some vessels leaving a fishery, remaining vessels often increase their catch, extending their stays in communities close to fishing grounds from which they operate. These extended stays can add stability to spending patterns, but peak spending by fishery participants under rationalization will often be less than peak spending in the pre-rationalization fishery. If

the vessel use caps result in additional vessels in the fisheries, total purchases from support industries in coastal communities could increase, contributing to local economies. These effects include spending on goods and services that directly support fishery operations, as well as general spending of crewmembers. As with other more direct effects in the fisheries, dispersing activity across a larger fleet could reduce spending by some vessels that are fishing smaller allocations and may spend less time in communities close to the grounds.

Limiting the catch allowed by a single vessel using a vessel cap could impact production efficiency gains in the fishery, if stacking quota beyond the cap could be more cost effective. In addition, some vessel owners have likely made financial commitments and business plans based on fishing in cooperatives with catch in excess of the proposed caps. These vessel owners could be disadvantaged by changes in the use caps.

Background:

Prior to the implementation of the rationalization program, the BSAI crab fisheries were prosecuted as a limited access, derby fishery, under which the participants raced for crab after the opening with the fishery closing once managers estimated that the guideline harvest level (GHL)¹ was fully taken. This management is noted for its tendency to reduce production efficiency, since participants often improve individual returns from the fishery by increasing catch rates and costs. Safety may also be compromised by participants who take greater risks to increase catch. The limited access management also increases the incentive for all license holders to participate in the fishery, since a person cannot receive a return from the fishery without participating. This progression was evident in the crab fisheries. For the last several years of limited access management, seasons in the two largest fisheries ranged from a few days to a few weeks. During this time, harvest levels have been near historic lows. From the 2000 season through 2005-2006 season, Bristol Bay red king crab fishery harvests ranged from a low of 7.5 million pounds to high of 18.3 million pounds, while Bering Sea *C. opilio* harvests ranged from 22.2 million pounds to 30.8 million pounds. Between 150 and 250 vessels participated annually in each fishery. Some participants allege that financial pressures of boat payments ensured their participation, since revenues from the fisheries were their primary source of income from their vessels. Participants also likely remained in the fishery, in part, to reinforce their stake in any future history-based allocation.

Under the rationalization program implemented in the fall of 2005, participants are allocated fixed shares of the annual total allowable catch (TAC). Under the revised management, allocations are exclusive. So, participants do not need to race to prevent others from preempting their catch. To improve returns from the fisheries participants, instead, have an incentive to reduce costs. One obvious means of reducing costs is to stack quota on fewer vessels, potentially saving on costs not only of capital, but also on maintenance, insurance, crew, fuel, and other variable input costs. High lease rates have likely contributed greatly to consolidation in the first two years of the program. In the first year of the program, Bristol Bay red king crab lease rates were as high as 70 percent of the ex vessel price, while Bering Sea *C. opilio* lease rates reached 50 percent of the ex vessel price in some cases. In the Western subdistrict Bering Sea *C. bairdi* fishery lease rates were in the range of 35 percent of the ex vessel price. The lower rate in this fishery is likely a reflection of the fact that the fishery is primarily an incidental catch fishery with relatively lower catch rates and a low TAC. Lease rates in the Eastern Aleutian Islands golden king crab fishery were approximately 50 percent of the ex vessel prices, while lease rates in the Western Aleutian Islands golden king crab fishery were approximately 25 percent of the ex vessel price. The low price in the Western Aleutian Islands fishery likely has resulted from the high operating costs and low ex vessel price in that remote fishery. Lease rates have dropped by as much as 10 percentage points in the various fisheries this year. Demand for shares in the Western Aleutian Islands golden king crab fishery has reportedly not supported a lease market this year. Examining data from

¹ Historically, the GHL specified a range of allowable catch, providing in-season managers with some discretion to close the fishery based on their assessment of stock conditions. In making these assessments, managers would rely on survey information, as well as in-season and cross-season variations in catch rates. In recent years, managers have stated GHLs as specific amounts, managing the fishery in-season to allow harvest of that specific amount.

the first year of the program and the years immediately preceding implementation show a drastic reduction in the fleet under the program.

Table 1 shows some simple statistics of the fleet participating in the Bristol Bay red king crab from the 2001 season through the 2005-2006 season. Figure 1 shows the distribution of catch across the fleet during those years, with each point showing the average catch of four vessels to protect confidentiality. The table and histogram show considerable consolidation occurred in the first year of the rationalization program. In the Bristol Bay red king crab fishery, the fleet contracted to slightly more than one-third its pre-rationalization size. The median vessel harvested slightly more than twice the pre-rationalization median harvest, while the largest harvests in the fleet grew to more than double the pre-rationalization levels. Owners have registered 81 vessels for the 2006-2007 fishery, slightly fewer than participated in the 2005-2006 fishery.

Table 1. Simple statistics of the fleet participating in the Bristol Bay red king crab fishery (2001 through 2005-2006).

BBR

Season	Number of vessels in the fishery	Total Catch	Average vessel harvest		Median vessel harvest		Average of highest four vessel harvests	
			as percent of total allocation	in pounds	as percent of total allocation	in pounds	as percent of total allocation	in pounds
2001	230	7,681,106	0.43	33,396	0.37	28,747	1.28	98,202
2002	241	8,770,348	0.41	36,391	0.40	35,316	0.82	71,911
2003	250	14,237,375	0.40	56,950	0.33	47,540	1.40	198,892
2004	251	13,889,047	0.40	55,335	0.38	52,780	0.86	119,599
2005 - 2006	89	16,469,100*	1.12	185,132	0.85	140,669	3.91	643,786

* Total allocation

Source: ADFG fish tickets

Figure 1. Catch by vessel as a percent of the total allocation in the Bristol Bay red king crab fishery (2001 through 2005-2006).

