



4241 21st Ave W • Suite #302 • Seattle, WA • 98199
Ph: 206-462-7690 • Fax: 206-462-7691 • www.alaskaseafoodcooperative.org

Reducing Alaska Seafood Cooperative Halibut Catch

At its February 2014 meeting, the Council requested that each sector participating in Bering Sea fisheries develop a presentation describing measures that its members could adopt to further reduce halibut catch in those fisheries. This document is the Alaska Seafood Cooperative's (AKSC's) response to that request.

To understand the potential for future halibut reductions by the AKSC, it is important to understand the status of halibut reductions by the cooperative. The extent and means of achieving current halibut reduction affect the possible halibut reduction measures and the potential halibut savings arising from those measures. This paper begins with a brief description of measures currently undertaken by the cooperative for halibut avoidance.

The paper goes on to describe halibut reduction measures currently under development by the cooperative. Some of these measures will require regulatory changes. Others can be implemented by the cooperative without any Council or NMFS action. Measures also differ in that some are intended to improve halibut avoidance, while others are intended to reduce mortality of halibut that are caught. A brief description of the measures under development are:

- ***Halibut avoidance best practices*** – a number of measures currently in use by the cooperative - such as information exchange, use of excluders, moving from areas with high halibut rates – have proven effective for reducing halibut catch. Development of guidelines (or “best practices”) for captains to use when considering whether to adopt a halibut avoidance measure could ensure the efficacy of these measures, as well as broader use of the measures throughout the fleet. With ever changing conditions on the grounds, these guidelines must be viewed as recommended considerations, as individual circumstances may suggest that other choices could result in better halibut avoidance performance. These guidelines can be revisited on an ongoing basis and reviewed more formally at annual captains meetings and modified accordingly to ensure they remain effective.
- ***Intersectoral cooperation of halibut avoidance interactions*** – The cooperative is engaging other Amendment 80 cooperatives and other trawl sectors to develop a system of information sharing. Measures under development would be intended to ensure that participants have up to date information concerning possible halibut avoidance measures in each target fishery. Trawl-wide initiatives are likely to provide the greatest and most current information to fishery participants concerning halibut interactions.
- ***Year-end halibut avoidance incentives*** – The cooperative is exploring the creation of measures designed to increase the incentive for halibut avoidance at year-end, when halibut caps may not be limiting. This year the cooperative will implement a 4th quarter target rate of 10 percent less than the three-year fourth quarter average.

- **Flatfish flexibility program** – *Once implemented, the Council’s program to allow transfers of flatfish allocations across species will allow cooperative participants to reduce halibut by increasing flexibility to move to flatfish targets that provide greater returns from halibut usage. This inherent incentive will reduce halibut interactions.*
- **Decksorting of halibut for faster release** – *Current observer requirements intended to ensure accurate halibut accounting prohibit crews from sorting halibut on deck. The cooperative is currently exploring the use of camera systems as an alternative means of maintaining the integrity of halibut accounting, which would allow for on-deck sorting and rapid release of halibut to achieve minimum mortality.*
- **January 1 season opening** – *Moving the Amendment 80 trawl season opening to January 1 (from January 20th) could increase fishing opportunities during low halibut interaction periods, increasing the opportunity for cooperative members to further reduce halibut.*
- **Evaluation of current closures** – *Through an EFP, the AKSC is developing a study that would help provide data needed to consider the efficacy of current area closures. Although not intended to address halibut harvest, allowing fishing inside the closure area could aid flatfish and cod fishermen targeting known aggregations with low halibut concentrations that move into the closure area. This greater flexibility could create more efficient target species harvesting while possibly reducing halibut rates.*

The cooperative recognizes that with the uncertainty of halibut avoidance reevaluation of measures is always beneficial for improving performance. The cooperative will evaluate and update measures to maintain acceptable performance.

Recent improvements in halibut avoidance

Prior to Amendment 80, NMFS allocated halibut and crab limits to limited access fisheries by gear, season, area, and target, indirectly dictating when and where vessels fished. Vessels competitively raced to maximize shares of valuable targets limiting actions to avoid halibut for fear of reduced fishing opportunities.

