POST-RATIONALIZATION RESTRUCTURING OF COMMERCIAL CREW MEMBER OPPORTUNITIES IN BERING SEA AND ALEUTIAN ISLAND CRAB FISHERIES

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DRAFT REPORT

Jennifer Sepez
Alaska Fisheries Science Center
7600 Sand Point Way N.E., Seattle, Washington, WA 89115
Email: jennifer.sepez@noaa.gov
Phone: (206) 526-6546

Heather Lazrus
University of Washington and Pacific States Marine Fisheries Commission
7600 Sand Point Way N.E., Seattle, Washington, WA 89115
Email: heather.lazrus@noaa.gov
Phone: (206) 526-6683

Ron Felthoven
Alaska Fisheries Science Center
7600 Sand Point Way N.E., Seattle, Washington, WA 89115
Email: ron.felthoven@noaa.gov
Phone: (206) 526-4114

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BACKGROUND AND PURPOSE

The purpose of this research is to understand how employment opportunities for commercial fishing vessel crew members have changed in the Bering Sea and Aleutian Island (BSAI) crab fisheries following the implementation of a quota-based management system by the North Pacific Fisheries Management Council (NPFMC). The objectives of the Crab Rationalization Program (referred to as rationalization or the rationalization program) are to address conservation and management issues associated with the previous open access fishery, reduce bycatch and associated discard mortality, and increase the safety of crab fishermen by ending the race for fish.[1] In the Environmental Impact Statement produced by the National Marine Fisheries Service (NMFS) and NPFMC for the Fishery Management Plan of BSAI King and Tanner Crabs, a rationalization program is explained as "one that results in an allocation of labor and capital between fishing and other industries that maximizes the net value of production." It is further noted in the Statement that "because rationalization involves a total revamping of the way the fishery is run, its designers must be aware of the numerous economic, social, and environmental consequences that flow from the details of the program design" (EIS No. 040410:1-6).

This report transmits preliminary information to the NPFMC, its committees, stakeholders, and the public, about the findings of the research thus far in concert with the NPFMC 3-year review of the program. However, the research and this report are not officially part of the 3-year review as directed by the NPFMC. Funding for this research was provided by the NMFS Office of Science and Technology in 2007 as part of a wider effort to develop social information regarding commercial fishing vessel crew in the United States. The project is expected to continue through the beginning of 2009.

While planning and conducting this research we became aware of a number of research projects on related topics and have made efforts not to duplicate efforts or exhaust the same interview populations. Briefly, these complementary projects include:

- Research by the staff of the NPFMC for the mandatory 3-year review.
- Research by Dr. Michael Downs of EDAW for the 3-year review on the social impacts of the program on Alaska fishing communities.
- Research by Dr. Gunnar Knapp and Dr. Marie Lowe of the University of Alaska's Institute for Social and Economic Research on the economic and social impact of the program on communities in the Aleutians East Borough.
- Research by Dr. Seth Macinko of the University of Rhode Island and funded by the North Pacific Research Board on the impacts of rationalization on BSAI crab crew with a focus on financial compensation using ethnographic interview techniques.
- Research by Dr. Chang Seung of the Alaska fisheries Science Center applying regional economic models to BSAI crab fisheries.

[1] See http://www.fakr.noaa.gov/sustainablefisheries/crab/rat/progfaq.htm#changes

In the interest of providing useful and meaningful research, we have coordinated and consulted with each of these researchers either by telephone or in person. As a result of two other projects underway that focus on financial compensation to crew, we elected to de-emphasize that aspect of crew employment in our own research and focus more on social factors. As a result of two projects focusing on community impacts, we have also de-emphasized that in this work, focusing instead on crew members as an occupational community.

Our focus on crew employment analyzes information derived largely from ethnographic interviews to understand the impacts of rationalization in four categories: Crew Composition, Employment Opportunities, Work Characteristics, and Alternative Employment Opportunities. The impacts perceived by individuals, conveyed to us through the interviews, and expressed in this report should be interpreted as a reflection of the way in which these individuals feel about various aspects of the crab rationalization program. A primary goal of eliciting this information was to scope a set of testable hypotheses that can be rigorously evaluated in the future to address what interviewees conveyed as the most salient and pressing issues concerning crew opportunities in the crab fisheries.

METHODS

The methodological approach of this research has been ethnographic. Ethnographic research engages fieldwork techniques to describe social and cultural meanings and activities from an insider point of view as opposed to an outsider's perspective (Spradley 1979).The basic techniques applied are participant-observation and semi-structured in-person interviewing. Ethnographic approaches are particularly appropriate for small populations (for example, a village or a regional subgroup like BSAI crab crew rather than a nation-state or a demographic category); for populations not likely to respond to surveys (because of, for example, issues with literacy, culture, technology, infrastructure, trust, etc., some of which are pertinent to BSAI crab crew); for populations that are difficult to randomly sample (because, for example, they are not enumerable or they tend to have transient residencies, both of which are true for BSAI crab crew); and for populations that are difficult to contact (again, relevant to BSAI crab crew). Ethnographic methods are particularly suited for research in which the goals include eliciting the voices of a particular population; for deriving ideas, testable hypotheses, and conclusions inductively from data and experience; for generating nuanced profiles of human practices; and for understanding social and cultural subjects for which the primary elements are not well understood.

The majority of the work for this project has been based on unstructured interviews or semi-structured interviews. Unstructured and semi-structured interviewing techniques are used in tandem to form the foundation of time-intensive ethnographic interviews (Bernard 2002:205). Such interview methods are designed to prescribe the general topic and then allow themes within that topic to emerge from the interview population.

Interviews are then coded thematically and the themes are analyzed to construct an understanding of the topic from the perspective of the participants.

One objective of ethnography is to allow the voices of research participants to speak for themselves. To this end, we have included many direct and paraphrased quotes in the text. We offer some attributes of the speaker to provide context, such as involvement capacity in the BSAI crab fisheries and residence. However, it should be carefully noted that the same sentiment may also have appeared in other interviews[2] and been expressed by people differently involved in fishing and residing in very different geographic areas. We therefore caution against concluding that a statement is necessarily representative of the type of interviewee which was specifically not our intention. In the text, we use quotation marks to denote direct quotes, all others are paraphrased. Quotes are described by the place and status of interviewee, and the interview number. For example (former captain Seattle, #099) means that the interviewee was a former captain and the interview, number 99, was conducted in Seattle. We designate all interviews conducted with informants in Oregon communities by the state due to small number of interviews conducted in some Oregon communities and the resulting potential for the individual to be identified.

Interview participants for this project were solicited by methods known as intercept sampling and snowball sampling of persons meeting the criteria for the project.[3] We sought to include informants who had participated in BSAI crab fisheries before and/or after rationalization (or both) as a crew member, but also included skippers/captains, vessel owners, and processing plant employees in the sample frame. Intercept sampling refers to contacting participants in places where persons meeting the interview criteria are likely to be found. In the case of this project, this has included docks, supply stores, fishermen's typical meeting places, and organized conferences and meetings. Snowball sampling refers to meeting key people (for example through intercept sampling) who then connect researchers to others who may be relevant and willing to contribute to the research project (Bernard 2004). In this way, contacts were sought and made through local crewmen's groups and fishing associations. In addition to intercept and snowball sampling, this project also solicited participation by posting notices on bulletin boards at community centers and commercial fishing docks in field work locations (locations are discussed in more detail below).

The authors of this report were aware of several vessel owners' groups that could have been used to track down additional crew members, but it was determined that such a "top-down" approach may have compromised the confidentiality we felt as essential for crew members to speak openly about their work experiences and opportunities. Given

[2] In some instances the same sentiment was expressed by a large number of individuals but to avoid redundancy and strive for parsimony in reporting we did not include successive, nearly identical comments in this report. Rather, we selected one or more quotes that encapsulate the thoughts on a topic and our accompanying text comments on the pervasiveness of those thoughts or feelings in the interviews to provide context.

[3] Crew population data from which a sample could have been drawn from data held by the PSMFC was not available due to confidentiality restrictions. The sampling approach used instead was determined to be the best available option.

the hierarchy that exists among owners, captains, and crew, and the potential repercussions for participating in such a study (especially if the sentiments of the crew differ widely from those expressed by the other parties), we felt that a "bottom-up" approach may provide more candid responses.

All types of sampling present the challenge of overcoming sample bias. Sample bias occurs when a non-random sample or an imperfect random sample is not representative of the population it purports to represent. Although the ethnographic approach used does not purport to be statistically representative of the entire desired population, it attempts to represent a reasonable portion of that population. Interviews were conducted with former and current crew, captains, and others with varying extents of involvement in the BSAI crab fisheries and holding a diverse array of opinions about the crab rationalization program. Thus, as displayed in the tables below, even without a statistically representative sample, this project has benefited from the involvement of all different categories of crew that may represent unique perspectives. Again, we want to emphasize that our priority was to contact current and former crew members. While this does include both captains and deckhands, we distinguished between these categories and prioritized the latter. In our sampling techniques we avoided contacting boat or quota owners or captains who could lead us to crew members, favoring instead a "bottom-up" up approach of contacting crew, deckhands, directly.

Nonetheless, several sources of potential sample bias should be recognized. Some segments of the population remain under represented in the interviews despite our attempts to seek them out. For example, it has been much more difficult than anticipated to find crew who are no longer in the crab fishery, despite many efforts. As one current crew member put it, "We don't see the guys who lost jobs, they just disappeared." (crew, Seattle, #074). An additional source of potential sample bias is that only six major locations were pursued while there are actually hundreds of locations in Alaska and elsewhere that currently supply or historically supplied crew to the fishery.

Even if solicitation of interviews is broadly representative, it does not mean that agreement of participation is representative. As one potential snowball sampler put it, "But you know, even if I give them your number, they'll be like 'blaahhhh' [waves hand]. They're fishermen, they don't like to talk. What good will it do?" (Seattle, crew, 037). Although we did find the vast majority of stakeholders willing to talk with us, once agreed to participate, a few people found it difficult to discuss something about which they feel sensitive. For example, one crewmember who is no longer able to find a position in the BSAI crab fisheries explained that "he feels stupid" that he cannot find work in the fisheries and that because he feels it is his own fault, he has a hard time talking about it (former captain, Seattle, #083).

Fieldwork Locations

Field research was conducted for this project in Alaska, Washington, and Oregon. The purpose of going to field locations was to interview people who met the project criteria

for interviews, rather than for direct observation of the fisheries. Field reearch consisted of visiting communities involved in the crab fisheries and interviewing current and former participants in BSAI crab. Interviews took place on docks, on board vessels, at processors, in local cafes, at public meetings, and by telephone. No fieldwork was done observing actual crab harvesting. Table 1 contains the locations and dates of fieldwork.

Table 1. Locations and dates of project fieldwork.

State	City	Dates
AK	Dutch Harbor	6 – 12 October 2007; 24-25, 31January 2008
AK	Kodiak	12,15-18 October 2007
AK	Akutan	25-30 January 2008
AK	King Cove	Tentatively planned for November 2008
AK	Old Harbor	13-15 October 2007
OR	Astoria/Warrenton	May 31-June 1
WA	Seattle area	April 15 – June 30, 2008

In addition to interviews, fieldwork involved attending the Kodiak Fisheries Advisory meeting on 18 October 2007, the February 2008 NPFMC meeting in Seattle, the 28 February 2008 Pacific Northwest Crab Industry Advisory Committee meeting in Seattle, and visiting docks and shipyards in Washington, Oregon, and Alaska.

Interviews

A total of 90 interviews with 134 unique individuals (five people were interviewed more than once and several interviews included more than one participant) have been conducted. The interviews were distributed between locations in Alaska, Washington, and Oregon. More than half of interviewees were current BSAI crab fishery participants. The rest included former BSAI crab fishery participants and other stakeholders. The distribution of interviews by location, participant category and interview type is disclosed in more detail below.

The majority of interviews were conducted in person. Six phone interviews were conducted from the Alaska Fisheries Science Center in Seattle when an in-person meeting was not feasible. Of the 90 total interviews, 38 have been classified as in-depth, lasting up to an hour or more and yielding particularly detailed information.

Interview refusals, in which a person was asked to participate but declined to do so, were very few. In general, the vast majority of people agreed to participate. Only one person actively refused while several others did so indirectly ("come back at another time" or "leave your number and I'll call") and might have been included had they been pursued

under a different type of sampling strategy. In one case, the captain intervened and refused on behalf of the crew members. There were a few interviews in which the participant either directly or indirectly indicated a wish to keep participation confidential, but the vast majority of interviewees were not uncomfortable disclosing their participation. Nonetheless, we have obscured all identities in the materials presented here, identifying individuals only by their category of participation (e.g. ex-crab crew) and occasionally by location.

Interviews followed a semi-structured format that involves guided questioning as well as allowing for topics that are salient to the interviewee to be explored. Semi-structured interviewing was determined to be the most appropriate technique for collecting information on general parameters of change within the BSAI crab fisheries as well as details on more specific, individual experiences of fishery participants. All interviews with current or former participants in the fishery covered topics such as personal histories including how people entered the crab fishery, other fisheries or industries in which they have participated, and how long they have been fishing in a BSAI crab fishery and other fisheries.

Interviews with current and former crew and skippers covered the hiring process, opportunities and opportunity costs in the fishery, and decision making regarding participation in the fishery. To elicit information on changes associated with the crab rationalization program, we asked about changes in the fishery following rationalization, including questions that allowed us to later make comparison between the decades prior to rationalization and more recent experiences since the first rationalized season in 2005. Crew experience levels, compensation issues, and future expectations were covered. Because the semi-structured interview process allows the interviewee to guide the specific topical foci of an interview within the selected theme, participants were free to elaborate on the topics they found most relevant. As a result, two major affects of rationalization as experienced by crewmen ─longer seasons and quota leases─ dominated the unstructured portion of most interviews.