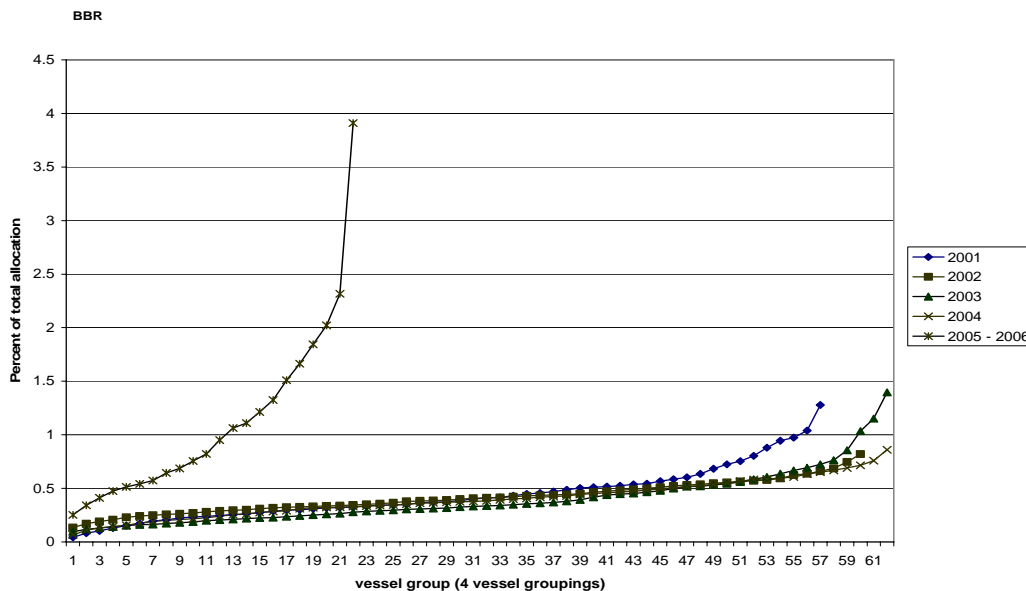


Table 2 shows simple catch statistics of the fleet participating in the Bering Sea *C. opilio* fishery from the 2001 season through the 2005-2006 season. Figure 2 is a histogram showing the distribution of catch across

the fleet during those years, with vessels grouped in fours to protect confidentiality. In the Bering Sea *C. opilio* fishery the fleet contracted to levels similar to those in the Bristol Bay red king crab fishery, but the contraction was of smaller magnitude because this fleet had contracted to some degree prior to implementation of the program. The relatively fewer vessels in the *C. opilio* fishery prior to the 2005-2006 season likely occurred because GHs in that fishery were at historic lows leading up to implementation of the rationalization program. In the first year of the program, the harvests of the largest vessels in the fleet greatly exceeded the largest pre-rationalization harvests.² In assessing the numbers of vessels in the *C. opilio* fishery, it should be borne in mind that the catch in that fishery dropped substantially since 2000. In the *C. opilio* fishery in years from 1997 through 1999, the average vessel harvest was approximately 617,000, substantially higher than the average vessel harvest in the 2005-2006 season. Registration numbers are currently not final for the 2006-2007 fishery.

Table 2. Simple statistics of the fleet participating in the Bering Sea *C. opilio* fishery (2001 through 2005-2006).

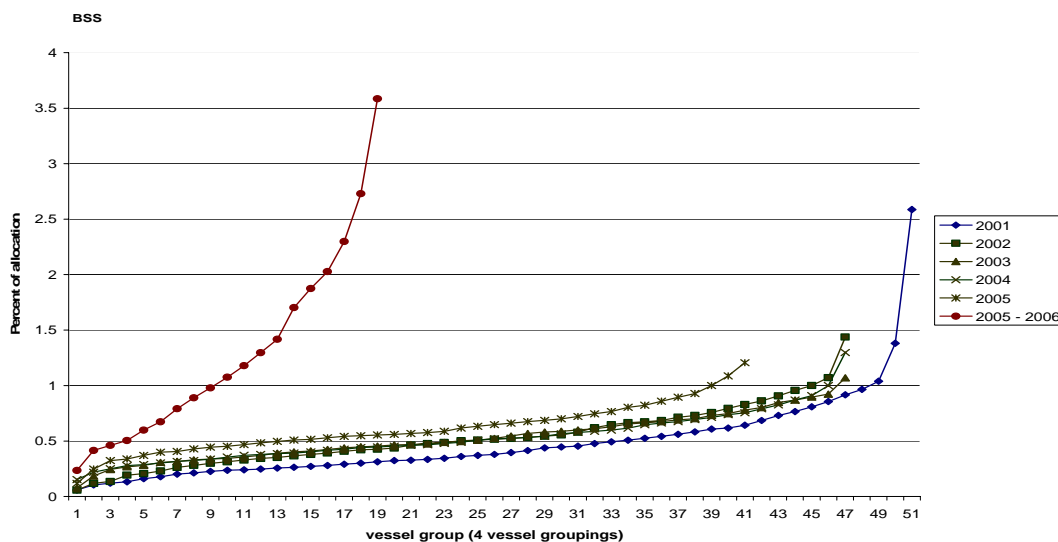
BSS

Season	Number of vessels in the fishery	Total Catch	Average vessel harvest		Median vessel harvest		Average of highest four vessel harvests	
			as percent of total allocation	in pounds	as percent of total allocation	in pounds	as percent of total allocation	in pounds
2001	207	22,940,704	0.48	110,825	0.38	86,479	2.59	593,306
2002	190	29,609,702	0.53	155,841	0.50	147,730	1.44	425,538
2003	190	25,410,122	0.53	133,737	0.49	125,655	1.07	271,901
2004	189	21,939,493	0.53	116,082	0.49	106,791	1.30	284,844
2005	167	22,655,777	0.60	135,663	0.57	128,122	1.21	273,237
2005 - 2006	78	33,465,600*	1.27	426,361	1.05	352,169	3.59	1,199,822

* Total allocation

Source: ADFG fish tickets

Figure 2. Catch by vessel as a percent of the total allocation in the Bering Sea *C. opilio* fishery (2001 through 2005-2006).



² The four largest vessels in the fishery in 2001 harvested a substantially greater share than the four largest harvests in any other year. This likely occurred because some catcher processors did not acknowledge a catcher vessel strike in the fishery that year.