Implementation of Amendment 80 overcame this propensity to disregard halibut rates. Under Amendment 80, target and halibut caps are allocated to co-ops. Under AKSC's co-op agreement, each vessel or company is allocated a share of the co-op’s total allocation of each target and PSC species. Since each vessel is both responsible for and protected by its share of the co-op’s target and PSC allocations, potential for lost fishing opportunities has decreased and vessels are able move among fisheries and areas to avoid halibut concentrations without sacrificing catch. Companies and captains have been more inclined to spend time fine-tuning halibut avoidance devices such as halibut excluders, because they can increase catches through using less halibut. The decrease in competition has also removed barriers to communication across the fleet. Captains regularly exchange information concerning locations of halibut concentrations and conditions affecting halibut, as each can improve their own performance with improved information.

Prior to Amendment 80, the sector had access to the full trawl halibut cap, or 3,675 mt. Amendment 80 allocated a portion of the trawl cap to each cooperative, and reduced the total

halibut allocation by 200 mt over four years. The following table shows how halibut quotas have decreased from 2,525 mt to 2,325 mt under Amendment 80.

3.7.5.2.1 Allocation Formula

The trawl PSC limit for halibut, Zone 1 red king crab, C. opilio crab PSC (COBLZ), Zone 1 C. bairdi crab PSC, and Zone 2 C. bairdi crab PSC is apportioned between the non-AFA trawl CP and the BSAI trawl limited access sector as follows:

Sector	Year after implementation.	Halibut PSC limit in the BSAI (mt)	Zone 1 Red king crab PSC limit...	<u>C. opilio</u> crab PSC limit (COBLZ)...	Zone 1 <u>C. bairdi</u> crab PSC limit...	Zone 2 <u>C. bairdi</u> crab PSC limit...
			as a percentage of the total BSAI trawl PSC limit after allocation as PSQ			
Amendment 80 sector	Year 1	2,525 mt	62.48	61.44	52.64	29.59
	Year 2	2,475 mt	59.36	58.37	50.01	28.11
	Year 3	2,425 mt	56.23	55.30	47.38	26.63
	Year 4	2,375 mt	53.11	52.22	44.74	25.15
	Year 5 and all future years	2,325 mt	49.98	49.15	42.11	23.67
BSAI trawl limited access	All years	875 mt	30.58	32.14	46.99	46.81

<http://alaskafisheries.noaa.gov/sustainablefisheries/amds/amd80fmp.pdf>

The following figures illustrate the trend of historical use of halibut by the sector (Five-Year Review of the Effects of Amendment 80, Northern Economics, 2014). Notably, use of halibut has been reduced over time.

Table 28. Bycatch of Prohibited Species in the AM80 BSAI Fishery

Item	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
PSC Halibut Mortality (mt)	2,649	2,732	2,700	2,540	2,572	2,012	2,080	2,255	1,838	2,082
PSC King Crab (#s)	90,901	87,997	116,133	110,893	102,852	113,163	85,794	70,726	91,270	54,539
PSC Bairdi Crab (#s)	608,798	1,734,731	3,118,248	832,166	1,214,389	615,392	364,563	267,030	484,842	339,775
PSC Opilio Crab (#s)	951,732	774,933	1,461,852	770,884	602,427	554,482	396,036	389,198	802,076	352,912
PSC Herring (kg)	51,692	94,193	80,387	24,252	57,103	82,703	23,401	4,117	14,048	11,445
PSC Chinook (#s)	5,698	5,526	4,567	2,625	4,010	583	623	1,625	983	848
PSC non-Chinook (#s)	1,126	8,854	3,442	13,468	1,866	1,535	1,247	1,589	3,078	1,717

Source: Table developed by Northern Economics from CAS data provided by AKFIN (Fey, 2014).