Interviews by Location

The majority of interviews were conducted in Alaska, although many of these participants reside in other locations such as Seattle. We designate the location of the interview according to the location of the informant at the time of the interview which may be different from their place of residence or from the location of the researcher in the case of interviews conducted over the phone (Table 2). Several interviews involved more than one interviewee. Four people were interviewed twice, and one person was interviewed three different times for follow up information.

Table 2. Number of people interviewed at each location

Location	Number of People Interviewed
Dutch Harbor	69
Akutan	23
Kodiak	17
Old Harbor	1
Seattle	24
Astoria/Warrenton	4
Other Alaska locations	2
Total people interviewed	134

Interviews by Participant Category

We interviewed people involved directly or indirectly in various capacities in the BSAI crab fisheries. We sought to interview persons who had participated in BSAI crab fisheries before or after rationalization (or both) as a crew member, skipper/captain, vessel owner, processing employee or other stakeholder, with an emphasis on those participating as crew members (Table 3). Crew members with a variety of experience levels were interviewed ranging from aspiring crew who had not yet been hired on a crab vessel but did have previous fishing experience to veterans of the industry, retired skippers, and boat owners with over 50 years of experience.

Of 133 individuals interviewed, only 24 were persons who could be considered to have left or lost their positions in BSAI crab fisheries in the post-rationalization restructuring. This represented just 18% of the total number of individuals interviewed, but nearly one quarter of the total number of captains and crew interviewed. We anticipated a larger number of former crew participants in the project but, as mentioned, we had difficulty locating people in this category. In the words of a former crew member, "We don't even have any proof that they, crew, you know, exist. They are a band of gypsies united by what they do" (former crew, Kodiak, #031). Consequently, we may not have captured the full range of perspectives from former crew who are no longer in the BSAI crab fisheries. We are therefore more limited in what we can say about what former crew are doing and how current circumstances compare to their time participating in the BSAI crab fisheries. We are concerned that this means that the report reflects a view of the fishery held by those who have not been displaced. For those we located, the response rate (agreement to be interviewed) was similar to that of current fishery participants.

Table 3. Number of people interviewed by participant category

Crab crew	64
Former crab crew	20
Crab captain	12
Former crab captain	6
Non-crab crew/captain (fishermen who never participated in BSAI crab fisheries)	6
Crab boat owners	5
Processing plant employees	8
Community members and other stakeholders	13
Total unique individuals	134

We recognize that there may be other or underrepresented categories due to our sampling methodologies in spite of our efforts to be broadly representative. Therefore, we are still eager to solicit further information. Please contact the authors regarding questions, concerns, and suggestions that could improve our sample base and our study.

ANALYSIS OF INTERVIEW DATA AND CREW INFORMATION

The application of data from the ethnographic interviewing for this project and other available sources of information on the topic of post-rationalization restructuring of crew opportunities generated four main topical areas: 1) composition of crew (including total number, geographic distribution, types of positions, and demographic characteristics); 2) employment opportunities (including hiring processes, qualifications, unfilled positions, c-shares, and job-seeker decision processes); 3) work characteristics (including pay structure, time inputs, compensation per unit effort, delivery schedules, and safety); and 4) alternative employment opportunities (including multi-industry and multi-fishery strategies, and geographic influences). Each topic is considered comparatively, as appropriate, in terms of pre-rationalizations conditions and post-rationalization conditions.

The focus of this preliminary report is crew employment. Information relevant to other aspects of BSAI crab crew experiences is not presented or analyzed here, but may be the subject of subsequent articles and reports.

Composition of BSAI Crab Crew

The composition of BSAI crab crew can be considered in several different ways. Below, we analyze information regarding changes in the total number of BSAI crab crew participants, changes in the geographic distribution of participation, changes in the type of positions designated on a vessel, and demographic characteristics of crew.

Numbers of Participating Crew Before and After Rationalization

The rationalization program was designed in part to address the overcapitalization of the BSAI crab fleet by providing incentives to consolidate fishing effort on fewer vessels. Job loss for crewmen was a significant and predicted impact of the rationalization program due to processes of fleet consolidation (EIS No. 040410). Limited data is available on crew in the BSAI crab fisheries, but we can quantitatively estimate some changes that took place with the implementation of the rationalization program. The numbers we use here are based on vessel participation data and other cited sources, and do not rely on information from ethnographic interviews nor on data from the Economic Data Reports (EDR) submitted annually by vessel and processing plant owners[4].

Table 4 uses two different methods to calculate the changes in available crew positions. Method A takes the number of unique vessels participating in any BSAI crab fishery multiplied by the Alaska Department of Labor estimate of six crew positions per vessel.[5] The result of 1026 positions lost would correspond to the number of persons affected if each vessel kept the same individual crew members for all fisheries throughout the year. This could be considered the lower bound on the number of individuals affected.[6]

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[4] The EDRs collect information on cost, earnings and employment and can be examined in more detail at http://www.fakr.noaa.gov/sustainablefisheries/crab/rat/edr/default.htm

[5] The Alaska Department of Labor creates employment estimates by combining landing records attached to a fishing permit with the results of an on-going survey of permit holders. "Crew factors" quantify the labor needed to fish a specific permit given gear type and regional specifications. Crew factor estimates may be conservative since they do not account for shipyard work nor do they capture individual cases when a crew member may leave prior to landings being made (Patton and Robinson 2006:12-13). In our calculations we assume that one permit will be associated with one vessel (as indicated on the Alaska Commercial Fisheries Entry Commission permit application forms), therefore allowing us to calculate positions by vessel.

[6] While refer to this as a lower bound of individuals affected in terms of participation in crab fisheries, Arni Thompson of the Alaska Crab Coalition (ACC) has analyzed this issue in terms of *jobs lost for the entire year in all fisheries* and has a much lower estimate (he asserts that 108 jobs were lost due to consolidation in red king crab). His calculations assume that if a vessel which left the crab fisheries remained active in another endeavor, that the same crew were employed and thus no jobs were lost. Unfortunately, sufficient data on crew participation data do not exist to test this assumption. Regardless, the reader should understand that the disparity between his job number estimates and the participation number estimates referenced here and in Lowe and Knapp arise because they are fundamentally different concepts resting on different assumptions.

Table 4. Statistics and crew positions in all BSAI crab fisheries before (2004) and after (2007) the implementation of the rationalization program (data retrieved from CFEC fish tickets)[7]

	Notes	2004	2007	Change
Unique vessels in BSAI crab fisheries fleet[8]	Vessel counted only once no matter how many distinct fisheries participated in	256	85	-171
Vessels fishing in aggregated BSAI crab fisheries[9]	Vessel counted repeatedly for each fishery participated in	456	177	-279
Pounds	Total of all BSAI crab species	44 million	61 million	+ 17 million
Value in dollars	Estimated from CFEC data	136 million	147 million	+ 11 million
Crew positions method[10] A	# unique vessels x AKDOL estimate of 6 positions per vessel	1536	510	-1026
Crew positions method B[11]	# vessels in each BSAI crab fishery x AKDOL estimate of 6 positions per vessel	2736	1062	-1674

Method B takes the aggregated number of vessels participating in each BSAI crab fishery multiplied by the Alaska Department of Labor estimate of 6 crew positions per vessel. In other words, vessels may be counted two or more times if they participated in more than one fishery, such as red king crab and opilio crab. The result of 1674 positions lost would correspond to the number of persons affected if each vessel hired a completely different crew for each fishery in which it participated. This estimate could be considered to be near the upper bound on the maximum number of individuals affected, given that the

[7] We have collated available fish ticket data from all BSAI crab fisheries, this data represents Bristol Bay red king crab, Bering Sea snow crab, Eastern Aleutian golden king crab, and Western and Eastern Bering Sea tanner crab. We do recognize the complexity of vessel involvement in different fisheries, and that crew positions associated with vessels that are able to fish in multiple fisheries will have been affected differently than vessels that rely solely on a handful of fisheries such as the Bering Sea opilio and pot cod, and salmon tendering.

[8] Not all of the change in vessel numbers reported here is attributed to the rationalization program. A total of 25 vessels were removed from the BSAI fisheries through a federal buyback program. More precise data is available to distinguish between vessels tied up as a result of rationalization which we will use to correct the umbers displayed here in subsequent versions of this report.

[9] See above note.

[10] Vessels were also removed prior to rationalization through the federal BSAI crab vessel buyback program, and a corresponding proportion of crew positions were removed at this point.

[11] See above note.

usual rate of in-season turnover has not been included. This rate is unknown, but would raise the maximum number of individuals affected.

The range of 1026-1674 crew positions lost encompasses the estimate provided by Lowe and Knapp (2006) of 1350, reached by adding the estimate of 900 positions lost in Bristol Bay red king crab and 450 in Bering Sea opilio crab between 2004/5 and 2005/6. The numbers in Table 4 above also include additional BSAI crab fisheries (Bristol Bay red king crab, Bering Sea snow crab, Eastern Aleutian golden king crab, and Western and Eastern Bering Sea tanner crab).

No matter how crew members are counted, the loss of available positions is a significant effect of rationalization. It should be noted, however, that not all of the decline in vessel participation and jobs was due specifically to crab rationalization. As noted in Lowe and Knapp, about 15% of the 2005/06 decline in fishery participation was due to the crab vessel buyback program—which would have occurred even had the crab rationalization program not been implemented. Thus, the loss of positions is closely associated with the removal of vessels from the active fleet through both the consolidation of fishing effort on fewer vessels, and to a lesser extent, the buyback. The expected efficiency gains of a quota-based management program are based on some amount of consolidation. This is not unique to BSAI crab fisheries, but can be considered a predictable effect of rationalization in any fisheries context. It should be emphasized that the calculations reported here do not reflect actual unemployment of former crew members (or even forced employment in other industries) but only the removal of a number of once available crew positions from the BSAI crab fisheries. Thus, it is beyond the scope of this data to suggest that former crew members have lost their only possible source of income (although ethnographic interviews that uncover the difficulties of transitioning into other careers does suggest this in some cases). Sufficient data do not exist to determine to what extent vessels removed from the BSAI crab fisheries but active in other Alaskan fisheries still hire the same crew members they used in the crab fisheries.

Another way to analyze the information about changes to crew positions is in terms of total crew effort, as perhaps measured by total crew days at sea.[12] Consolidation clearly means fewer positions for fewer people, but it does not necessarily mean less total work to harvest the total catch. It could simply be work that is distributed differently, such as to fewer persons working more days, as is clearly indicated by the interview data.

To determine if the total crew effort is similar before and after rationalization, we relied on Lowe and Knapp's (2006) numbers comparing estimated average days fished per

[12] Another method not pursued here to assess crew effort would be in terms of the number of pots pulled. As expressed by one captain, "Huge numbers of the jobs evaporated in the fishery as a whole, but there are still the pots to pull" (captain, Seattle, #082). If this measure is used, the number of viable crab retained per pot must also be taken into account. The average number of crab per pot between 2000-2005 approximately doubled between 2005-2007 as recorded in the 2007 Crab SAFE report.

vessel for 2004/5 and 2005/6. For the Bristol Bay red king crab fishery, we calculated the following total numbers of crew days at sea:

2004/5: 251 vessels x 6 expected crew x 3 average days at sea per vessel = 4,518 total crew days at sea.
2005/6: 89 vessels x 6 expected crew x 26 average days at sea = 13,884 total crew days at sea.

For Bering Sea opilio crab we calculated the following total numbers of crew days at sea:

2004/5: 164 vessels x 6 expected crew x 5 average days at sea = 4,920 total crew days at sea
2005/6: 80 vessels x 6 expected crew x 42 average days at sea = 20,160 total crew days at sea.

We see that the total number of crew days at sea has greatly increased in both fisheries but at a different rate for the red king and opilio fisheries. This increase can be partially attributed to the larger harvest in 2005/6 but the magnitude of these increases (17% and 34% respectively) is much less than the 3-4 fold increase in days at sea. The information we obtained from interviewees and the limited documents that discussed crab rationalization have attributed these changes to longer soak times used for crab pots, greater selectivity over the product quality of retained crab through increased discards (Barnard and Pengilly, 2006), more time spent waiting for safe fishing conditions, and in some cases a less breakneck pace of work. As we will discuss below, this change in the overall number of days at sea associated with crew jobs is one of the most significant factors affecting the experience of crewmen in the post-rationalization fishery.

Geographic Distribution of Vessels by State

In addition to effects on crew positions available and total crew effort, post-rationalization consolidation can also be understood in a geographic context. Ideally, we could examine the geographic distribution of crew member residences before and after rationalization. EDR data contains some information about crab crew residences, and can be linked to other databases to extract such information, but is not included here because the North Pacific Fisheries Management Council has requested that these data not be included as part of the three year review. The ethnographic interviews captured demographic data, but did not cover enough of the pre- and post-rationalization population for a sufficient geographic analysis. ADF&G crew license data, which also contain information about crew residences, cannot be sorted by fishery. Thus, without access to the data needed to directly address the geographic impacts on crew employment, we have relied upon indirect data available from vessel owner records. As indicated in interview data discussed in more detail below, it appears that crab vessels often hire crew in the home locations of the vessels, more so than at crab ports or through advertising. Thus, the geographic distribution of vessel ownership before and after rationalization was used as a rough indicator for the geographic distribution of crew position loss.

Nearly all of the vessels (98-99%) that have participated in the BSAI fisheries both before and after rationalization are registered to owners who reside in three states:

Alaska, Washington, and Oregon. Figure 1 shows geographic changes in the BSAI crab fleet between 2004 and 2006, indicating how crew who are residents of these states may have been differentially displaced by jobs lost on boats that no longer participate in the fisheries.