Table 3 shows simple statistics for the Western subdistrict Bering Sea *C. bairdi* fishery for the 2005-2006 season. The fishery was closed for several years leading up to the rationalization program implementation. In 2005-2006, the fishery was opened with a TAC of approximately 1.5 million metric tons – a catch limit substantially smaller than any previously permitted in the fishery. The fishery would have likely remained closed, if limited entry management has been continued, as inseason managers questioned their ability to control harvest of such a small quantity of crab, given the number of eligible vessels. The fishery is generally prosecuted incidentally to the *C. opilio* fishery. The relatively low median vessel catch and high average of the high four vessel catches is a reflection of the tendency of few vessels to actively target *C. bairdi*.³

Table 3. Simple statistics of the fleet participating in the Western subdistrict Bering Sea *C. bairdi* fishery (2005-2006).

WBT

Season	Number of vessels in the fishery	Total Allocation	Average vessel harvest		Median vessel harvest		Average of highest four vessel harvests	
			as percent of total allocation	in pounds	as percent of total allocation	in pounds	as percent of total allocation	in pounds
2005 - 2006	42	1,458,000	1.29	18,835	0.36	5,209	6.98	101,726

Source: ADFG fish tickets

Approximately 10 fewer vessels participated in the *C. opilio* fishery than in the Bristol Bay red king crab fishery in the first year of the program. Consequently, the mean and median harvests shares were slightly larger than in the Bristol Bay red king crab fishery. A few factors could have led to fewer vessels participating in the *C. opilio* fishery than in the Bristol Bay red king crab fishery in the first year of the program. Although the TAC in the *C. opilio* fishery exceeded the red king crab TAC, the comparatively low price of *C. opilio* may require greater catch volumes to achieve production efficiencies. Additionally, since the *C. opilio* is prosecuted later in the year than the red king crab fishery, some share holders may have developed greater familiarity with the leasing arrangements and cooperative fishing opportunities. Also, some operators may have decided to lease shares in the *C. opilio* fishery after experiencing the added operating costs (primarily resulting from high fuel prices) in the Bristol Bay red king crab fishery. This additional consolidation likely carried over to the Bristol Bay red king crab fishery this year. The *C. bairdi* fishery had approximately half the number of participants in the *C. opilio* fishery. The small TAC likely discouraged most vessels from actively targeting that species.

Table 4 and Table 5 show simple statistics for vessels participating in the Eastern Aleutian Islands golden king crab and Western Aleutian Islands golden king crab fisheries, respectively. These fisheries also showed considerable consolidation in the first year of the program. Both fisheries' fleets consolidated to half or fewer vessels than pre-rationalization levels. The harvest amount of the average vessel in the rationalized fisheries are substantially greater than harvests in the rationalized Bristol Bay red king crab fishery. The average vessel's harvests in the Eastern fishery are comparable to the average harvests in the *C. opilio* fishery, which are half of the harvests of the average vessel in the Western fishery. These harvest levels are not surprising given the relative catch rates, manner of prosecution (i.e., longline pots), limited grounds, and relative price. These factors all contribute to greater levels of concentration than in the Bristol Bay red king crab fishery, while all except price contribute to greater consolidation than in Bering Sea *C. opilio* fishery. The substantially greater concentration in the Western fishery results from the remoteness of those grounds, which

³ Because the Western subdistrict *C. bairdi* fishery was close for several years preceding implementation of the rationalization program, a histogram of catch in the fishery (similar to Figure 1 or Figure 2) is not revealing of consolidation in the fishery.

together with high fuel prices and low crab prices in recent years has substantially reduced economic returns in that fishery. Seven vessels have registered to fish Aleutian Islands golden king crab in the 2006-2007 season.

Table 4. Simple statistics of the fleet participating in the Eastern Aleutian Islands golden king crab fishery (2001 through 2005-2006).

EAG

Season	Number of vessels in the fishery	Total Catch	Average vessel harvest		Median vessel harvest		Average of highest four vessel harvests	
			as percent of total allocation	in pounds	as percent of total allocation	in pounds	as percent of total allocation	in pounds
2001 - 2002	19	3,128,409	5.26	164,653	5.19	162,353	9.65	302,015
2002 - 2003	19	2,765,436	5.26	145,549	5.05	139,601	8.90	246,047
2003 - 2004	18	2,900,247	5.56	161,125	5.28	153,039	8.76	254,082
2004 - 2005	20	2,846,273	5.00	142,314	5.47	155,654	7.97	226,772
2005 - 2006	7	2,700,000*	13.59	366,828	10.99	296,732	18.85	508,930

* Total allocation

Source: ADFG fish tickets

Table 5. Simple statistics of the fleet participating in the Western Aleutian Islands golden king crab fishery (2001 through 2005-2006).

WAG

Season	Number of vessels in the fishery	Total Catch	Average vessel harvest		Median vessel harvest		Average of highest four vessel harvests	
			as percent of total allocation	in pounds	as percent of total allocation	in pounds	as percent of total allocation	in pounds
2001 - 2002	9	2,693,221	11.11	299,247	4.46	120,155	21.70	584,538
2002 - 2003	6	2,605,237	16.67	434,206	13.59	354,129	24.50	638,228
2003 - 2004	6	2,637,161	16.67	439,527	13.99	368,959	23.80	627,711
2004 - 2005	6	2,639,862	16.67	439,977	14.17	374,012	24.18	638,314
2005 - 2006	3	2,430,000**	32.71	794,855	*	*	*	*

* Withheld for confidentiality

** Total allocation

Source: ADFG fish tickets

Table 6 shows the percent of catch and number of participants by vessel type in the Bering Sea and Aleutian Island crab fisheries. The table shows that catcher processor participation dropped slightly less than participation of catcher vessels, given the relative fleet sizes prior to implementation of the program. The table also shows that participating catcher processors averaged less than the proposed vessel caps in all fisheries, except the Western Aleutian Islands golden king crab fishery. Only three vessels prosecuted that fishery in the first year of the program. Anecdotal reports from the fishery are that a substantial portion of the TAC could be left unharvested this season because of low product prices and high costs of operation for harvesters and processors. Processors, in particular, have argued that the combination of processing share use caps together with the Western regional landing requirements in the fishery severely damage economic returns for that portion of the fishery.⁴

⁴Since the two Aleutian Islands golden king crab fisheries both had fewer than 7 vessels participating in the 2005-2006 season, histograms showing the distribution of catch among vessels in the fishery (similar to Figure 1 or Figure 2) are not revealing of consolidation.