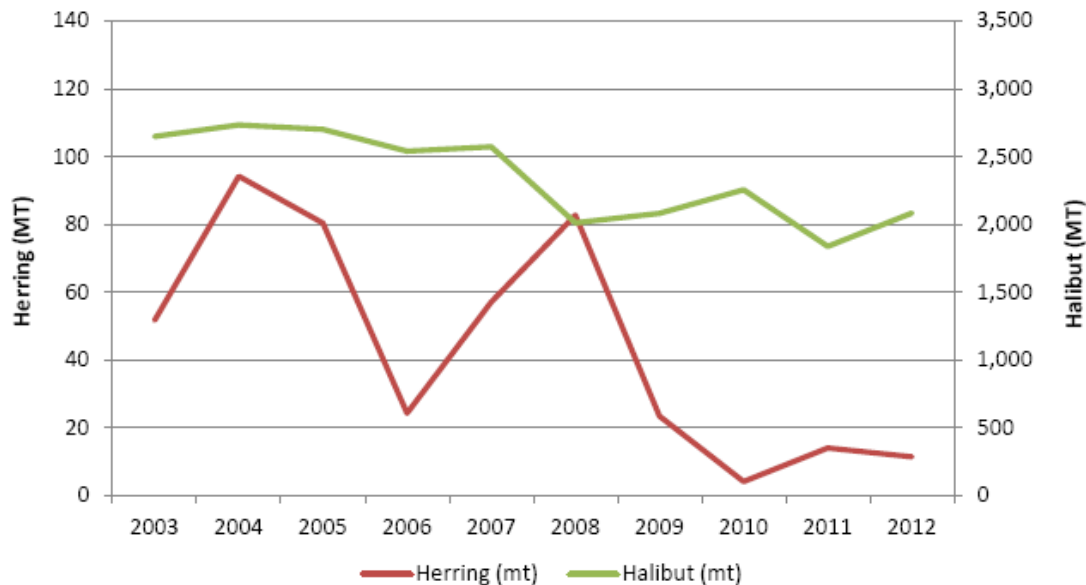
Table 29. Bycatch Rates in the AM80 BSAI Fishery

Item	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
All rates are measured as the total units of PSC ÷ mt of Groundfish.										
PSC Halibut Rate (mt/mt)	0.0099	0.0092	0.0095	0.0091	0.0087	0.0060	0.0066	0.0067	0.0057	0.0064
PSC King Crab (#/mt)	0.3387	0.2959	0.4072	0.3969	0.3488	0.3400	0.2726	0.2100	0.2811	0.1668
PSC Bairdi Rate (#/mt)	2.2682	5.8328	10.9349	2.9785	4.1182	1.8491	1.1584	0.7929	1.4933	1.0390
PSC Opilio Rate (#/mt)	3.5459	2.6056	5.1263	2.7591	2.0429	1.6660	1.2584	1.1557	2.4703	1.0792
PSC Herring Rate (kg/mt)	0.1926	0.3167	0.2819	0.0868	0.1936	0.2485	0.0744	0.0122	0.0433	0.0350
PSC Chinook (#/mt)	0.0212	0.0186	0.0160	0.0094	0.0136	0.0018	0.0020	0.0048	0.0030	0.0026
PSC non-Chinook (#/mt)	0.0042	0.0298	0.0121	0.0482	0.0063	0.0046	0.0040	0.0047	0.0095	0.0053

Source: Table developed by Northern Economics from CAS data provided by AKFIN (Fey, 2014).

Figure 8 below shows how halibut catch dropped precipitously in 2008, coinciding with a reduction in available halibut and implementation of Amendment 80.

Figure 8. Herring and Halibut Bycatch by AM80 BSAI Fisheries, 2003–2012



Source: Figure developed by Northern Economics from CAS data provided by AKFIN (Fey, 2014).

Since implementation of Amendment 80 in 2008, halibut has not constrained fishing by the sector. Most of the large potential halibut reductions have already been realized by simply removing disincentives for halibut avoidance and fleet communications concerning halibut concentrations. Opportunities for additional gains remain, but those gains are likely to be less substantial and more challenging to achieve. These future actions must also be more focused on specific and limited opportunities for improvement.

Competing objectives complicate achieving gains in any one area. While Amendment 80 achieved significant reductions of total bycatch, including all PSC, captains are challenged by

competing objectives. Amendment 80 captains have a mandate to reduce all PSC (including halibut, Chinook, and three crab species), achieve high overall groundfish retention rates even when subject to regulatory discard requirements, ensure harvests of Amendment 80 target species allocations are maximized yet not exceeded, comply with area closures (regulatory, contractual, and voluntary), and ensure the safety of their crew. Meeting one or more of these objectives often compromises one's ability to achieve others.

Time/area closures are also an obstacle to vessels in low halibut areas and during low halibut times. In 2007, NMFS implemented Amendment 84, which allowed vessels targeting pollock to enter salmon savings area closures if they operated under an approved salmon bycatch reduction program. The analysis prepared for Amendment 84 concluded that the salmon savings area closures actually displaced pollock effort into higher bycatch areas. Based on anecdotal information from captains, AKSC believes that current time/area closures may also exacerbate halibut rates during flatfish fishing.