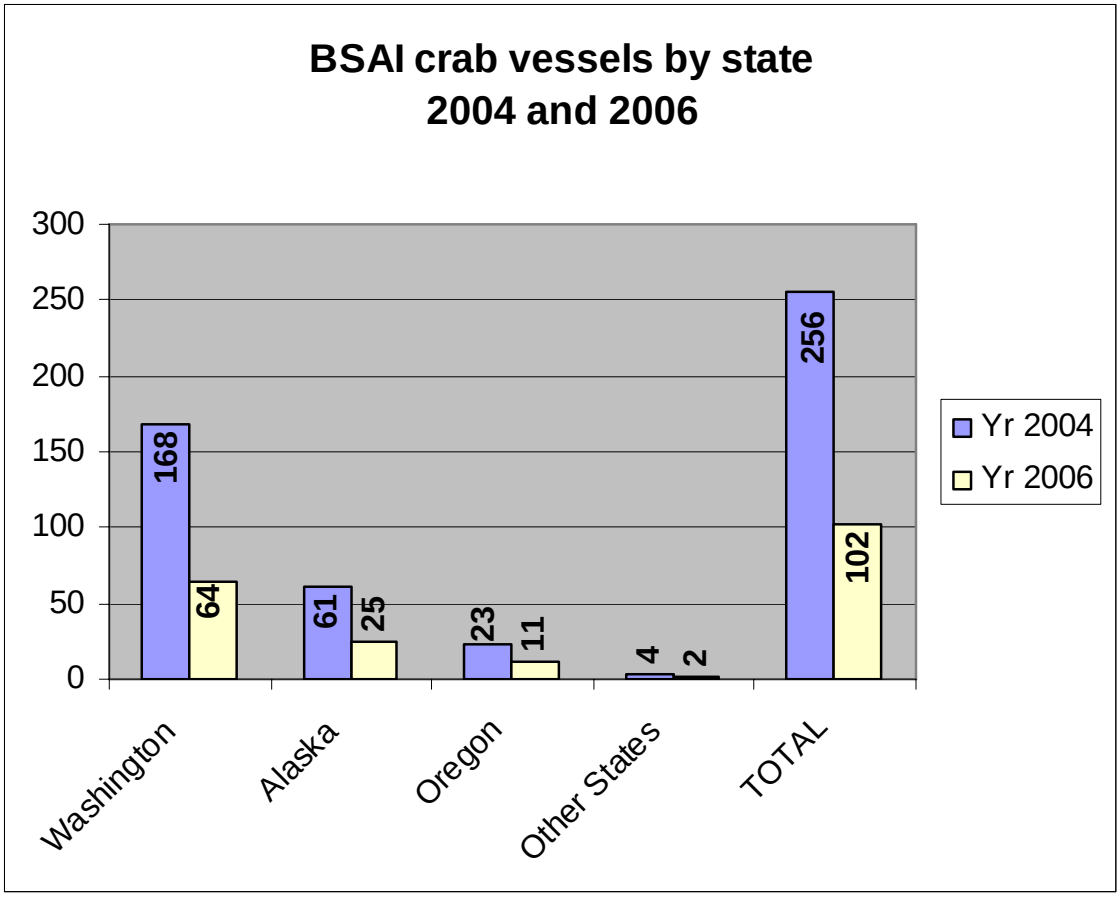

Figure 1. Number of unique vessels participating in BSAI crab fisheries between 2004 and 2006.

Our research results indicate the primary importance of social networks in crew employment processes. Consequently, we can make the tentative claim that generally speaking much crew hiring is done where the vessel, and likely the captain, are based. Thus, position loss would be high where vessel numbers are high. Figure 1 shows that the largest concentration of vessels and thus probably the largest concentration crew jobs, both available and lost, are based in Washington state. The Seattle area in particular likely absorbed the highest number of crewmen losing their positions (Lewis 2005). As discussed more in sections below, the residence of a displaced crewman has a strong effect on alternative employment opportunities. Proportionately, however, as shown in Figures 2 and 3, the geographic distribution of vessel participation in BSAI crab fisheries, and thus likely of crew opportunities, remains virtually identical to the pre-rationalization distribution. The implication is that crew job losses were not disproportionately distributed between the states.

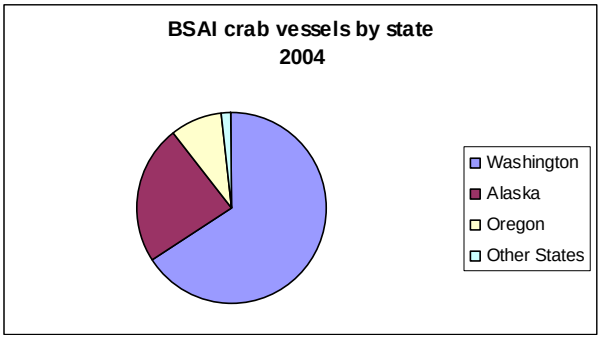

Figure 2. 2004 proportion of BSAI crab vessels by state of owner residence

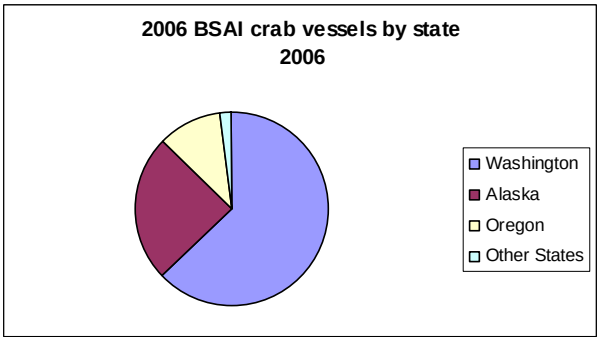

Figure 3. 2006 proportion of BSAI crab vessels by state of owner residence

Types of Crew Positions on a Vessel

Based on the information provided in ethnographic interviews, the types of crew positions on a vessel have not changed with rationalization. The basic categories of position continue to include captains (or skippers) and deckhands, where deckhands include greenhorns, engineers, and other sub-types such as deck boss. Our interviews do suggest, however, that there may have been changes in the numbers of certain types of crew, the qualifications of individuals filling the positions, and ways in which they earn compensation.

Captains

Captains or skippers[13] run the vessel. There is one captain per vessel and there may be a relief captain who can stand in as needed. The captain decides where to fish (sometimes in consultation with the vessel owner), when to fish (within regulation seasons and in coordination with processing plants), oversee the preparation and post-season care of the vessel, hire and direct the deckhands, and run the wheelhouse. At sea, the captain is in charge of everything and all authority to act flows from his command. Knowledge and judgment are among the most important thing captains provide to the fishing operation.

Captains must hold an appropriate State of Alaska Gear Operators Permit and this number is recorded on fish tickets at the time of delivery. To fish as a captain in a cooperative in the rationalized fishery, a captain must have the hired master classification. BSAI crab captains are usually hired by the vessel owner, which may be an individual, company, or CDQ group. Captains often have a long history with a boat or a company, usually working their way up to the position, and often having close relationships with the owners of the boats. An average experience is reported in interview notes from one such captain as follows: After being with the company since 1984, he

[13] Although some sources may differentiate Captains from Skippers in terms of licenses held or vessel ownership, we use them interchangeably in this report.

began to run the boat as a relief skipper in 1991 and in 1995 was hired as a skipper full time (captain, Dutch Harbor, #004). All the captains interviewed for this project appeared to be white and male and this seems to be representative of the group as a whole.

Captains are compensated in different arrangements depending on their relationship to the vessel owner, their level of experience, and their ownership of C-shares. In most cases, their compensation is proportional to the revenue earned by the vessel. Only captains, and not other hired crew, were eligible for C-shares in the initial allocation of BSAI crab quota and C-shares may increase their compensation significantly.

Deckhands

Deckhands carry out the hands-on activities of fishing and running the vessel. A vessel typically has 4-8 deckhands who are on call 24 hours a day at sea, but more typically work 12-20 hours at a time. Different tasks are associated with different types of deckhands, although there is a great deal of malleability according to skill, conditions, and the traditions of a particular vessel. Greenhorns, a term used to describe first season or early career crew, typically carry out the least desirable jobs, such as baiting the pots. Other routine tasks including cooking may revolve among crew or be designated to an individual for the length of the season. Engineers oversee the mechanical integrity of the vessel. If a deckboss is designated, he is a senior deckhand who will supervise the crew on deck for all activities, including pot pulling, sorting, cleaning, etc. Some vessels do not designate a deckboss, and at least one interviewee claimed that the position, or at least the label, was pushed by the producers of the Discovery Channel's Deadliest Catch television show (crew, Dutch Harbor, #008).

Deckhands in the BSAI crab fisheries are required to have a State of Alaska Commercial Fishing Vessel Crewmember License, which costs slightly less for Alaska residents than it does for non-residents. These licenses are readily available at fishing ports throughout Alaska and may be purchased online through the Alaska Department of Fish and Game (ADF&G). Crew licenses are not fishery specific and are not a way to link crew members to specific fishery participation. Unlike the State of Alaska Gear Operator Permit, crew license numbers are not recorded on fish tickets at the time of delivery. Engineers may hold special licenses, but these are not required.

In the BSAI crab fisheries, deckhands are almost always compensated in terms of crew shares. Crew shares are calculated at the end of a season based on a percent of the vessel's net revenue, which is defined as total landing revenues less any costs that are shared among the crew and vessel. The shared costs that come "off the top" of the landings revenue when calculating share payments differ by vessel, but can include fuel, bait, groceries, taxes, individual fishing quota (IFQ) or community development quota (CDQ), among other things. Individual crew share sizes differ according to one's experience and crew position and are denoted in fractions of a full crew share. Fractions we encountered during interviews included ½ share, ¾ share, full share and 1 ¼ share. Experienced crewmen are unlikely to work for less than a full share, while greenhorns can expect a half share, although there is no set progression. As one captain describes it: "The shares are along a continuum between ½ and full share crew. It's arbitrary but we

recognize experience and also provide extra incentives as bonus to reward guys. There is also room for people to negotiate" (captain, Seattle, #082).

However, more important to overall compensation than the fraction of crew share are the percent of vessel net revenue a full share represents. Evidence from participants in this research suggests a typical full crew share between 4% and 7% of ex-vessel net revenue. The range or crew shares can be corroborated more definitively through the EDR database in the future.

Demographic Characteristics of Crew

There is no reliable source of data on the basic demographic characteristics (age, gender, ethnicity, etc.) of BSAI crab crew. When available for use, EDR data on crew may be linked to ADF&G crew license data which contains information on age and gender (Carothers and Sepez 2005). The majority of interview subjects were working-age white males, and this appears to reflect the majority of participation in the fishery, with additional participation by Alaska Native, Latino and Pacific Island males. While it was discussed in theory that the conditions of the post-rationalization fishery could increase participation by foreign nationals, there was no evidence to suggest this was actually happening. The subject most raised by interviewees was the issue of age, although there was no consensus on the direction of impacts. A majority perceived that crew were getting older. A few informants connected that shift directly to rationalization because of both the diminished opportunity to enter the fishery – and diminished attractiveness – for younger people, as well as because of the ability to fish at a slower pace, as evidenced in these interview quotes:

- I see older crabbers now. Young people don't think there is opportunity in the fishery to start at the bottom and work way up, and doesn't think they want to work in jobs like this (displays his grease-blackened hands and fingers) (captain, Seattle, #075).
- "I know I am making more money now. And you don't have to be 19 years old anymore. We've got old guys now" (captain, Dutch Harbor, #004).
- "I'm not seeing a new generation here….the tide has shifted" (former captain, Kodiak, #079).
- "There's no competence in the fishery with young people. There's no future in the industry for young people" (crew, Seattle, #066).
- "I'm not seeing a lot of young guys trying to get into the crab industry right now. I think the word is getting out that you can support a family. I am optimistic" (boat owner, Kodiak, #088).
- "The hardest thing to do is get young people to work and save at the shipyard. Even at the John Deer store, it's all old guys there too" (former captain, Kodiak, #079).

However, some participants recognized the critical role of young men in the fishery, implying that younger entry level persons would continue to be hired, and even favored in the hiring process:

- "When you look at the majority of the crab fishermen out here it's like these older guys' generation….You don't see many kids my age out here. I have a handful of friends that are doing it. So when these guys all retire, who's gonna do it? I don't know. The fishery's gonna become more dangerous [because people have less skill] (crew, Akutan, #051).
- "This is my 25th year fishing with these [boat owners] so I want to hire someone who will stay for 20 years. A younger guy has that going for him and the positions that open are usually more physical, climbing pots etc" (captain, Seattle, #087).
- "It's a young man's fishery: You have to be agile, quick and take a real good whack now and then" (community member, Dutch Harbor, #007).

Clear demographic data on crew members through the Economic Data Report or ADF&G is necessary to track this trend.

Employment Opportunities

Hiring processes under the post-rationalization BSAI crab fisheries appear to have remained similar to those used prior to rationalization, although they are now manifested under new conditions and terms of employment. Captains largely control hiring decisions and social networks are the predominant factor in hiring. Many crew members are hired that have some connection to a current crew member, the captain, or an owner. Experience on other vessels and in other fisheries is valued, although having worked for too many vessels is seen as a negative, indicating the inability to keep a position by performing well or being too opportunistic. There are still opportunities for greenhorns on nearly every vessel. We were unable to quantify or compare the level of turnover in individuals filling crew positions.

Hiring Process

Captains are usually in charge of hiring. One Seattle based boat owner says "I hire and fire skippers and I give them a lot of rope to hire their crew" (owner, Seattle, #084). On the other hand, this was not universally true. A Kodiak-based vessel owner who asserts that "[hiring] is the difficult part of the industry" does it himself (captain, Seattle, #088). Crew on boats owned by large companies may be hired through corporate procedures. According to a captain of a boat owned by Trident Seafoods, the crew hiring process was done entirely through the company. The captain himself did not have a hand in the process (captain, Akutan, #055).