Table 6. Percent of catch and participation by operation type (2001 through 2005-2006).

Fishery	Season	Catch (as percent of total) by		Number of vessels participating	
		catcher vessels	catcher processors	catcher vessels	catcher processors
Bering Sea <i>C. opilio</i>	2001	88.5	11.5	200	6
	2002	94.4	5.6	182	8
	2003	96.8	3.2	185	5
	2004	97.0	3.0	183	6
	2005	97.1	2.9	161	6
	2005 - 2006	91.6	7.8	74	4
Bristol Bay red king crab	2001	95.0	5.0	222	8
	2002	95.6	4.4	231	9
	2003	95.2	4.8	241	8
	2004	95.7	4.3	243	8
	2005 - 2006	96.4	3.7	85	4
Western Bering Sea <i>C. bairdi</i>	2005 - 2006	*	*	40	2
Eastern Aleutian Islands golden king crab	2001 - 2002	100.0	0.0	19	0
	2002 - 2003	100.0	0.0	19	0
	2003 - 2004	100.0	0.0	18	0
	2004 - 2005	100.0	0.0	20	0
	2005 - 2006	*	*	6	1
Western Aleutian Islands golden king crab	2001 - 2002	*	*	8	1
	2002 - 2003	*	*	5	1
	2003 - 2004	*	*	5	1
	2004 - 2005	*	*	5	1
	2005 - 2006	*	*	2	1

* Withheld for confidentiality

Source: ADFG fish tickets

The changes in participation patterns in the crab fisheries arising after rationalization have had noticeable impacts on both crew in the fisheries and some communities that depend economically and socially on the fisheries. The drastic reduction in participation has decreased the number of crew employed in the fisheries. Anecdotal reports are that crew sizes have changed minimally (at most one person per vessel) since implementation of the program. As a result, the removal of vessels from the fisheries provides a direct estimate of the number of crew jobs lost. Assuming approximately 6 crew members per vessel, approximately 850 fewer crew (including captains) were employed in the Bristol Bay red king crab fishery in the first year of the rationalization program, in comparison to the 2001 to 2004 season average. Approximately 600 fewer crew were employed in the Bering Sea *C. opilio* fishery during the first year of the program, when compared to the 2001 to 2005 season average. These rough estimates are consistent with a recent study of fisheries employment conducted by the Alaska Department of Labor and Workforce Development. The study estimated monthly crew positions in the crab fisheries from 2000 through 2005 (see Table 7).⁵ Since the rationalization program was implemented in August 2005, the study only assesses employment under the program in the last half of 2005. Notably, monthly employment in crab fisheries dropped substantially in October of 2005 in comparison to previous years – the month of peak employment in the Bristol Bay red king crab fishery in recent years. A less substantial increase in estimated employment occurred in November. Additionally, a slight rise in employment occurred in December.

⁵ These estimates are generated based on fishery specific crew factors applied to active permits in the fishery on a monthly basis.

Table 7. Estimated monthly harvesting employment in Alaska crab fisheries from 2000 to 2005.

Year	August	September	October	November	December
2000	434	174	1,707	304	72
2001	575	156	1,748	506	129
2002	658	204	2,052	564	77
2003	615	184	1,978	566	91
2004	568	110	1,836	304	82
2005	420	91	688	834	190

Source: Alaska Economic Trends, Alaska DLWFD, December 2006.

Although these job losses are substantial in number, in assessing their importance, one must consider the nature of the employment. Few crab deck jobs fully supported the crewmember. Because of the small size of the fisheries in years leading up to implementation of the rationalization program, most crew worked only a month or so in the crab fisheries. Notwithstanding the relatively short term of these jobs, for many deck crew, their crab fishing jobs are reported to have provided important contributions to annual income. Particularly in the case of crew from remote communities, replacing income from lost crab crew jobs is reported to be problematic.⁶ Most captains, who make substantially larger shares than crew, also supplemented their crab income with income from other activities. Several crab captains also captain their crab vessels for cod fishing and salmon tendering. Others work in other fisheries or in other jobs unrelated to fishing.

Most crew (including captains) who retained their positions under the new management faced a change in terms of employment. Based on anecdotal evidence, many crew received full crew share on quota owned by the vessel owner. In most cases, shares paid on leased quota fished by a vessel were computed after deduction of any lease payments. So, the base revenues used to compute a crew payment for catch of leased shares were reduced by as much as 70 percent in the Bristol Bay red king crab fishery and as much as 50 percent in the Bering Sea *C. opilio* fishery in the first year of the program. The effects of this change vary to the extent that the amount of leased quota varied across the fleet. In some instances, vessels reportedly leased a substantial portion of the quota fished, with little held quota. In these instances, crew received virtually all share payments from the discounted revenue base. In some other instances, vessels reportedly fished almost all owned quota, in which case crew received a share similar to their historic share. Some vessels held substantial amounts of quota, but also leased substantial quota. In most of these instances, crew are reported to have received historic share payments for vessel owned quota, supplemented with shares from the discounted base revenues on leased quota. In some cases, however, vessel owners are reported to have charged royalties on owned quota, lowering the base on which shares are calculated for all quota fished on the vessel. Depending on the level of royalty charged, crew could receive substantially reduced payments.