Observer sampling procedures that prevent sorting on deck prevent reductions in halibut mortality that could be achieved by sorting on deck and releasing halibut rapidly. Because halibut estimation is currently based on observer sampling protocols, observers must have access to all halibut at their sampling station. This requires all halibut to be held in a fish bin until all catch has moved across the flow scale and the observer sampling station. These requirements, of course, increase time out of water for halibut, and increasing estimated mortality for halibut in flatfish targets to around 80 percent.

Halibut rates near the end of the year tend to increase due to fishing conditions, but also, at times, due to the incentives arising under a simple annual cap. Near year-end, target species tend to be less aggregated and halibut are moving across the shelf from shallow to deeper water, posing a greater challenge for halibut avoidance. Early in the year, a captain may be highly incentivized to avoid halibut, as halibut needs later in the year are unknown. At the end of the year, if the halibut allocation is unlikely to be reached, a captain may have little incentive to avoid halibut. Cooperative mandated reductions at the end of the year will ensure that Captains avoid halibut throughout the year.

Based on these conditions, AKSC has identified a potential solution to incentivize lower halibut rates during the fourth quarter of 2014.

Internal measures to reduce halibut

Formalize best fishing practices. As noted by AKSC captains during annual meetings, the most effective halibut reduction tool was ending the race for fish. Reducing competition among the fleet allowed captains to communicate and cooperate on reducing halibut. Real-time tow-by-tow catch and halibut rate communications on the ground (coupled with the ability for a captain to move fishing areas without losing fishing opportunities) is the single most effective tool captains have. While developing this white paper, AKSC staff queried captains about how they successfully reduced halibut catch. One captain said, "...every radio conversation begins with, "how big was your tow and how much was your halibut did you catch?" This statement is

testimony to captains' work towards achieving meaningful halibut reductions while meeting OY goals.

To date, Amendment 80 hard cap limits have incentivized these behaviors. However, AKSC believes that formalizing guidelines for "best fishing practices" for adoption by captains in the cooperative would 1) create continuity for use of these practices as new crew enter the fishery and 2) facilitate additional halibut avoidance behavior by communicating halibut avoidance expectations to current crews.

Over many years of experimentation and observation, Amendment 80 fishermen have found the following actions may reduce halibut in some situations.

- Sharing information, both real-time among fishermen on the grounds and through data analysis services provided by SeaState and by the AKSC data manager. Through experience and information sharing cooperative fishermen learn seasonal 'hot spots' for halibut in current and previous years. Experience and knowing relative stock status and seasonal variations also help fishermen understand what a realistic halibut rate may be, which are often communicated among the fleet.
- Changing towing speed. Larger halibut may be able to out-swim flatfish target species, so reducing speed before hauling back (or during the tow) may allow larger halibut to escape the trawl.
- Changing time of day. Some target species may disperse at night, resulting in a lower CPUE and longer towing times. Assuming halibut is evenly dispersed, longer towing times may result in higher halibut rates.
- Stand-down, change targets, or move when aggregations of target species are not available. As fish migrate, 'waves' of high concentrations tend to move through the grounds. Moving to another area (where fish may emerge from the closed area, if possible) or standing down to look for the next wave of fish can reduce halibut rates. At times when halibut rates are universally increasing toward unacceptable levels in a target fishery, changing targets may be considered.
- Fishing depth and temperature variation. Halibut and target species may disaggregate based on depth strata or water temperature in particular areas or at particular times. Attention to depth and temperature can contribute to halibut avoidance.
- Adjust rigging. Trawls can be 'tuned' to fish differently by adjusting the relative lengths of the rigging wires, buoyancy, weight, and door spread. These changes can affect both target and halibut catch rates.
- Mesh size/orientation. Similar to use of an excluder, using different mesh sizes and configurations (diamond vs square) may facilitate greater exclusion of bycatch during the tow.
- Establish policies and recommended fisheries, areas, and conditions for halibut excluder use. Halibut excluders work well in some fisheries where halibut differ in size from the

target catch. Yellowfin sole fisheries often feature very low halibut rates and, because of the large tow sizes and the possibility of the codend clogging at the excluder due to large volumes of yellowfin sole or other species, many yellowfin sole fisheries may not be the best option for excluder use. Additionally, halibut encountered during the winter rock sole fishery are often comparable in size to the target catch, thus making the excluder ineffective as it is designed to exclude larger halibut. However, flathead sole, arrowtooth flounder, and many GOA fisheries are conducive to excluder use. Yellowfin sole fishing in the fall tends to encounter more halibut than in the spring and therefore may be a viable choice for use of halibut excluders.