Word of mouth and reputation are used by both skippers looking to make a hire and people who are looking for a crew job. The vast majority of current crew interviewed said they got their current and past positions through word of mouth or a social connection through friends or family. Many made the connection through participation in another fishery, particularly salmon. The following selection of quotes and interview notes illustrates the point:

- "Who you know – it's completely about that. Especially now because it's an even smaller market with fewer jobs but not fewer people looking" (former captain, Kodiak, #079).
- A crew member got the job because of a connection made when he was fishing salmon. Has been with this boat owner, but on another boat, for 10 years [his entire crab fishing career] (crew, Dutch Harbor, #059).
- "I've always done business through social networks" (i.e., got jobs and hired crews) (captain, Seattle, #082).
- "You can get a job if you know somebody…there's real tight nepotism" (crew, Oregon, #077).
- "It shouldn't be based on networks, or friends [but it is]" (former crew, Dutch Harbor, #019).
- A former crew got his first job when he would meet people who became friends when they came to deliver ladings to processors on which he was working. He is still friend with these people (former crew, Akutan, #046).

In hiring decisions by captains, reputation of the job-seeker is paramount. Captains will check with their own social networks to evaluate an applicant, as illustrated by the following selection of quotes and interview notes:

- A captain would call other captains for hiring, more or less through the grapevine (captain, Seattle, #083).
- "I know all the skippers because the fleet has shrunk so I can ask them about someone who wants to be a deckhand and our jobs are coveted on this boat so I can be choosey. But they can be choosey about me too" (captain, Dutch Harbor, #004).
- "It's about reputation; you take both the good and bad into account" (former captain, Seattle, #082).
- "Finding a crab job is more like dating because it's more about who you know. If you cheat on your old lady, people will say things behind your back. And when you've got a girlfriend, everyone is interested" (former crew, Seattle, #076).

The hiring process for greenhorns, for emergency fill-ins after loosing a person, and in times when it is too difficult to find experienced labor is different since there often may not be a candidate presented through social networks with a reputation that can be checked. In these cases, hiring seems more the chance of finding someone in the right place at the right time:

- Greenhorns are hired off the docks and from processors (former captain, Seattle, #083).
- If I need a half share guy off the docks, "He's showing something just by being there" (captain, Seattle, #075).
- "Spots open up on the boats, because of injury, migration enforcement and so on" (community member, Akutan, #056).
- "Sometimes we're just forced to take a body. If it's warm, it's hired" (captain, Seattle, #087).
- "If someone came down here [Fishermen's Terminal] now, they'd be working ten minutes later" (captain, Seattle, #075).
- "They'll take anyone holding their head up, and those guys often go for less" (former captain, Seattle, #083).

As one interviewee suggests, this urgent-hire process is not really different from before rationalization. When under the gun, a hire will be made regardless of the skill level. He says that "Even before rationalization in the derby, Olympic style fishery, they [skippers] were filling out crew with less experienced people" (processing plant employee, Dutch Harbor, #014).

Job Qualifications

While the processes of hiring may not have changed since rationalization, there is limited evidence to suggest that the qualifications of those hired may have changed. Specifically, there seems to be a more bimodal distribution of skill and experience among crew (i.e., disproportionately more greenhorns and veterans than mid-career types) in the post-rationalization fisheries, whereas the former fisheries may have exhibited a more consistent or uniform distribution of experience.

For positions requiring experience, the level of experience expected may have increased, likely due to the greater availability of such crew due to consolidation and job loss:

- "The more competition, the more picky the skippers can be" (community member, Dutch Harbor, #007).
- A captain hired experienced crew, about 20 years of total experience each means they are efficient and safe (captain, Akutan, #047).
- "It's more efficient if you have guys who know what they are doing, and you spend less on fuel because you can go faster" (boat owner, Seattle, #084).
- "I don't really like hiring guys without experience anymore, but sometimes you have to….At least [more experienced crew] know what they are getting into and it's still a dangerous job [so it is important to have experience]" (owner, Kodiak, #088).
- People who are in the fishery now are good. They are the ones who could get good jobs. There are also, but on the best boats, even the greenhorns have a lot of fishing experience, and some of it is with crab (crew, Seattle, #037).

However, some interviewees suggested the opposite, noting that under rationalization skippers have more time, so they can hire less experienced crew because they don't have to respond to so much time pressure (community member, Dutch harbor, #007). A captain states that rationalization "has been about taking away the Olympic style derby and turning it into something more efficient. Efficient harvests allow more of a training period for the crew…. It is a good thing" (captain, Dutch Harbor, #062). Also, it should be noted that while experience is a desirable job qualification, not so if it has been on too many different vessels. Captains can interpret that as being unable to keep a job:

- "We'd prefer a greenhorn. If we're picking between someone who's been on a lot, on 10 different boats, we'd pick the greenhorn" (boat owner, Seattle, #084).
- "You can not move around boats too much, you get a reputation very fast for not sticking with a job throughout the season" (former crew, Akutan, #046).

A concern about safety arises form the hiring process: "The industry has been getting steadily lobotomized, as less experienced crew members hire from their field of friends who have less experience than they do….and it would be very difficult to quantify how much the average experience level is gone down. But due to the fact that the overall goal was to reduce labor cost. It would be safe to say that industry felt that this was an acceptable price to pay" (former captain, Seattle, #083).

In the context of a large available pool of labor with a high level of experience, the persistent position of the greenhorn is somewhat problematic. Why hire someone new to fishing when there is an ample supply of experienced crew? The answer to this question is multifaceted and examined throughout this report, but revolves around several primary factors: the greenhorn can be expected to do the less desirable jobs that experience crew will not do, the greenhorn can be trained to the vessel or captains particular way of doing things, and the greenhorn can be paid a lesser crew share, increasing the remaining available crew shares for experienced crew:

- "Sometimes there's an advantage to hiring inexperienced crew because they are more malleable and don't think they already know it all" (captain, Dutch Harbor, #058).
- "They can be trained the way we like on this boat" (captain, Dutch Harbor, #058).
- "Half the time it may not work out [with a greenhorn], but when it does it *really* works out. Eight times out of 10 it does not work out if it is someone who's been bouncing around a lot" (boat owner, Seattle, #084).
- A captain hired two greenhorns because the boat had lots of leased quota shares and a high number of full and large share guys so wanted to help them out (captain, Seattle, #065).
- "…So skippers can look for a greenhorn because they can play this game and there are guys fishing ½ shares for 4 years. It's cheaper to get a greenhorn then someone with experience and knowledge" (community member, Akutan, #050).

- "There are a lot more greenhorns fishing because older [more senior to the fishery] guys are not going to go out for $100/$150 a day for weeks" (community member, Dutch Harbor, #012).

The existence of a large experienced labor pool lies in contrast to sentiments expressed in interviews that many vessels have had a hard time finding crew in the several years since rationalization was implemented:

- "If you talk to skippers, they're not finding them [crew] but the press is full of stories of all those people losing their jobs" (processing plant employee, Dutch Harbor, #013).
- Alaska based boats are having the hardest time crewing up. There is a really limited labor pool that they can draw from (boat owner, Seattle, #084).

Of the wide variety of explanations offered by our interview subjects for the difficulty some vessels experienced in finding crew, the most persistent was the change in conditions (elaborated upon in the Work Characteristics section) since rationalization. As expressed by an observer of the fishery, "It's getting harder [for boats] to keep good crew because of conditions [season length and compensation rates on some boats]" (processing plant employee, Dutch Harbor, #014). These conditions include most prominently the longer length of fishing seasons and the effects of lease payments on compensation rates, each of which will be discussed below.

C-Shares

At the inception of the rationalization program, captains/skippers were issued shares to 3% of the total harvester quota. These quota chares are known as C-shares and like B-shares (10% of the total harvester quota), but unlike A-shares (87% of the harvester quota), C-shares are not matched with processing quota held by processing plants so deliveries can be negotiated with any plant. C-shares held by captains may thus yield 3% of the available IFQ every year.

The discussion of shares allocated to crew featured in several interviews and reflects the importance of the issue. The intention of C–shares is to increase opportunities for participation by crew, but the effect has been mixed (see also Lewis 2005). Comments reflected on the current value of C-shares to captains, as well as on the hopes of other crew members who do not currently hold shares. The lack of capital to buy shares and high levels of crew transience in the fishery suggest that C-shares may not be a sufficient mechanism to accomplish the goal of increased opportunity.[14] Many crew pointed out that C-shares are currently available to purchase, but that they can not afford to do so.

[14] A NMFS crew loan program that is intended to facilitate crew purchases of C shares will be established.

Crew members are very concerned about the lack of shares allocated to them at the inception of the program. The concern is about issues of equity and fairness as much as it is about financial opportunity and financial security: "At the inception of rationalization, council members put forward the 3% [shares for crew], which begs the question [for many crew members], why 3%? Why are only captains getting it?" (crew, Kodiak, #031). Another informant expresses a sense of deep disenfranchisement: "Owners got quota that is more than the boats [were worth]. What did crew get? They got handed a bleak future. They didn't have representation and that's the way things are going in this country. Labor is the last thing to get handed anything" (former captain, Seattle, #070). These perceptions of unfairness are significant indicators of a general sense of dissatisfaction and inequity and may be important in crew members' decisions about whether to continue to participate in the BSAI crab fisheries.

C-shares that were allocated to captains have also generated important positive changes for many. While some have left the fishery and subsequently sold their C-shares, others credit C-shares with their ability to continue to participate in the fishery:

- "Without C-shares, we'd all become bus drivers" (captain, Seattle, #082).
- "I like the IFQ part because it put a value on it. I started with those boats in 1979 or 1980 but none of that stuff (participation) had value. Boats themselves lost value (with rationalization) but access to the fishery, if you have IFQs, you're guaranteed a percentage. That's where the value is" (former captain, Kodiak, #081).

A former captain who is now in the longline industry elaborates on the importance of C-shares in his experience and the critical role he think they will play in the future of the BSAI crab industry as a whole:

> "When the allocations came out I received C shares along with a lot of other captains. With my new Job on the longliner I have been able to moonlight into the crab fishery the last 7 years making a trip as Captain or deckhand. I have also purchased C-shares…. This has allowed me to literally buy myself a position on deck or Captain at my convenience. Also making money on my shares as well as my wages as deckhand or Captain. My point on all of this is…that if a deckhand is to purchase shares (C-shares) this will strengthen his position as a key player in the industry and basically lay out the red carpet for him to climb the ladder in this industry. I would like to stress the importance of the C share program for the future of this industry. If you look at it years in the future this will be the way for a deckhand to build wealth towards one day becoming a Captain or owning a vessel himself. There is a lot of greed making decisions for the deckhands at this time, from owners who don't want to give anything, top CDQ corporations, and also the Processors who don't want their shares diminished. But if you look at this down the road when we are all dead and gone and the next new greenhorn is looking at starting in this business

there has to be something for him to make him want to go into this, and the C shares make this possible" (former captain, Seattle, #071).

A former crab crew and current participant in the halibut fishery corroborates that "quota is everything. [Boat owners] need guys with quota. Quota in the hands of crew is the next most empowering thing….No one wants to go back to the derby days, no true fisherman does, but something is not right and something needs to be done. C-shares need to be made available" (former crew, Seattle, #089).

Our research findings suggest that C-shares may play into hiring processes. C-shares can be used as assets that may influence hiring preferences. According to one captain, "Owners see me as an asset because I lease C-shares to them and then the boat gets to keep a percentage so it is a win-win situation. I hope it will push other crew and captains to do the same" (captain, Seattle, #071). However, from another point of view ownership of C-shares does not necessarily make a crew member who has purchased C-shares more valuable because it is not an important component in how crew are hired. A captain in Seattle relayed that C-shares are such a small addition to the larger quota pools, that even though C-shares could allow for some regional flexibility since they are not linked to a specific processor or region, they do not make a significant difference in these respects (captain, Seattle, #082).

C-shares are also considered to be important to the long term sustainability of the BSAI crab fisheries which certainly rely on individual skill and experience. A boat owner considers that "We'd like to see some IFQ in the hands of crew….Owners understand that to make the program work we need to get quota in the hands of crew, as owners we see that. We are thinking about what we can do" (boat owner, Seattle, #084).

Finally, crew express that if C-shares are made more accessible to them, for example through a loan program, C-shares may offer a means for crew to invest financially as well as socially in longer term involvement:

- "You should have faith in the fishery you're involved in [by investing in C-shares]….You should make the decision to buy into fishing, have faith in it" (former captain, Kodiak, #081).
- "In the past owners always ended up selling part of the boat to the crew so they could work their way up from the deck through engineer position to captain. You were obligated to pay for the boat because you'd get loans and take a financial risk. Now you're better off trying to buy IFQ" (former crew, Kodiak, #081).
- A crew considers that if he makes crab fishing his career, it would be silly not to invest in quota shares and attempt to buy them, but says he does not have the option of a good loan now and he is not sure about his commitment to crabbing as a career (crew, Seattle, #086).

It is important to recognize that the new goal of IFQ ownership has in some ways supplanted the former goal of boat ownership, and thus access to IFQ is another layer of both limitations and opportunities in a rationalized fishery. Indeed, the viability of

purchasing C-shares, and the investments they allow, appears to be a critical issue: "Crew very rarely were able to make their way up from deck to being an owner of a boat. With rationalization it is now easier for crew to not only own IFQ (as the investment amount is much smaller) but it is also easier for crew to buy a boat as there are now boats for sale for reasonable prices. As a matter of fact there are a handful of skippers who have done just that, went out and bought a boat with little or no IFQ owned and made a go of it. This would have been very difficult prior to rationalization and much more risky" (boat owner, Seattle, #084).