No reliable source of data shows crew satisfaction. Anecdotal reports from the fleet vary. Many crew receiving historic shares for quota owned by the vessel owner and shares computed based on the reduced base after lease payments are reportedly satisfied with the arrangement. Although the reduced basis on leased quota does affect overall crew payments relative to ex vessel revenues, in many instances a significant portion of revenues may not be subject to basis reduction. Some crew are reportedly dissatisfied with royalty arrangements that result in reduced crew payments. Most of these crew fish on vessels that lease a large majority of the quota fished on the vessel. Reports of the greatest dissatisfaction are from crew that fish on vessels that charge royalties on all quota fished on the vessel. In extreme cases, these crew are reported to have walked off their vessels before or during the season. In general, market and fishery conditions likely contributed to crew dissatisfaction in the first year of the program. Specifically, low ex vessel prices and poor

⁶ Some long term crew who lost positions in the fisheries due to vessel owners leasing shares were reportedly compensated despite not fishing. These payments certainly eased the transition for those crew. Payments of this type are likely not the norm and are unlikely to continue for extended periods.

fishing conditions, especially in the *C. opilio* fishery, affected satisfaction of some crew with terms and conditions of their employment.

The change in terms of crew employment have also affected the ability of some vessel owners to find crew. With the change in management of the fisheries and consolidation of catch, many of the vessel owners have attempted to employ crews that work longer periods on their vessels. This extended employment often includes not only working during an extended crab season, but also working on the vessel in other fisheries or in tendering. While these jobs may provide more stable employment, some experienced crew are reportedly reluctant to enter these arrangements, since they conflict with other work (including work in other fisheries). Some halibut and sablefish IFQ holders and crew are reported to be reluctant to fish crab for an extended season, if it interferes with their work in that fishery.

Long term effects of the change in terms of employment for crew are uncertain, but could be more troubling. As initial recipients depart from the fisheries and sell off their interests, new quota holders will not have an initial allocation with which to buffer their crew payments. If current compensation trends continue, all shares would be effectively acquired shares, which in the holder's eye could justify charging royalties prior to crew compensation. Whether vessel owners could still attract crew with acceptable skill and ability at these payment levels is uncertain. If not, the payment structure would likely to change, with commensurate changes in quota values and lease rates.

Community effects of the rationalization program are harder to discern. Many of those effects are less direct and difficult to estimate, in part due to data shortages. To date, two studies have examined the effects of the program on four communities. One, undertaken on behalf of the City of Kodiak, examines effects on crew employment and support businesses in that city; the other, undertaken on behalf of the Aleutians East Borough, examines economic and social effects on King Cove, Akutan, and False Pass (Knapp, 2006; Lowe, et al., 2006). The most evident local impacts arise from the reduction in crew. Declines in crew positions are believed to be in direct proportion to declines in vessel participation. No specific data are available concerning residence of crew, compelling analysts in the recent studies to rely on the knowledge of local residents for estimating crew job losses. Those studies estimate that 25 residents of the three Aleutians East Borough communities lost crab crew positions, while Kodiak crew are estimated to have lost 125 positions in the Bristol Bay red king crab fishery and approximately 60 positions in the Bering Sea *C. opilio* fishery in the first year of the program. Estimates of job losses in other communities are unavailable at this time. Although crab crew typically are short term positions that account for only a portion of a person's income, the loss of this income to residents of remote communities is likely of greater consequence than job losses in larger economies, since job markets in remote areas are more limited. In most cases, these job losses will be transitional for individuals, as they work to find substitute income or adjust their lifestyles to account for losses of income. In remote communities, with fewer job opportunities, the potential for losses of income to result in a decline in living standards is increased. In some instances, the absence of opportunities could compel out migration. Whether any outmigration from remote fishing communities attributable to loss of crab crew jobs has occurred is not known.

In small economies, the loss of crew jobs can also have indirect effects, if local spending of resident crew declines. Declines are exacerbated, if job losses induce migration of residents to other areas (removing all spending of the departing residents from the area). In addition, social disruptions can also occur through several effects. Clearly, if job losses affect a noticeable portion of the community, the community will suffer socially. Small fishing dependent communities, however, are particularly vulnerable, since the fishing industry is often synonymous with the local identity. This local identity will suffer to the extent that any loss of fishing opportunities threatens the ability of residents to make a living in the industry. At this point, the extent and longevity of these effects is uncertain.

Fleet contraction is also felt by communities whose businesses have suffered because of a drop in demand for goods and services from their businesses. Attribution of these effects to the change in crab management is difficult, since data isolating spending of crab vessels and fishery participants from spending associated with other fishery and non-fishery activities are not available. In the Kodiak study, anecdotal evidence suggest declines in spending at some businesses, but evidence of a broad decline in total local spending could not be identified. In the Aleutians East Borough study, King Cove was found to have suffered large declines in revenues from harbor and moorage fees. In addition, declines in revenues of many support industries are cited (although the magnitude of these declines is not specified). At the same time, one business in King Cove – a support industry business owned the local processor – has experienced an increase in revenues during the first crab season under the program. This increase may have resulted from activities other than crab fishing. Some vessel owners assert that they have increased their purchases from communities proximate to the fishing grounds since the program was implemented. These owners state that their extended stays in the communities require them to make local purchases to sustain their fishing activities. Most of these owners assert that they prefer to make these purchases prior to positioning their vessels near the fishing grounds, because of the comparatively high prices in remote Alaskan communities. The extent to which these additional purchases have offset declines in spending because of the removal of vessels from the fleet is uncertain.

Both studies caution that effects may lag. For example, vessels that did not fish in the first year of the program may still buy some inputs to allow their use in other fisheries. If these vessels are retired over time, effects may not be felt until some time in the future.

Discussion:

The only change in management considered by this action would be the application of vessel use caps to vessels fishing cooperative allocations. Vessels fishing individual allocations (rather than cooperative allocations) are currently limited by caps. Since the provision would establish new caps applicable to vessels fishing in cooperatives, the action would only have effect to the extent that cooperative participants who would otherwise choose to fish in excess of the cap would be limited by the cap.