For fisheries encountering larger halibut, captains expect between 50 and 80 percent to be excluded. This often also results in a flatfish target loss of about 20% by weight. If the flatfish target species are larger (for example, arrowtooth flounder) or halibut are smaller (as is often the case during winter rock sole fishing), then the grate size needs to be adjusted. This may result in a tradeoff between halibut excluder selectivity and target catch loss, which can be as high as 40 percent. Excluder effectiveness is highest in the GOA rex sole fishery, where captains report 65 percent selectivity with only about 20 percent target loss.

Halibut excluders are also used when vessels are targeting cod concentrations. However, because of the design of the excluder, the bigger the halibut the less likely it is to escape. The "slotted" excluder (horizontal slots along the side are designed to exclude flatfish while retaining roundfish) achieves about 50 percent halibut selectivity by weight, with a cod loss of about 10-20 percent.

The effectiveness of halibut excluders and the feasibility of their use has improved steadily over the last 15 years. Controlled testing under EFPs has provided an initial baseline of performance data for the early versions of halibut excluders starting in the late 1990s and continuing from 2000-2006. From that starting point, fishermen have shared design ideas and several gear manufacturers have worked with fishermen to improve escapement performance for halibut and retention rates for target species. This very productive process is very much still underway and suggests that halibut avoidance under catch share programs and voluntary efforts where catch share programs are not formally in place are effective in incentivizing further development and eventual optimization of halibut excluders. Given the potential upside from further halibut excluder development, both in terms of reducing halibut and retaining target catch, this iterative development process is best left to the industry and would not be benefitted by locking in an excluder design by regulation.

It is important to recognize that there is no absolutely prescriptive formula for halibut avoidance. Conditions on the grounds are infinitely variable, and adjustments in fishing or behavior that work in one set of conditions may not be effective (and may even be detrimental) in others. Further, year-to-year variability may result in changes in intrinsic halibut catches with 'good years' of relatively low halibut rates followed by years of relatively higher halibut rates no matter what efforts are undertaken. Captains are advised to rely on both the considerations identified in the best practices, as well as their personal judgment and experience to achieve the highest practicable level of halibut avoidance.

Year-end incentives for halibut avoidance. During the fourth calendar quarter, halibut rates tend to increase relative to the previous three quarters. These increases are partially due to annual migrations from shallow to deeper water, and disaggregation of target species. Captains report that halibut crossing the 50-fathom curve at this time of year co-mingle with mixed species groundfish, making avoidance difficult. Additionally, under the current structure of annual allocations, incentives for halibut avoidance may decrease as the end of the year approaches, if participants perceive that the halibut limit will not constrain their fishing efforts. The sector is currently considering possible plans to create incentives for halibut avoidance under these circumstances.

AKSC is incorporating a target of reducing halibut rates by 10 percent into its 2014 fishing plan. Because a captain's ability to avoid halibut correlates with halibut biomass and biomasses vary over time, AKSC calculated a 10 percent reduction from the average fourth quarter rates of the previous three years.

AKSC's three-year rolling average halibut rate for the fourth quarter (October through December) is 0.92% mt halibut/mt groundfish. A 10% reduction would bring that aggregate rate down to 0.83%.

Exchange of halibut avoidance information across sectors. The cooperative is currently engaged in discussions with other sectors to exchange information on halibut. The exchange of information includes both sharing fishing information, as well as information on the development of new technologies, such as excluders, as opportunities arise and ideas develop. In the past, sectors have joined together to experiment with excluders traveling out of the country for flume tank use.

In addition to general information exchange, the cooperative has discussed developing a system of automated alarms set up by SeaState. Alarm criteria would be agreed for each of the different target fisheries based on halibut rates and usage in the target. Other factors could be considered for more specifically defining alarm criteria, including seasonality of halibut catch. Alarms notices would be structured to inform participants in the target fishery of halibut catches meeting the alarm criteria. The alarm notice could identify the catch by target and location and the halibut rate or amount that triggered the alarm. This system will be developed for use within the cooperative and can be shared with others in the Amendment 80 fisheries and across sectors to provide all participants in a target fishery with current information concerning halibut interactions in the fishery. Having access to prevailing information concerning halibut interactions can be very useful for avoiding halibut. A system that extends this information to all sectors has greater potential for providing broad halibut avoidance.