Non-Crab Employment with Vessel

Crew contracts may stipulate participation in shipyard work or other fisheries such as salmon tendering during summer months or cod fishing. As one captain explains, the boats in his fleet are kept busy for eight to nine months of the year and crew are expected to be actively involved. The crew contracts for this captain's fleet "encompass the whole package….including crab and cod and builds in salmon and shipyard work. A common scenario is to have a new crew do salmon tendering and if that works out then they come out for cod and crab." A typical crew contract with this captain's company has several basic components: vessel and crew names, terms and dates, crew shares, and a penalty if they leave early (i.e., if they quit they lose 1% share of what has already been fished). So if they were on a 5% share position they would get 4% of what has already been caught. These aspects of the contract serve as an incentive for people to not leave at the shipyard. The captain went on to say that while this is not always considered ideal, "people would like to do just king crab, hell, *I'd* like to do just king" (captain, Seattle, #082).

Indeed, while such contract relationships, or perhaps less formal agreements along a similar principle, were present for several current crew members interviewed, it was not the case for a majority. One crew member who was working in the shipyard over the summer months explained that he is never obliged to tender or fish cod as part of a contract because he signs a separate contract for each season (crew, Seattle, #085).

A former crew from Kodiak explained that in his view some of the ways in which losses to crew through rationalization have been calculated are flawed because tendering positions have been counted as jobs that make up for the diminished positions in crab. However, "saying there is no job loss because of tendering opportunities doesn't work, because we've *always* tendered" (former crew, Kodiak, #031).

Crew Employment Decision Making

Analysis of interview data has allowed us to develop a conceptual model of a generalized crew perspective on seeking and finding employment in BSAI crab fisheries. Conceptual models such as the one presented here are known as ethnographic decision models or

ethnographic decision trees. Like any model, decision models are empirically based representations of reality that can serve as an idealized 'map' – rather than claiming to *be* reality. They are particularly useful for the insight they provide into alternatives evaluated, points of contrast and comparison drawn, and contextual information about decisions. Essentially, decision models allow us insight into a set of factors that influence why individuals within groups make the decisions that they do (Gladwin 1989:8). Decision-modeling is done by aggregating information from several individuals. Decision models can therefore only be used as loosely predictive tools.

A central issue uncovered by this project is the process of crew employment decision making. Understanding how the decision is made to seek employment and when to accept an offer are particularly important given significantly fewer crew positions available and changed working conditions (especially lease fees and season length) following implementation of the rationalization program. The decisions made by crew whether or not to pursue employment may shed light on the apparent paradox that, in fact, captains appear to be having a difficult time finding crew to fill positions.[15] This model represents aggregated information about the decision-making processes of several current and former BSAI crab crew members about whether or not to pursue employment in the rationalized crab fishery. It is important to recognize that this model does not capture the sense that some crew may feel that they do not have a choice not to fish, but that given their skills for crab fishing, they must go fishing if they have a position. As expressed by one Alaska-based crew after calculating that he earns less crab fishing since 2005, "I'm unable to quit even though it's going to tear my body apart until I become a cripple. I owe the government money, and I can't get out" (crew, Dutch Harbor, #063).

Examples such as the considerations exhibited in the following crew members' narrative about fishing the 2007/2008 BSAI crab seasons help in the construction a crew decision model:

> "I'd never actually do the 70/30[16] thing, I was hoping it would turn out differently but it sure didn't turn out worth a damn. We should have made $80-100,000.00. We made $20,000.00. You're looking at $20,000.00 for a couple of months, what did we do before that? We didn't work, didn't work. If you have a family you have to go home and start working…Can I afford to quit my job on land when I have a wife and kids? Should I quit my land job now to go back to the ocean? No. So a lot of guys are staying home because they can't afford the downtime after our little $20,000.00….We [on this boat] fished all leased share… I'm still making, out of this 50/50[17] deal, I'm making pretty good off of it overall, I mean it's not what I expect I would have gotten in the old days….I had to actually go out and get a loan though after the [2007] king crab season to pay my year end bills! I went from a $36,000.00 pay check to a $20,000.00 pay check. Now people think that's a high pay check, but it really isn't. Not when it takes me $1,000.00 to get here and $1,000.00 to gear up. The longer I am away from home, it adds up. I

[15] We have not constructed a counterpart model of captains' decision-making about the hiring process, but such a model would provide important and complimentary information.
[16] Referring to the lease fees in the BSAI red king crab fishery that can amount to 70% of gross revenues.
[17] Referring to the lease fees in the BSAI opilio crab fishery that can amount to 50% of gross revenues.

have overhead when I leave the house. No one there's to fix my car, take care of the roof, shovel the driveway…. I have to pay for that so the longer I'm away from my home the more expenses I acquire. So it's not this big Discovery Channel paycheck for $20,000.00 in three days. We've seen that, but not anymore. We're fishing longer to make the same amount of money. We have to make the same money to pay the same bills. Now me, I downsized when this happened. I sold all my stuff when this happened, slowly liquidating assets. We're all in the process of downsizing" (crew, Akutan, #051).

Crab Crew Decision Model:

Step 1: Will a person seek employment as BSAI crab crew?[18]

Question 1. Do I need the income this year?

Primary evaluation criteria:

Economic status from other fisheries

Economic needs at home

Answer 1a. If YES = Possibly Seek, go on to Question 2.

Answer 1b. If NO = Probably Not Seek, but go on to Question 5.

Question 2. Is the income potential per unit of effort worthwhile?

Primary evaluation criteria:

Compared to other fisheries options

Compared to land-based options

Compared to the recent past

Answer 2a. If YES = Possibly Seek, go on to Question 3.

Answer 2b. If NO = Probably Not Seek, but go on to Question 5

Question 3. Is the time commitment away from land/homeport/family feasible?

Primary evaluation criteria:

Compared to other job possibilities

Considering current family needs at home

Compared to the recent past

Answer 3a. If YES = Probably Seek, go on to Question 4.

Answer 3b. If NO = Probably Not Seek, but go on to Question 5.

Question 4. Will the time commitment away preclude other necessary economic activities?

Primary evaluation criteria:

Other fisheries

Other land-based work

Answer 4a. If YES = Probably Not Seek, but go on to Question 5.

Answer 4b. If NO = Probably Seek, go on to Question 5.

Question 5: Do I need to go fishing now to hold the spot for future purposes?

Primary evaluation criteria:

Likelihood of future job availability

Likelihood of distribution of shares based on participation

[18] A consideration not listed here because it is not currently relevant under the stipulations for holders of C-shares is whether or not someone holds C-shares, and whether or not there are owner on board requirements.

Reputation and promised commitments
Answer 5a. If YES = Probably Seek, go on to Question 6.
Answer 5b. If NO = Probably Not Seek, but go on to question 6.

Question 6: Is the satisfaction I will derive from the job worth the work investment?

Primary evaluation criteria:

Dissatisfaction due to diminished crew compensation on leased quota
Answer 6a. If YES = Probably Seek, go Step 2 (Step 2 not yet drafted).
Answer 6b. If NO = Probably Not Seek. End Routine

Work Characteristics

Characteristics of work in the rationalized BSAI fisheries appear to have changed significantly under rationalization in terms of pay structure, season length, processor influence, safety at sea, and the compounding interactions between these factors. The impacts on work in the fisheries are extremely complex and effects of consolidation, quota leases, season length, crew experience, and safety are easily conflated. We make an attempt to describe these factors individually in the section, while also recognizing their interrelatedness.

Consolidation of the BSAI crab fleet was an intended goal of the rationalization program. By allocating resource privileges in the form of tradable quota shares, the number of vessels could be reduced and the quota shares of multiple quota holders could be 'stacked' on just one vessel. As noted previously, vessel numbers participating in the BSAI crab fisheries dropped from 256 in 2004 prior to rationalization to 85 in 2007. A processing plant manager emphasized that "we knew there would be consolidation under rationalization, but the amount was very surprising" (processing plant employee, Dutch Harbor, #014).

Owners of quota shares can lease quota to non-owners. These lease rates average 70% of gross revenues for king crab and between 50 to 60% for opilio crab. Whether or not quota is leased, and at what rate, influences compensation received per unit crew effort (or CPUCE). Whether or not additional quota is leased also influences the length of time a vessel will need to fish its quota, and thus the amount of time that crew members are active on the water. Evidence indicates that crew on boats that lease the majority of their quota earn less per CPUCE than before rationalization. Evidence from interviews suggest that these cumulative effects contrib.ute significantly to a low level of moral among crew.

Changes in Pay Structure – the Effect of Royalties

While some boats continue to fish only their allocated quota, many boats have acquired additional quota through leases or purchases. The lease rates are quoted at approximately 70% for king crab and 50-60% for opilio crab. The actual rates at which quota is leased to

specific boats can be analyzed with the EDR dataset. Quota acquisition and consolidation is an outcome of rationalization that facilitates vessel consolidation and thus lowers the total fleet costs of landing the year's total allowable catch. However, the benefits of lower overall costs do not come free, as vessels acquiring quota from idle vessels pay royalties for the right to land their fish. These royalties are then frequently deducted from the net revenue that is split among active vessel owners, captains and crew (as is often the case with other expenses like fuel, bait, or groceries).

Importantly, interview results suggest that there is no consistent way in which lease costs are passed on to the crew. Thus, the additional costs of leasing or buying quota beyond originally allocated quota share decreases the profitability of that additional catch relative to the allocated quota for all parties in various ways depending on how the contracts are defined. In some cases crew are exempt from the fees, and most frequently these costs are shared. In some circumstances crew are also charged for the quota the vessel owner received through the initial allocation (presumably to reflect the owner's opportunity cost of fishing that quota rather than leasing it to another vessel), which was particularly upsetting to interviewees. One former captain observed that "most boat owners are charging something on their originally issued quota, the ones that don't hold themselves up as examples. If for no other reason than they don't want the gravy train to end or the program to be cast in a bad light" (former captain, Seattle, #083).

While not yet a common occurrence, this practice has even outraged other owners who are against charging royalties on the quota they own that is fished on their vessels. A Seattle based owner observed that "In the Bering Sea there are a few who charge royalties on initially allocated quota, but the major players are not" (boat owner, Seattle, #084). In sum, the royalty fees charged to crew to share the costs of these quota acquisitions represented a particularly controversial and sensitive topic in our crew interviews.

In particular, crew members generally expressed that they do not want to work on a boat with high royalties because of their belief that owners are retaining disproportionate amounts of the earnings relative to effort. As expressed by one ex-crew member: "You don't pay someone that doesn't work" (former captain, Seattle, #070a). This is corroborated by the captain of a boat with a large proportion of leased quota who observed "I don't have a lot of people calling" (boat owner, Kodiak, #088). A Seattle-based crewmember states "Experienced guys are getting out if they can. Or getting the good jobs on boats with owner quota" (crew, Dutch Harbor, #045).

In one view, then, "through economic efforts, crew members have been aced out of the pie" (community member, Dutch Harbor, #012). A former crew calculates that "as a percentage of income made on the boat, you're making a miniscule percentage of what you could make before rationalization" (former crew, Dutch Harbor, #019). This view was widespread among those interviewed:

- "The fishing industry is dying because it is too top heavy… Money is sucked out of the industry off the top with little being put back into it. People say you are

doing OK because you are making money, but they are taking half so I feel I can say there is a huge disparity between owners and people [on the boats]" (crew, Seattle, #066).

- "I kind of expected it because it makes sense [economically]. Boat owners are OK, but crew are the ones who lose their livelihood…. I got an offer [of a job], but the money was so down. Plus I had friends who said it is not even worth it because the percent is so down. The boat owners are all getting the big bucks" (former crew, Akutan, #046).
- "I know captains who can't find decent crew…Owners will lease quota to other another vessel or to themselves and the crew gets paid on the remaining percentage after the lease fee, so crew are fishing for very reduced shares than [the crew] on vessels fishing their own quota. I think it's why crew are not fishing…For the most part [rationalization] is a good thing. 95% of the boats are not leasing to themselves" (former captain, Seattle, #068).
- Seattle-based crew: "There is no consistency [in the amounts and treatment of quota, whether leased or owned] from boat to boat….The worst [scenario] is a boat with little poundage but high lease, even a little poundage with no lease is better" (crew, Seattle, #066).

Where the problem seems to arise among vessel owners and crew on this topic is that while on the margin it may be financially viable for a vessel to lease or purchase additional quota, crew may not find the effective wage paid on those additional crab to be worth their time. For example, laborers may view this additional work as "overtime" of sorts and in many fields work above and beyond that typically conducted carries some type of overtime premium. Here, it is the opposite. Crew are effectively paid less per hour or per pound for this additional work. In many cases crew would rather not take on the additional quota but have no voice in the matter, and to earn the higher return on the allocated quota they must earn less per unit on the newly acquired crab. Moreover, and in parallel to the direct consequences to economic remuneration, interviews with experienced crew evidenced a sense of disenfranchisement. This is attributed observations that while the economic wealth generated by the implementation of quotas has accrued also exclusively to quota owner, income and bargaining power of crew has diminished relative to quota owners.

Alternatively, the business owner looks at the profit margin from bringing in additional crab and as long as it is still positive, it is still worthwhile to do so – especially since he has a large outlay of fixed costs that he must cover using the profits he earns at sea. Crew also recognize the business strategies at work here, noting that some boats will take higher lease fees "because a lot of these guys have boat payments. So, it's 'do I lose my boat or do I fish for less?'" (crew, Akutan, #051).