Effects of proposed caps on fleet size and consolidation

Table 8 below shows the number of vessels fishing inside and outside of cooperatives, as well as the average amount fished by these vessel groups and the number of cooperative vessels that would have exceeded the proposed caps. The table shows that 4 vessels in the Bristol Bay red king crab and *C. opilio* fisheries exceeded the three percent cap, while 9 vessels in the Bristol Bay red king crab fishery and 13 vessels in the Bering Sea *C. opilio* fishery exceeded the proposed 2 percent cap. More vessels exceeded these caps in the Western subdistrict Bering Sea *C. bairdi* fishery, as most vessels in that fishery did not engage in the directed fishing. On average vessels fishing a cooperative allocation harvested less than the lowest proposed cap in all fisheries except the Western Aleutian Islands golden king crab fishery, suggesting the cooperative allocations could have been redistributed among cooperatives in all but that one fishery to comply with the caps (without entering additional vessels in the fisheries).

Table 8. Number of vessels fishing and average catch inside and outside of cooperatives and number of cooperative vessels exceeding proposed cap percentages (in the 2005-2006 season).

Fishery	Number of vessels fishing			Average catch* of a vessel fishing			Number of cooperative vessels fishing over	
	outside of a cooperative	inside of a cooperative	total	outside of a cooperative	inside of a cooperative	in the fishery	the current cap applicable outside of cooperatives	150 percent of the current cap applicable outside of cooperatives
Bristol Bay red king crab	18	71	89	0.81	1.20	1.12	9	4
Bering Sea <i>C. opilio</i>	15	63	78	0.96	1.35	1.28	13	4
Western subdistrict Bering Sea <i>C. bairdi</i>	11	31	42	0.77	1.48	1.29	7	5
Eastern Aleutian Islands golden king crab	1	6	7	8.36	14.46	13.59	2	0
Western Aleutian Islands golden king crab	0	3	3	-	32.71	32.71	**	**

* as a percent of the total allocation

** Withheld for confidentiality

Source: ADFG fish tickets

An alternative approach to examining cooperative behavior relative to the proposed caps is to examine the activities within each cooperative relative to the caps. Table 9 shows the number of cooperatives with vessels exceeding the proposed caps during the 2005-2006 season and the number of cooperatives with their average vessel exceeding the proposed caps. The table shows that many of the cooperatives had vessels exceeding the current cap applicable outside of cooperatives, while few had vessels exceeding the 1.5 times that cap (the maximum cap under proposed). Fewer than 4 cooperatives would need to redistribute catch beyond their participating vessels to comply with the current cap in all fisheries except the *C. bairdi* fishery. No cooperatives would have needed to enter additional vessels to the Bering Sea *C. opilio* or the Eastern Aleutian Islands golden king crab fishery to comply with a 3 percent cap.

Table 9. Number of cooperatives, number of cooperatives with a vessel exceeding the proposed caps, and number of cooperatives with their average vessel exceeding the cap (in the 2005-2006 season).

Fishery	Number of cooperatives	Number of cooperatives with a vessel over the proposed		Number of cooperatives with their average vessel over the proposed	
		the current cap applicable outside of cooperatives	150 percent of the current cap applicable outside of cooperatives	the current cap applicable outside of cooperatives	150 percent of the current cap applicable outside of cooperatives
Bristol Bay red king crab	13	7	*	*	*
Bering Sea <i>C. opilio</i>	13	9	4	*	0
Western subdistrict Bering Sea <i>C. bairdi</i>	13	6	5	4	*
Eastern Aleutian Islands golden king crab	3	*	0	*	0
Western Aleutian Islands golden king crab	3	*	*	*	*

* withheld for confidentiality

Source: ADFG fish tickets

Table 10 shows the leasing of IFQ pounds during the 2005-2006 season. The table shows that most allocations were to cooperatives. More IFQ pounds were exchanged between cooperatives than between persons not in cooperatives.⁷ Since intra-cooperative exchange of quota does not require a lease, it is not surprising that a greater percentage of the non-cooperative allocations were leased. Internal exchanges within cooperatives likely exceed those of non-cooperative, but no standard is available for defining and estimating those internal exchanges (which are not administered by NOAA Fisheries). Agency administered exchanges of *C. bairdi* IFQ exceed those of all other species as a percentage of the total allocation (at almost 30 percent). Notwithstanding these exchanges, 46 percent of the total allocation in that fishery was left unharvested. In all other fisheries, 95 percent or more of the total allocations were harvested.

⁷ The program rules as defined by NOAA Fisheries do not permit exchanges between cooperatives and persons not in cooperatives.

A few factors likely affected (and will continue to affect) distribution of *C. bairdi* catch. In 2005-2006 only the area west of 166° W longitude was open for *C. bairdi*. In that area, harvests would be incidental to Bering Sea *C. opilio* harvests. The Council amended the program so that allocations of QS and PQS in this fishery are now divided to support two fisheries, one east of 166° W longitude and the other west of 166° W longitude. These revised allocations were made by providing each share holder with equal shares in the two fisheries. So, a person holding one-half of one percent of the *C. bairdi* QS prior to the amendment would receive one-half of a percent of the east QS and one-half of a percent of the west QS. Until TACs rise substantially, managers expect the east fishery to be prosecuted primarily incidentally to the Bristol Bay red king crab fishery, while the west fishery is expected to be prosecuted primarily incidentally to the Bering Sea *C. opilio* fishery. The *C. bairdi* fishery had a relatively small TAC – approximately 1.2 million pounds. Several factors likely contributed to leaving this crab unharvested. Fishery conditions (including ice and low *C. opilio* catch rates) likely contributed. Some participants report that they believed the fishery closed in May simultaneously with the *C. opilio* fishery. The fishery, in fact, closed March 31st, shutting out IFQ holders that hoped to fish in April and May. Some participants assert that independently targeting *C. bairdi* is cost prohibitive at the current prices and TAC levels. Participants expect that more of the TAC to be harvested in future years, as participants learn to coordinate their fishing. Some participants also expect quota to be stacked on fewer vessels to accommodate directed fishing and to reduce costs of catching the relatively small TAC.

Table 10. Allocations and leases of IFQ by fishery (2005-2006 season).