As other interviewees describe it, the problem may not derive from the royalties on leased quota per se, but the current lease rates for quota. As mentioned above rates as high as 70% are common in king crab and were reported by interviewees to approach 50%-60% for opilio crab. Thus, if a pie of owner quota is 100,000,000 pounds then the crew shares are 40% of the net revenue extracted from that, while a pie of leased quota

that is also 100,000,000 pounds becomes only 30,000,000 pounds after royalties are paid, leaving the slice of pie for crew shares still at 40%, but from a smaller pie (captain, Seattle, #065). A crew member echoed these sentiments, saying "I'd be happy with 60/40 [shares split in the king crab fishery]. At that, we could make a living" (crew, Dutch Harbor, #051).

Some current captains and crew expressed satisfaction with the amount of quota their vessels fish, both originally allocated (owned) and leased. One captain says openly that "I'm feeling lucky to be on a boat that does not fish leased quota" (captain, Akutan, #047). A captain on a vessel with approximately 700,000-800,000 pounds of crab, of which 500 is not leased, says that "you earn less on royalty crab but we cost average all the crab so you don't think some crab is earning you less" (captain, Seattle, #082). Another captain says that his boat has 1.8 million pounds of owned quota and 120,000 pounds of leased quota. He estimates that he earns $120,000-140,000 a year which is four or five times more than before rationalization. He summarizes that "for us its way better" (captain, Seattle, #075). Crew members may have a positive perspective on the increased earnings, especially given that they have already invested in arriving at the fishing grounds and the added income is beneficial: "Before you had to be really lucky to catch 10,000 pounds of king crab, now you can catch more so people are making more" (crew, Seattle, #085). A crew member who has a position on a boat with 256,000 pounds of owned quota and a further 1,000,000 pounds of leased quota feels that this is a good proportion, but says he would not fish if the amount of leased quota was increased (crew, Seattle, #073).

In fact, many crew expressed that they would not continue to fish if the amount of leased quota on their boat increased. In one case, interviews with five crew members on a vessel in Dutch Harbor were conducted minutes after the crew were told that they would be fishing a larger proportion of leased quota than they had early been lead to believe. This news arrived just hours before departing for the start of the BSAI opilio crab season. One crew member made the decision to leave the boat as a result (crew, Dutch Harbor, #044). In another interview with several crew members on a boat that was fishing all leased shares in opilio crab, one crew member said "We don't get paid enough…It's getting to the point where I'm thinking about jumping out completely." Another crew says it will probably be it for him as well. A third says "I build docks around Seattle now and that's where I'm at. I'm making just enough money down there to say it's not worth it to come up here anymore. Then what you'll end up with is a bunch of greenhorns on the boat. Guys are going to start getting hurt. Boat owners can't afford to fix the boat. They don't have money to work on them, he's [the boat owner] trying" (crew, Akutan, #051). Several themes here are discussed further is sections on greenhorns, participation in other industries and local opportunities, and safety.

In relation to the above section on crew experience and emerging trends, the changes to crew shares may be a disincentive for more experienced crew to continue in the fishery. One former crewmember from Oregon calculated that "When I looked at the numbers, I was not interested. There are tons and tons of good guys not doing it anymore because they are not interested in that type of compensation so there are less experienced people

coming in. It's still kind of attractive for someone who doesn't have anything else" (former crew, Oregon, #080). Another former crewmember from Kodiak corroborates that "Most of the real crab fishermen are gone because they won't work in these conditions. Those who are crabbing now are those who don't know any better" (former crew, Kodiak, #031).

The reluctance and even unwillingness of crew to fish leased quota on a diminished rate of compensation may in part explain the fewer than expected numbers of people looking for crew jobs in spite of the 1026 to 1674 crew positions removed from the BSAI crab fisheries following rationalization:

- "I know captains who can't find decent crew…Owners will lease quota to another vessel and the crew gets paid on the remaining percentage after the lease fee, so crew are fishing for very reduced shares than [the crew] on vessels fishing their own quota. I think it's why crew are not fishing" (former captain, Seattle, #068).
- "I was hiring guys I'd hired before and then fired, just to get [the job] done" (boat owner, Kodiak, #088).

There are follow through impacts to the hiring processes. As expressed by one crew, "the jobs that are left are competed for and it's swung the balance of power in favor of the employer. It has meant that they can hire people for less percentage because there are not many other options and you gotta work for a lesser job"(crew, Dutch Harbor, #063). A subsequent effect might be that "the captain makes money, but he also drops wages [because he can due to increased competition for those remaining 300 positions]. That's a secondary disaster" (community member, Dutch Harbor, #012). So, "to keep quality people you have to have a good crew share" (processing plant employee, Dutch Harbor, #015). There is thus a fear that "in the future, [control] will move further away from crew and consolidate the power in the hands of owners who will pay what they want to so that they will only get people that will work for that… who will not be experienced. Good guys aren't gonna stay" (former captain, Seattle, #070). In light of this, a Seattle-based captain says that he actually takes a reduced share in order to pay crew more because he wants to retain the good crew members who have worked with him for years (captain, Seattle, #065).

A final positive point about the effect of quota-based fishing was also made in some interviews. As one former captain and current longline participant emphasized that in contrast to the derby days when "we would go out and work for five to seven days straight [with] no guarantee of what you would make or if you owed the boat money if no crab was caught, at least now you know what you are going out to catch. Most vessels I know of pay the crew on original shares and then pay accordingly with the lease shares they fish. This in my opinion is working out for most guys and it will work itself out in time just like the Halibut & Blackcod fishery did (former captain, Seattle, #071).

Season Length

Two primary factors associated with the rationalization of the BSAI crab fisheries have increased the length of fishing seasons. Firstly, with rationalization came the end of the race for fish and secondly, fewer vessels have more fish to catch, keeping them on the fishing grounds for longer periods of time. Other factors were also identified as contributing, sometimes less directly, to longer season including longer soak times, the ability to wait out inclement weather or periods when the northern grounds become ice-covered, as well as delivery dates set by processing plants that may in turn dictate fishing schedules.

The "seasons are the same length if you only fish the quota that [the vessel owner] owns, but they are longer if you lease quota" (former captain, Seattle, #068). The increased season length may be problematic for crew who participate in other fisheries on one hand, but is also seen to "professionalize" the crab positions on the other hand. Depending upon how the longer seasons are managed, it may extend the time away from family and obligations at home or it may offer the chance to rotate crew and provide breaks to those who are involved in BSAI fisheries for up to nine months a year.

Under rationalization, the king crab fishery has been significantly extended. On captain remembers that "Before rationalization, people arrive in Dutch Harbor in early October for shipyard work. Fish for three days starting October 25th, tie up for 7-8 days before offloading the crab and the boats were tied up by the beginning of October" (captain, Seattle, #065). A crew member explains that-"Now the seasons are a little longer, before we would be out for about 2 weeks, now it's 2 months [for king]" (crew, Seattle, #085).

These longer seasons contrast sharply with the short seasons that existed since the late 1990s due to stock declines and additional vessel entry to the crab fisheries.[19] Previously, even with the race for fish, seasons were longer and may more closely resemble the current length of BSAI crab fishing seasons. For example, the Bristol Bay red king crab fishery alone extended for 40 days in 1980.[20] "It's only since 2000 [when seasons became that short] because resources tanked… Before that they were 4-6 months…. Some of those guys remember the 1980s when seasons were longer so they are happy with the way it is now" (boat owner, Seattle, #084).

While the post-rationalization season lengths have increased and boats are spending longer on the fishing grounds, there is a diversity of opinions about how this relates to rates of compensation. Many feel that they are working longer for the same or reduced compensation while others explain that the longer seasons does translate into greater pay overall. (A comparison of crew compensation as a percentage of total vessel cost from

[19] Some of the entry occurred due to "rent seeking" behavior by vessel owners seeking to establish a catch history (and thus quota allocation) as the fishery moved from regulated open access, to a license limitation program, and then to the subsequent rationalized fishery.

[20] See the 2007 BSAI crab SAFE Report for detailed historic season lengths.

before and after the implementation of the rationalization program was not possible for this report, but is recommended for future work.)

- "Now, the season is too long for too bad pay" (former crew, Kodiak, #027).
- "Rationalization is good and bad. The money is guaranteed, which is good, but you get the same amount for a lot longer season" (crew, Dutch Harbor, #005).
- "Now, we keep the boat busy eight to nine months of the year. So guys are working now much more, they are away from home more, and they are compensated more" (captain, Seattle, #082).
- "We work two times harder, twice as long for a third of the money" (crew, Kodiak,# 032).
- "With leases we're not making as much and we're gone for longer" (crew, Seattle, #066).
- "Other boats I could get on have too much quota [and you have to fish for longer to earn money] so I'm not interested in participating in the longer seasons. It would have to be a really attractive deal for me to consider going back to crab and it'd be a fill-in job for part of a season. I'd just go for a short duration not get tangled up in a long-term thing. If you get tied up in the shipyard and everything its over 7 months" (former captain, Oregon, #080).

There are, however, also positive outcomes of longer fishing seasons for some people. When it does not cause scheduling conflict, increased season length is viewed as a chance to increase the amount of money made overall, even if the compensation per unit of effort is diminished from the average pre-rationalization experience as noted above (and discussed in the following section). Additionally, longer seasons may be seen to justify the time spent in the shipyard preparing for fishing which is relatively the same regardless of a three day, three week, or three month fishing season: "Under rationalization we are working more but have the same amount of start up work as [we did] in the past but you're not paid anything for gearing up in Dutch harbor – 10 days getting ready for 3 months vs. 3 weeks" (crew, Seattle, #085).

- "Crew would rather stay out and fish royalty quota after they have fished allocated quota which they would have been fishing anyway [under rationalization]" (boat owner, Seattle, #084).
- "With rationalization we spend more time [crab fishing] and there is everything associated with that, including more money" (crew, Seattle, #085).

A further benefit is the ability of some boats to rotate crew and captains by hiring relief crew:

- "The boats that are doing the best try to get a revolving crew to give some people a break" (crew, Seattle, #066).
- "If there are long seasons, you also have time rotate out so you can see you family" (crew, Seattle, #086).

For some, longer seasons, together with increased job security and guaranteed compensation, contribute to the professionalization of the BSAI crab fisheries:

- "A lot of people are here as professionals, we call it 'our job' (crew, Seattle, # 086).
- "The guys that do have jobs have good jobs. They can make a living and raise a family. They don't have to get two-bit construction jobs when they're not fishing up here. More income means they can count in it all year" (captain, Dutch Harbor, #004).
- "Now they're fishing for a whole season – it's become a professional crew position. That stable type of position wasn't available before. It provides some level of security. You know the boat has quota" (processing plant employee, Kodiak, #034).
- "We're either crab fishermen or not….Now guys have a full time job. Before, you'd throw your dice. We were gamblers. Now you're a crabber" (captain, Dutch Harbor, #058).

Extended fishing seasons introduce temporal conflicts for crew members who do participate in multiple fisheries. Multi-fishery participation is often an important livelihood strategy based on diversification which may reflect individuals' abilities to adapt to often volatile and unpredictable fishing. Further, participation in multiple fisheries is lifestyle that carries deep cultural heritage:

- "The long seasons are really different. 3-4 months, it takes a different mentality" (Seattle based skipper 087).
- "In this day and age you have to go from one fishery to the next to make your yearly income and we can lose that opportunity to make the income you need when you miss the open day" (crew, Akutan, #051).
- "People give up on crab because they spend more time on halibut and salmon. "I have two crew who can't commit because they are working in Halibut in March. The halibut season has been extended and there is more money" (captain, Seattle, #065).
- "There are short pulse fisheries. I won't hire someone who wants to go halibut and Pollock fishing. He's not a professional crab crew and I won't hire him. Now you can be a crab professional and make good money for 6 months of fishing…. But we pay better than anyone because we have so much quota" (boat owner, Seattle, #084).

Crew and potential crew members' abilities to commit to longer fishing seasons is also a factor in hiring processes and may contribute to the apparent lack of employable crew observed by some captains.

- "Captains are not finding crew. People are making good money, but they are gonna be up there for a long time – all seasons, 6 months to a year. So a guy could make more than he used to, but there's no way he could keep a second job" (former crew, Seattle, #070).
- "I've testified to the council about crew positions, I always have conversations with other captains, like on the Sea boats, that we can't find crew. It's just the

guys looking for the two-week wonder jobs that can't find work now. But it's people who need to commit to 8 to 9 months that we need and can't find" (captain, Seattle, #082).

Compensation per Unit of Crew Effort

A major affect of rationalization reported in our interviews pertained to the rate of crew earnings relative to work, or compensation per unit of crew effort (CPUCE). This results from the longer seasons and the 'extra' costs of fishing leased quota. As detailed above, royalties are paid on quota that is leased and "when you have lease shares, a lot of the costs flow through to the crew" (former crew, Dutch Harbor, #019). Crew may therefore receive a lower rate of compensation per hour or per crab unit than they had prior to rationalization. The effects on CPUCE are largely driven by changes to pay structures detailed above. The combination of extended fishing seasons and reduced CPUCE mean that, in the words of one captain, "it has been a hard adjustment to go from derby to rationalization. Some can't adjust, including financially" (captain, Dutch Harbor, #004). This was explained according to one crew member's experience that prior to rationalization crew shares comprised for 5-7% of gross earnings. Fuel, bait, groceries, and associated taxes including delivery fees, were taken out of the total, and then crew shares are paid off of the remainder. Now, the lease is paid off the top then shares and expenses come out of the new remainder (crew, Seattle, #066). Thus, the job security of a longer season based on guaranteed quota does not necessarily make a position on a crab boat more desirable. As this crew member elaborates, "it doesn't matter if you know you are going to make $20,000.00 when you work 3 times as long and 3 times harder for the same thing" (crew, Seattle, #066). Another crew member who has not fished since the first year of rationalization (2005) calculates that for the same amount of crab fished, he would have earned significantly more than $100,000.00 in 1999 and only $29,000.00 in 2005 (former crew, Oregon, #080). Another crew calculates that he "went from $45-50,000.00 fishing year round down to $25-30,000.00 for both king crab and opilio crab" (crew, Akutan, #051).

A recurrent concern expressed in interviews was a shift toward a wage-based workforce with increasing numbers of undocumented participants who may not have legal standing in the United States and therefore less recourse to enforce their rights:

- "I see it that the only people who really come out ahead on this are the owners that own the quota. So now you get the fleet, the workers, making less money, but they are working longer too so there might be some boats that keep them on the full share thing and they're making good money and some boats say no…it's a monthly salary and that's it" (Plant manager, Dutch Harbor, #002).
- "If we continue down this path, there will be even fewer jobs, they'll be drafting wagers on the decks" (former crew, Dutch Harbor, #006).
- Guys who will do it for $100 a day "It's an indentured servant thing" (former crew, Kodiak, #023).

- "It used to be about how much you could catch, now it's about how cheap you can catch it…and that goes for the people too" (former crew, Seattle, #070a).
- "Serious guys ended up staying because no one's gonna put up with a so-so deckhand in this diminished employee pool…they're gonna pick the best they can and they're gonna dictate to us what they're gonna pay us….they are giving us one price up front and now we're looking at getting [it] knocked down" (crew, Akutan, #051).
- "At some point we will reach the bottom line scenario – that people will not work for diminished pay due to lease fees – but by then, everyone will probably be working for wages anyway" (former captain, Seattle, #070).

It is important to recognize that the livelihoods derived from fisheries are always dynamic and responsive to multiple factors. One former captain who has been involved in BSAI crab fisheries from 1979 to 2007 emphasized the economic outcomes of the trends he experienced during his fishing career: "The TACs (total allowable catch) were higher [on opilio crab] from the mid 1980s to the mid 1990s and we might be fishing from early January to late June, and making $8-10,000.00 per month. That was good. But then it changed and from the late 1990s until rationalization you could not make a livelihood just fishing" (former captain, Seattle, #090).

Finally, lower prices for crab as a result of the world market for crab also contribute to lower revenues extracted off the crab harvests. These global market fluxes are unrelated to rationalization, but we are aware that from the point of view of crew who are receiving less compensation per crab, these two contributing factors may become conflated. A drop in prices for crab products in the first years of the rationalized fishery was in large part due to high numbers of Russian crab flooding world markets, increasing supplies and reducing prices. According to the Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions 2007 Crab SAFE, ex-vessel prices for red king crab fell from $4.71/lb in 2004 to $4.24/lb in 2005 and $3.48/lb in 2006.[21]

Processor Delivery Schedules

Most processing plants which hold processing quota for A share BSAI crab have responded by implementing scheduled deliveries to specific plants. Deliveries are further regionalized by community protection measures. The coordination of deliveries is negotiated prior to the opening of the fishing season by boat cooperatives and may reflect historical relationships between boat and processor companies. As of the 2007/2008 fishing seasons at least one major processing plant has refrained from setting strict delivery schedules in recognition of the hardships this may impose on fishing. Keeping a processing crew on hand and the processing lines open incurs costs that could be reduced by scheduling deliveries, but the processing plant sees it as a way to attract B and C share

[21] See table 2-2 on page 6-31 of the 2007 Crab SAFE.

crab that are not designated to specific plants as well as reflecting a longstanding relationship with a loyal fleet (plant manager, Dutch Harbor, #014).

A significant economic incentive to comply with agreed to delivery dates comes from the fear that the price will be lowered by processing companies if deliveries are received behind schedule. On the topic this topic, one crew asserts "Tell me that doesn't impact us as much as competing [in derby fishery]." A captain shares the view that "rationalization may have done away with the race for fish derby, but the 90/10 split has created a 'processor derby' in its wake" (captain, Dutch harbor, #020).

Initial difficulties in the first years of rationalization caused by the scheduling of delivery dates may be getting 'ironed' out:

- "The canneries improved in a year. Last year we had 30 days between deliveries of opie's, but this year they're working tight" (captain, Dutch Harbor, #058).
- "[Delivery and offload coordination] is getting better. I thought it was a total joke the first year. But it's getting better. If you have to wait in line for 4 days to offload, the opportunity cost of fish not caught is greater than the price of fuel and expenses to get to another processor, get offloaded sooner, and get back out to fish" (captain, Seattle, #087).

The benefits of scheduled deliveries, especially when well coordinated with a vessel's fishing grounds (usually through planning within the coop), are that fishing, deliveries, and the vagaries of weather (or other unpredictable influences) can be synchronized. One captain happily recounts that "It's the most beautiful thing. I know when my dates are: I could fill the boat in 3 days if I wanted to, but I have 6 days between deliveries so I can also be more cautious…So, if I'm stressing I don't have to haul gear. If I starts blowing, I say 'guys, we're done' " (Captain, Dutch harbor, # 058).

However, an apparently more common response to processor delivery schedules that stipulate the date and location of offloads are of dissatisfaction, ranging from mild to critical concern about risk from unsafe conditions that perpetuate under the 'race for processors':

- "The worst thing is the 90/10 split. It was sold on safety. It is not about safety. I fish in really inclement weather because they drop the price if you miss the deadline [for offloading at the processor" (crew, Seattle, #073 crew).
- "A few years ago we delivered to St Paul, so now we're committed to them. But often it's bad weather. That happened once, we couldn't get in [to make the offload] and processor charged us for each day [that the delivery was delayed]" (crew, Dutch Harbor, #008).
- "It's really a time deal. We're only sleeping 2-4 hours a night to meet delivery schedules, especially if we haven't been on the crab" (crew, Seattle, #073).
- "You're still not able to sit out high winds because they're under the gun – the processors dictate the schedule" (former crew, Kodiak, #023).

- "The industry hasn't done anything but worsen: It is not safer…[processor] companies dictate delivery times. You better have your crab or they'll put you off" (former crew, Dutch Harbor, #006).
- It's not safer because we still have to fish weather to make processor dates. If we miss it, we have to wait a week and time is money so it is expensive (captain, Akutan, #047).
- "There are still problems. The reason my boat has a hole in it right now is processor consolidation" (captain, Seattle, #065).
- "It was a lie to predict that safety would increase, a total lie because with the 90/10 split allocation the processors control explicitly everything they need so they have a …time schedule so they dictate delivery dates. It's still an incredible race for fish and safety is not improved" (former crew, Oregon, #080).

In summary, the information elicited in our interviews suggest that pre-arranged processor delivery schedules have a range of benefits and potential costs that must be considered by skippers. Benefits can be obtained by avoiding the need to wait in a queue to deliver at flexible delivery processors (e.g., decreased crab deadloss, smaller opportunity costs of time and profits that could be earned in other fisheries, fewer groceries consumed by idle crew). These benefits must be weighed against the costs of delivering instead to another processor with a fixed delivery schedule (e.g., decreased trip flexibility, potential price cuts for not meeting the delivery date, safety considerations associated with avoiding such price cuts, and potentially higher fuel costs if such processor is geographically more distant than the flexible delivery plants).

Safety

Safety concerns have dominated the discussion of rationalization. After nearly three years of implementation of the rationalization program no fatalities have occurred in BSAI crab fisheries. Still, opinions diverged in our interviews about the success of the program to meet its safety-related goals. Indeed, the extreme conditions of the Bering Sea mean that safety risks can never approach zero.[22] Many see safety as having declined because of the trend to lower costs across the board so that the remaining boats "are the ones that were able to operate the most efficiently and the cheapest" (former captain, Seattle, #083). Others believe that boat maintenance has in fact increased and that where as in the past vessel owners had to make difficult decisions to address only the most urgent maintenance issues, now the boats receive total overhauls at more frequent intervals (former captain, Seattle, #090)."

Some see the inability to change that fact as the ultimate cause of hazardous conditions that remain independent of safety measures: "It's not safer on the water. You're still under pressure, and it's still the same problem: if you go over, you'll probably die" (crew,

[22] Statistics from the US Coast Guard pertaining to incidents on the Bering Sea reported on BSAI crab vessels needs to be analyzed in this regard.

Seattle, #037). As mentioned in the section above, the imposition of delivery dates and penalties if they are missed are seen to replace the "race for fish" with an equally unsafe "race to the processors".

Others agree that changes have been minimal, and if safety has increased it is attributable to efforts of the Coast guard rather than outcomes of the rationalization program:

- "It hasn't changed an iota. When it is blowing SW 70, I don't care what quota we have" (crew, Dutch Harbor, #063)
- "It's a little safer. We're still doing the same thing 90% of the time in the same weather. There are some cases when we're working like idiots in idiot weather. Especially if have a lot of pounds" (crew, Seattle, #086).
- "The coast guard would say this is because of the enforced dock side inspections preseason" (Captain, Seattle, #082)
- It was not completely unsafe before rationalization. If the weather was predicted to be really bad, the coast guard wouldn't let us go out (captain, Dutch Harbor, #015).

Safety fears pervade, in spite of the intention of the Program to improve safety for boat captains and crew. The BSAI crab fishing is carried out in an inherently hazardous environment. However, the difference between hazard and disaster is the difference between risk reduction and no change in safety measures. That safety concerns perpetuate under the parameters of the Program testifies to the need to continue to improve safety measures, perhaps through training, education, and intensified vessel inspections.

- People still have to go out in bad weather because of fuel costs and other overhead (Plant manager, Dutch Harbor, #002).
- "The whole safety thing, that's half of it turns out not to be true!" (former crew, Dutch Harbor, #012).
- "Safety was a smoke and mirrors thing. Nothing has changed" (captain, Seattle, #067).

Fewer boats on the water following the federal buyback and implementation of the Program also means that boats in distress are more isolated and potential help is further away. Moreover, the longer seasons are seen to increase exposure to risk. "It took one month, now it takes 2- 5 months and you take more risk because it takes more of your time [and the longer you are out here the more exposure you have]" (former crew, Seattle, #066).

Time is money on the water, and costs combine with fishing conditions to motivate expedited fishing:

- "There are other reasons for fishing as quickly as possible, and other constraints that mean that just stopping the derby style is not enough to change how safe it is out on the water when we're fishing for crab. Processors push us through, and captains just want to get home" (crew, Dutch Harbor, # 008).

- "I don't want to spend extra money on food and fuel so need to make sure we get to the processors" (captain, Kodiak, #047).
- Some people say you don't have to go out when it's shitty, but we went out anyway because the captain makes the call – "he says work, we work" (former crew, Akutan, #048).

Levels of crew experience have implications for safety in that less experienced crew may not be versed in maintaining safe practices at sea and may not have the knowledge about boats to identify problems. A high crew turnover rate may also contribute to lower concern about maintenance and upkeep of the vessel:

- Worried about ever being in a situation with inexperienced crew who are dangerous (crew, Akutan, #047).
- "If you want safety, you have to have guys who will stick around longer" (boat owner, Seattle, #084).
- "Safety is one of the biggest issues. Now, people on boats are not fishermen, but others, who will work for less. They don't know the boats, and don't know if something is wrong" (former crew, ex crab crew, Kodiak, #027).

Importantly, others perceive an increase in safety under rationalization underscoring that fishing is a diverse practice and individual boats are managed differently. Further inquiry into safety issues could help to identify the variables that contribute to the variation in views on safety, but was beyond the immediate scope of the present study. Increases in safety are due to a slower pace of fishing and the ability to wait out inclement weather:

- "Oh, it's night and day. Now, we can just stop because some bad weather came up so the risk factor is diminished. How do you put a $ sign on someone's life? Nothing else you say holds water….1,000 jobs does not equal one person's life" (captain, Dutch Harbor, #004).
- "One thing, it's made it safer. [Avoiding bad weather means] less stress in equipment [and] less stress on crew" (community member, Dutch Harbor, #007).
- "[There are benefits from] slowing fishing down, with fewer injuries now and I don't know if there has been any loss of life sine rationalization" (captain, Seattle, #082).
- "If a big storm blows in, we don't have to go out" (crew, Oregon, #077).
- "The 80 boats remaining [in the fishery] are the 80 best boats" (captain, Seattle, #065).
- "You get a whole night's sleep as opposed to 3 hours in open access fishing" (captain, Dutch Harbor, #058).

Alternative Employment Opportunities

Alternative and additional employment opportunities may affect crew members' abilities and decisions to participate in the BSAI crab fisheries. Multi-fishery and even multi-industry approaches are harder with longer crab fishing seasons and other obligations to

the boat that now extend across several months. As related above in the section on work conditions, longer seasons may prevent participation in multiple different fisheries or industries by increasing the annual time commitment related to crab fishing. For many, longer seasons in crab may represent job security, but problems arise for others who depend on income from crab fishing to support other endeavors such as other fishing operations or small businesses. As expressed by a Seattle based skipper, "I think this is becoming a full time job and a lot of displaced workers were happy as part time because they did so many other fisheries, pot cod, etc. That's the type of fishermen they are – that's why they are out of work [in the crab fishery]. [Crab] is all our boats do. We're dedicated to our boats.' (captain, Seattle, #087). Another skipper also from Seattle emphasizes the changeable nature of fishing and the need to be resilient: "I am a third generation fisherman, that is just a decision you have to make" (captain, Seattle, #082).

Participation in other fisheries

Multi-fishery strategies including participation in BSAI crab fisheries are common amongst crew members interviewed for this project. When asked what other ways they would be earning income if not on a BSAI boat, many responded that they would be concentrating on other fisheries. Many of the more highly experienced current participants in the BSAI crab fisheries stated that they tend to focus on the winter opilio season as opposed to participating in king crab. Two factors most likely explain this. Firstly, the lease fees are lower on opilio crab quota that king crab quota (around 50% as compared to 70%). Secondly, the opilio crab fishery occurs in winter months when there is less conflict with other fisheries. In the experience of one Kodiak-based crew member, October (during the king crab season) is spent fishing Halibut and he has not fished during a king crab season for several years. He notes that "the guys with the most experienced fish opilio because they are fishing other fisheries during the other seasons" (crew, Akutan, #047).