Fishery	Total allocation in the fishery (in pounds)	Non-cooperative allocations (in pounds)	Cooperative allocations (in pounds)	IFQ pounds leased between					
				persons not in cooperatives			cooperatives		
				in pounds	as percent of non-cooperative allocations	as percent of all allocations	in pounds	as percent of cooperative allocations	as percent of all allocations
Bristol Bay red king crab	16,496,100	2,738,548	13,757,552	384,171	14.0	2.3	1,030,949	7.5	6.2
Bering Sea <i>C. opilio</i>	33,465,600	5,486,186	27,979,414	781,554	14.2	2.3	3,240,703	11.6	9.7
Bering Sea <i>C. bairdi</i>	1,458,000	255,027	1,202,973	28,793	11.3	2.0	260,760	21.7	17.9
Eastern Aleutian Islands golden king crab	2,700,000	237,365	2,462,635	6,953	2.9	0.3	125,605	5.1	4.7
Western Aleutian Islands golden king crab	2,430,000	0	2,430,000	0	0.0	0.0	192,207	7.9	7.9

Source: NOAA Fisheries, Alaska Region, RAM Division

A few factors likely contributed to the substantial consolidation that occurred in the first year of the program. Consolidation was simplified by the cooperative structure that reduces administrative burdens for in-season quota exchanges among members. Quota leasing (inside and outside of cooperatives) was particularly attractive in the 2005-2006 season. Lease rates were reported to be substantially higher than most participants expected, ranging as high as 70 percent of the ex vessel price in the Bristol Bay red king crab fishery and 50 percent of the ex vessel price in the Bering Sea *C. opilio* fishery. Fuel prices were also extraordinarily high last season, rising by more than 50 percent of the price in recent years. Several participants also reported increases in insurance costs, in part, because many purchased cargo insurance to cover the quota landings committed to IPQ holders and lease payments committed to other quota holders. In the face of exceptionally favorable quota lease rates and high operational costs many participants elected to lease their quota holdings.

Whether additional consolidation will occur in the future is uncertain. Fleet size is likely to change with TAC levels. Recent harvests from the fisheries are relatively low in comparison to historic highs (or even average) harvests. TAC increases could lead vessels to reenter the fishery. Other factors could also affect decisions to participate. As share holders become more comfortable with cooperative arrangements, it is possible that persons fishing individual allocations could join cooperatives. In addition, consolidation within cooperatives could increase, as cooperative members become more comfortable with cooperative management.

Future quota lease rates and operational costs are uncertain. Most participants believe that lease rates are

unlikely to rise from the high levels observed in the first year. Noticeable drops in lease rates are reported to have occurred in the second year of the program (i.e., drops of as much as 10 percent of ex vessel revenues are believed possible in some fisheries). Some vessel operators who leased quota reported financially successful seasons in the first year, despite the high lease rates, weak crab markets, and high operating costs. Given these relative successes and the unusually strong incentives for consolidation in the first year, it is possible that little consolidation will occur in the future, in the absence of the caps.

Applying caps to vessels fishing cooperative allocations could have a few effects. Clearly, vessels that would have fished over the cap will need to redistribute a portion of their allocations to avoid exceeding the limit. Whether this redistribution would lead to additional vessels entering the fisheries is another question. Many of the vessels participating in the fisheries last year fished allocations well below the proposed caps – the median vessel harvest in both the Bristol Bay red king crab and the Bering Sea *C. opilio* fisheries is approximately 1 percent. Given these harvest patterns, the redistribution necessary to avoid exceeding the cap could occur within the current fleet. The caps would only have an impact on fleet size, if the current fleet were to contract further in the absence of the caps.

In the smaller fisheries, the caps are more likely to affect fleet size. As noted earlier, participants in the *C. bairdi* fisheries believe that more consolidation could occur to support targeting of the relatively small TACs expected in the near future in those fisheries. These same participants also point to the large share of last year's TAC left unharvested as an indication that consolidation is necessary to ensure harvesting the *C. bairdi* TAC is economical.

The Pribilof red and blue king crab and the St. Matthew blue king crab fisheries have been closed since 1998 because of stock concerns. In the immediately preceding years when the Pribilof fishery was open, harvests as low as 500,000 pounds were shared by approximately 50 vessels (approximately 10,000 pounds per vessel on average). Vessel caps of between 4 and 6 percent would compel between 17 and 25 vessels to fish in the fisheries. Vessels fishing at the cap on a TAC of 500,000 pounds would each be permitted to harvest between 20,000 and 30,000 pounds. Although the average vessel harvests permitted under the proposed caps exceed average vessel harvests in the last years the fisheries were open, some participants assert that economic prosecution of the Pribilof and St. Matthews fisheries will require consolidation beyond that permitted by the proposed caps.

Applying vessel caps in these smaller fisheries (the St. Matthews and Pribilof fisheries and *C. bairdi* fisheries at the current TAC levels), however, could have no effect on the total number of vessels fishing crab. These fisheries are likely to be prosecuted only by vessels that already participate in the larger fisheries. Using caps to require additional vessels to participate in these fisheries will likely draw additional vessels into the fisheries, but may not result in more vessels participating in crab fisheries overall.

The Aleutian Island golden king crab fisheries have had substantially lower participation rates than the other crab fisheries. Approximately 20 unique vessels participated in these two fisheries in the years immediately preceding the implementation of the rationalization program. In the first year of fishing under the new program, 3 vessels participated in the Western fishery, while 7 participated in the Eastern fishery. As in the other fisheries, participants in the golden king crab fisheries are concerned that low prices and increased costs require stacking of quota to economically prosecute the fishery. Particularly in the more distant Western fishery, fuel costs are said to have added considerably to operating costs. Participants report that some quota in the Western fishery will remain unharvested this year due, in part, to the high costs of operating in the fishery and the relatively low price of golden crab. The majority of the unharvested quota is likely to be regionalized for delivery West of 174° W longitude. Processors have suggested that processing in the region is not economical because of their inability to consolidate under the current 30 percent processing cap. The proposed vessel caps in these fisheries range from 20 to 30 percent of the TAC. Clearly, either cap would

require the introduction of additional vessels into the Western fishery. As in the other fisheries, it is difficult to determine whether additional vessels would be operated in the fisheries under the proposed caps. If the fleet does not consolidate beyond last year's level, it is possible that redistribution of catch among vessels in the fisheries might be sufficient for compliance with the caps. Some participants believe that additional consolidation may be economically beneficial under current conditions because of the low price of golden king crab and the high fuel costs (particularly in the Western area).

Effects on production efficiency in the harvest sector

Substantial production efficiency gains were realized by the removal of vessels from the fisheries under the rationalization program. Perhaps the best evidence of these gains is the high quota lease rates observed in the first year of the program realized by vessel owners that removed vessels from the fisheries. Most vessel owners believe that the imposition of caps on vessels fishing cooperative allocations will limit production efficiency gains intended to be realized under the program. Specifically, caps that limit fleet consolidation would require introduction of additional vessels, the costs of which include fuel costs of positioning and operating the vessel, vessel and gear maintenance costs, insurance costs, and the costs of employing and supplying a crew. Production efficiency losses, albeit less substantial, would also arise from the redistribution of catch among the participating fleet, as larger more powerful vessels would be forced to divest of some shares. The cooperative structure should reduce transaction costs of this redistribution. In general, the fluid lease market, which seems to have developed in the first year of the program, should ensure that these production efficiency losses are distributed across all share holders. Owners of large vessels, however, are likely to be disproportionately affected, if their vessels require allocations greater than the caps to operate at maximum production efficiency. These vessels could lose any competitive advantage, if caps prevent their achieving production efficiencies. Caps in the smaller, ancillary fisheries (the St. Matthews, Pribilof, and *C. bairdi* fisheries under current TAC levels) are most likely to lead to the greatest losses of production efficiency. Participants believe that consolidation in these fisheries beyond the proposed caps is important to achieving production efficiencies.

Effects on crew

Downsizing of the crab fleet under the rationalization program had the clear effect of reducing crew jobs. A more subtle effect, however, occurred through the changes in the nature of and compensation for remaining jobs. Whether application of caps to vessels fishing in cooperatives will affect either of these changes is uncertain. Application of the proposed caps would likely lead to some redistribution of shares among vessels and could lead to a few additional vessels participating in the fisheries. The redistribution will likely have effects on some crew employed in the fishery. Crew on vessels receiving shares by transfers from vessels otherwise over the caps are likely to receive additional income from fishing those shares, while crews on vessels that reduce fishing to comply with the caps would lose some income. The losses from this redistribution are most likely to affect crews employed on the largest vessels with the greatest catching power.

The caps are most likely to have effects only if fleets would contract beyond first year levels in future years. The extent of any possible additional contraction is uncertain. The current high fuel prices, low ex vessel prices, and high lease rates have motivated participants to remove vessels from the fisheries. Whether these conditions will continue or is uncertain. If additional contraction would occur in the absence of the caps, the caps would prevent loss of additional crew jobs. If added demand for crew arises from the caps, the terms and conditions of employment for some crew that are currently employed.

Effects on communities

Two potential effects on coastal communities could arise from this action. First, the application of vessel caps to cooperatives could lead to more crew employment than would be the case in their absence. Given the current distribution of catch, it is unlikely that a substantial number of additional vessels would enter the fisheries because of the proposed caps. It is possible, however, that the caps could prevent future

consolidation. The effects of any added crew employment on employment in remote communities is uncertain. The study of the three Aleutians East Borough communities states that residents of those communities perceive no job opportunities in the fisheries. This assertion is at direct odds with statements of some vessel owners, who report that they have been unable to locate crew to work on their vessels. A possible explanation of these inconsistent perceptions is that residents of remote communities are unaware of the openings. Alternatively, these residents of remote communities may believe the terms of these positions are unacceptable. The extent to which those beliefs are based on accurate information concerning the positions (or inaccurate inferences drawn from anecdotes concerning poor compensation of some crew positions in the fisheries) is not known. For some crew in remote communities, it is possible that extending employment in the crab fisheries over the longer season conflicts with participation in other fisheries. The proposed caps are unlikely to affect this conflict, since they would still allow vessels to extend fishing for a substantially longer period than the former derby openings.

The second possible effect on coastal communities would arise from increased spending by vessels than would have occurred in the absence of the caps. Most of any added spending would benefit fishery support industries, such as marine suppliers and fuel suppliers. Additional benefits may accrue to businesses that provide goods and services to crews, including hotels, restaurants, and bars. Depending on the community and the activities of the local crab fleet these impacts vary. The effects of the proposed caps, which are unlikely to increase the number of vessels in the fisheries, are limited to prevent further reductions in spending that could arise, if additional consolidation were to occur.

Conclusion

In considering the information in this paper, the Council should bear in mind that much of the analysis is based on anecdotal evidence received from fishery participants. Data for assessing impacts of the rationalization program and for analyzing the potential impacts of the proposed vessel caps are unavailable at this time. The Council should also consider that with a single year of fishing under the rationalization program, only weak conclusions should be drawn.

If the council wishes to proceed with consideration of this action, potential actions that it could take at this meeting include adoption of a problem statement, identifying its rationale for considering this action, and adoption of alternatives for analysis.

Persons Consulted

Edward Poulsen
Ken Tippet
Kevin Kaldestad
Keith Colburne
Joe Sullivan
Forrest Bowers
Gretchen Harrington
Arni Thomson
Gunnar Knapp
Marie Lowe
John Iani
Lenny Herzog
Jeff Steele
Jeff Stephan
Tom Suryan
Jorn Kvinge

References

Lowe, Marie, Gunnar Knapp, and Steve Langdon (2006) Social and Economic Impact Assessment of BSAI Crab Rationalization on the Communities of False Pass, King Cove, and Akutan, Institute of Social and Economic Research, University of Anchorage Alaska.

Knapp, Gunnar (2006) Economic Impacts of BSAI Crab Rationalization on the Kodiak Fishing Employment and Earnings and Kodiak Businesses: A Preliminary Analysis, Institute of Social and Economic Research, University of Anchorage Alaska.

Robinson, Dan and Neal Gilbertsen (December 2006) Fish are Alaska's Bread and Butter, Alaska Economic Trends, Alaska Department of Labor and Workforce Development.