An ex-crew member from Oregon who has moved into other fisheries says he would consider a one or two week trip to fish opilio an attractive prospect, but it would have to be during the January opilio season because he had other fishing obligations during the king crab season. He says he is unlikely to go opilio fishing if he can survive with income from his other fishing because he does not find the opilio season attractive, "because it is crappier weather, less money, and 60-66% lease fees off the top so you never hit $2…. You're fishing on $1.2, $1.1. then it's 3-5% of that for crew, so it would have to be a whole boat load to make it worth it." This crew member stopped fishing two years after rationalization was implemented because of the longer seasons which pushed into the longtime fisheries that he felt were ultimately a more lucrative investment. The 'jump off date' had been agreed to with his previous skipper, and he says "so I left and stayed longlining" (former crew, Oregon, #080).

Another ex-crab crewmember from Alaska explains that he was lucky to have investments in other fisheries that allowed him to transition when he was no longer able

to work in the BSAI crab fisheries: “Quality crabbing was one of the best things that I [knew]. It’s just the way it happened. Forced me out. Also forced me to pursue other economically successful pursuits. I don’t think I can achieve my goals in the fishery anymore. But, every cod I catch is one less that someone else [in the cod fishery] is not catching” (former crew, Dutch harbor, #019).

For others, it has been difficult to support a multi-fishery livelihood without participation in the BSAI crab fisheries. This is expressed by a former captain: “So crew are out of a job, guys who I’ve worked with for, 28,27,29, and 41 years. They were with me in all different fisheries, but not anymore because we can’t afford to crab” (former captain, Dutch Harbor, #064). A former crew in the BSAI crab fisheries explains that he fished crab every season between 1992-2003, as well as halibut and black code. Now he says he makes $130,000.00 less than before rationalization by “scrambling” from one work opportunity to another: “Guys call me ‘the butterfly’” (former crew, Oregon, #078).

Participation in Multiple Industries

The relatively concise pre-rationalization crab seasons were conducive to multi-industry strategies that correspond to season or temporary land-based work. Landscaping, construction, and heavy machinery operations were the most frequently mentioned alternatives. Also mentioned were ranching, ski patrol, car mechanic and helicopter pilot. Several people also held tugboat licenses. The multi-industry combination may have been what made participation in either sector viable. “If you look at what the traditional job was 3-5 years ago, some people just came in from carpentry, etc. for a of couple of weeks – it’s different for people that tendered when not on the crab boats” (processing plant employee, Kodiak, #034). In some cases, work outside of the fisheries represents an investment for the future that is currently subsidized by crab fishery earnings. Crab fishing is generally considered a younger profession relative to other industries and thus long-term planning would need to entail other options. Qualifications such as an engineering qualification facilitate transition between fisheries as well as industries (former captain, Seattle, #083).

Options and opportunities are constrained by location as well as skills. An ex-crew member explained that following from the effects of rationalization he no longer had a position on a boat and “so I started doing construction. But I thought about [going BSAI crab fishing again]…I would have gone fishing if the money was still there. If I was paid more, I’d still fish” (former crew, Akutan, #046). This emphasizes that fishing, including crab fishing, must remain competitive with the local economy, as emphasized by one Seattle-based skipper (boat owner, Seattle, #084). Regarding those who have left the fishing industries, one former captain notes that “most of the [crew I knew] have landed on their feet, but they are doing different things” (former captain Seattle, #068).

Effects Structured by Local Opportunities

The effects following from fewer available crew positions as an outcome of the rationalization are strongly dependent upon the locally available alternative opportunities. The metropolitan context of Seattle offers an economy that can readily absorb those displaced from the BSAI crab fishery. However, the required skill sets and an ability and willingness to be in Seattle would need to be present. Retraining opportunities exist and have encountered limited success. Seattle-based crew members who participate in the fishery may find year-round occupations through shipyard work or tendering opportunities. As mentioned above, a local economy may provide opportunities with which fishing positions must be competitive. As one former crab captain explains who is now participating in longlining fisheries, "I'd take a crab job, but it would have to offer more than I am making now" (former captain, Seattle, #083).

There is an immense variety among the local economies to which displaced crew may have recourse. At one extreme is the larger metropolitan area of Seattle. Rural Alaskan communities are also diverse, ranging from coastal to landlocked, CDQ and non-CDQ communities. For instance the community of Kodiak is characterized by its historical dependence on commercial fisheries. Indeed, as expressed by one crew member, "The only reason to be here is the fishing…"(crew, Kodiak, #031). Another Kodiak local relates that "I'm interested in fisheries where I can fish locally" (former crew, Kodiak, #023).

Many fisheries seasons in which fishing community residents participate are in conflict with the extended BSAI crab seasons. Fishing community-based crew may therefore find it particularly difficult to maintain the multi-fishery strategies that characterize their economy. Without income afforded by participation in the BSAI fisheries, however, many may struggle to make a viable income throughout the year with other fishing activities.

In Akutan an ex-crew member explains that: "I'll probably get into black cod that's open in the three miles around the island. That's enough." He says that there is more money doing cod, about 50 cents per pound which compares favorably with crabbing, which for him, is about $30-35,000 per season. He continues, saying that "I can do better sitting here then fishing [for crab]. Me and my dad do cod and halibut. It's close to home, and fuel costs are not so bad. If I wasn't fishing, I guess Id be doing construction here" (former crew, Kodiak, #048). At the time of this research, two other ex crabbers were employed on a local construction project and some work opportunities may be afforded by Akutan's status as a CDQ community.

Summary of Conclusions

The purpose of the research reported here has been to understand how employment opportunities for commercial fishing vessel crew members have changed in the Bering

Sea and Aleutian Island (BSAI) crab fisheries following the implementation of a quota-based management system by the North Pacific Fisheries Management Council (NPFMC). We have conducted 90 ethnographic interviews in several Alaska, Washington, and Oregon communities with 134 current and former crew members, captains, boat owners, processing plant employees, and other stakeholders. Participants were selected using snowball and intercept sampling methods that were determined to be the best available options. We attempted to canvass a broad sample of the population, speaking with people along a continuum from those who perceive increased benefits under the rationalization program to those who feel deeply disenfranchised by it. While we have chosen to convey many direct quotes in this report, they are not idiosyncratic anecdotes, but rather illustrations of commonly expressed sentiments. The importance of conveying the crew perspective, on which we focused, is underscored by many issues raised in the interviews which merit rigorous scientific inquiry. As such, the conclusions drawn from the information provided by crew in this report identify several testable hypotheses that can and will be pursued in future research to identify the validity of the common assertions.

The primary conclusions regarding the elements of crew composition that have been affected by rationalization are that the number of crew positions available in BSAI crab fisheries have significantly declined. A major portion of this contraction is due to vessel consolidation and a smaller portion can be attributed to the buyback that occurred prior to rationalization. Geographically, the majority of the decline has likely been aboard Seattle-based vessels, with significant decreases also occurring aboard vessels home-ported in Alaska, Oregon, Other Washington locations, and other States. Indirect evidence suggests that the overall proportion of positions crewed by state remains the same. Separate from the number and distribution of crew positions, the types of positions available on vessels and tasks associated with those positions remain essentially the same as before rationalization, although there are significant changes to the structure of compensation and some likely changes to the types of individuals employed, possibly favoring a mix of older crew members with new entrants known as greenhorns. This trend suggests a more "bimodal" distribution of crew skill between greenhorns and veterans, as opposed to a more uniform distribution of skill and experience that may have been predominant in the pre-rationalization period. It will be very difficult (perhaps impossible) to obtain demographic information on former crew to bear on this issue. However, it may be possible to more definitively address changing demographics in the future through crew license number data contained for many crew in the EDRs if those numbers can be merged with the State of Alaska database on crew license demographics. Similarly, if the proposed crew participation data collection program currently being scoped by the State of Alaska is enacted such research could be viable.

The primary conclusions regarding employment opportunities are that hiring processes under the post-rationalization BSAI crab fisheries appear to remain very similar to those used prior to rationalization, although they are now manifested under new conditions and terms of employment. Hiring is largely carried out by captains, sometimes in consultation with crew members. Social networks and reputation (of person seeking employment and of the boat) may play a large role. There are different strategies when it comes to crew

qualifications. Some captains will try to hire the most experienced people available. Others will adopt a strategy of hiring less, or un- experienced people who can be specifically trained. This explains in part why, in spite of a surplus of non-employed but highly qualified and experienced crew members, there are still hires of greenhorns and people new to the fishery. It is also explained by the pay structure: less experienced crew may be paid relatively less thus leaving more of the net revenues allocated to crew shares for more experienced members. Another very important factor is that experienced crew may not want to work for the significantly diminished returns per unit of effort that may arise on vessels with high quota lease rates; such vessels typically charge royalties to crew on the purchased or leased shares which in turn leads to lower net revenues earned per pound by the crew on the additional crab, lowering their average compensation earned per pound of crab during the trip.

Related to these issues is a perceived increase vessel expenditure (factor) shares for capital (to buy quota) and decreased shares for labor. Such a shift is consistent with a decreased emphasis on having the best, fastest crew to maximize vessel returns (which was important in a derby fishery). Now, since the catch is essentially guaranteed, the returns to the vessel may be maximized by utilizing the economies of scale on the vessel and leasing/purchasing quota to bring in greater revenues to cover the fixed costs of the vessel (lowering average variable costs).

C-shares are seen as important investments in the fishery that allow captains (and in the future perhaps also crew) to make financial in addition to physical investments and may be the difference between staying in the fishery and deciding to leave. A crew employment decision model based upon the considerations expressed by interviewees illustrates the cognitive process involved in deciding whether or not to seek employment in the BSAI crab fishery. The model includes considerations of: financial need, relative, potential compensation, temporal investment, alternative opportunities, and future considerations.

The primary conclusions regarding characteristics of work in the rationalized BSAI fisheries are that they appear to have changed significantly under rationalization in terms of pay structure, season length, processor influence, safety at sea, and the interactions between these factors. The impacts on work in the fisheries are extremely diverse and complex, and effects of consolidation, quota leases, season length, crew experience, and safety are easily conflated. We make an attempt to describe these factors individually in the section, while also recognizing their interrelatedness.

Quota acquisition and consolidation is an outcome of rationalization that facilitates vessel consolidation and thus lowers the total fleet costs of landing the year's total allowable catch. The profit margin for crab that are leased or purchased is much less than for those given through the allocation, and so the return on the additional crab is lower for both crew and the vessel owner(s). The lease rates are quoted at around 70% for king crab and around 50-60% for opilio crab. The actual rates at which quota is leased to specific boats can be investigated in EDR data. In turn, depending on the extent to which a boat fishes their allocated quota versus purchased or leased quota, crew can experience a diminished rate of compensation per unit of crew effort compared to pre-rationalization rates. From

the vessel owners' perspectives and observed behavior it appears clear that it is often financially worthwhile to acquire additional quota, but crew often conveyed the opposite opinion in the interviews. As illustrated in the decision model and several other quotes included in this report, crew may decide not to work on a boat with higher royalty charges.

Longer season are another consequence of transition to a quota-based fishery. Longer seasons may provide greater job security and contribute to a "professionalization" of the BSAI crab fisheries. However, longer seasons can create potentially insurmountable scheduling conflicts for those who also participate in other fisheries. To accommodate the longer seasons and avoid idle plant time, many processing plants have developed delivery schedules which have reportedly had the effect of dictating the pace of fishing. While some find this agreeable, others feel that the open access "race for fish" has been replaced with an equally hazardous "race to the processors" in order to meet offload dates and avoid associated price penalties. Thus, the need to meet delivery schedules of some processors may diminish the safety benefits associated with ending the race for fish. The net effect of rationalization on safety can be more rigorously examined by utilizing U.S. Coast Guard data on both accidents and fatalities. With respect to the latter, there have actually been no fatalities in the post-rationalization fisheries. However, a longer time series may be required to estimate the effects of the program on accidents and fatalities in a rigorous, quantitative manner with sufficient statistical confidence.

Safety aside, interviewees have suggested that the combination of longer seasons and diminished per-unit profitability associated with leased or purchased quota have decreased compensation to crew when examined in a per-pound or per-day metric, but may have increased in total (due to greater landings per vessel through quota consolidation). Similarly, the share payments to crew as a percent of total vessels costs may have declined as well, reflecting a shift in factor shares between capital and labor. Recent price declines have also decreased the compensation available for vessel owners and crew, exacerbating concerns about income earned in the fishery. These hypotheses will be tested in future analysis using the EDR data on the costs and crew compensation present in the crab fisheries.

Finally, the primary conclusions regarding alternative and additional employment opportunities are that these may deeply affect crew members' abilities and decisions to participate in the BSAI crab fisheries. Multi-fishery and even multi-industry job portfolios (common among crew) are more difficult to accommodate with longer crab fishing seasons and other obligations to the boat that now extend across several months. The effects following from fewer available crew positions as an outcome of the rationalization (and to a lesser extent, the buyback) are strongly dependent upon locally available alternative opportunities. Crucially, fishing community-based crew may find it particularly difficult to maintain the multi-fishery strategies that characterize their economy. Without the income afforded by participation in the past BSAI fisheries, many may struggle to make a viable income throughout the year with other fishing activities.

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DISCLAIMER
The research and conclusions conveyed in this report are those of the authors and not necessarily the official position of the National Oceanic and Atmospheric Administration or the National Marine Fisheries Service.

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