Additional measures to reduce halibut catch

Flatfish flexibility is scheduled to be implemented January 2015. The program will allow trading of target allocations across different flatfish species to accommodate uncertainties allowing better use of available halibut. As halibut resources change and are affected by environmental conditions, flatfish flexibility may allow the cooperative to focus on species with

the lowest halibut concentrations relative to target catch. As the cooperative develops its agreement for trades among the different flatfish species, improved halibut performance will be consideration for trades.

Decksorting to reduce mortality rates of halibut is believed to have significant potential for reducing total halibut mortality.

While substantial efforts have been exerted to avoid halibut, potential reductions in halibut mortality rates through improved halibut handling procedures are another important part of the AKSC's goal to make best use of its halibut allowances. Increasing halibut survivability is critical to the development of an adequate set of tools to achieving additional decreases in total halibut mortality.

AKSC has engaged with NMFS in two separate EFPs designed to assess whether carefully sorting halibut from the catch on deck and quickly returning them to the sea (after accounting catch and assessing viability) would reduce halibut mortality. AKSC is currently testing cameras designed to determine halibut lengths (and thus weights) on deck. The results of these tests will be critical in developing implementation and monitoring protocols.

During a 2012 EFP, AKSC explored alternative halibut handling procedures designed to return halibut to the sea faster, and decrease halibut mortality rates. Field work was conducted between May 27 and September 19, 2012 on four AKSC vessels: F/T Arica, F/T Constellation, F/T Vaerdal, and the F/T US Intrepid. Primary target fisheries included yellowfin sole, arrowtooth flounder, flathead sole and rock sole. The field work in the yellowfin sole targeting occurred in the fall when catch rates are relatively low, which at times, contributes to an increase in halibut rates. Participating vessels used their own groundfish and halibut allocations.

Across all vessels and target fisheries (a total of 98 hauls), 81% of halibut by number and 87% by weight were sorted from catch on deck. The average halibut mortality rate for deck-sorted halibut was approximately 57%. On average, 6.1 halibut returned to the water per minute compared to 2.2 halibut during the 2009 EFP. The halibut sampling methodology prevented sorting delays on most hauls, but backlogs of halibut awaiting measurement and assessment were inevitable on a few hauls with very high halibut catch rates.

Recent technological advances may allow for automated catch accounting for halibut sorted on deck. Camera systems developed for use in NMFS trawl survey applications could be used to accurately measure each halibut sorted on deck, and a weight could be applied to these halibut. AKSC is currently conducting a field trial of a Beta version of NMFS "stereo camera" system mounted on a halibut sorting chute. The set up is designed to accurately measure live halibut as they are slid down the chute. A technician on the F/T Constellation, an AKSC member company vessel, will measure each halibut sorted from the catch on deck and prior to sliding it into the chute for length estimation by the camera system. Viability information will also be collected simultaneously to evaluate whether the degree of viability affects length measurement accuracy as well as allowing us to explore whether the camera system can be provide useful information for viability assessments. The field test has been arranged in cooperation with the AFSC's Fishery Monitoring and Analysis Division. While halibut collected during the field test are still

required to move normally through the factory, we are hopeful that a successful trial of the chute camera system will pave the way to making deck sorting feasible.

One additional piece needed for deck sorting to be viable is a monitoring system to ensure crews follow the fish handling procedures. Electronic monitoring systems could be used to verify that crew follow sorting protocols, eliminating the need for additional sea samplers. To this end, AKSC is in the process of talking to electronic monitoring providers about recent advances in deck monitoring camera systems. We hope this will expedite the process of creating a monitoring system for Amendment 80 vessels that are interested in sorting halibut on deck.

We believe decksorting has the potential to significantly reduce halibut mortality in the near future, and hope to have additional feedback for the Council at its June meeting. Assuming success with the field test of the chute camera system, we plan to develop an EFP application that would allow AKSC and other interested catcher processor vessels to sort halibut from the deck in their regular fishing activities in 2015. The exact timing of the development of this EFP will depend on what is learned in the chute camera test and other factors but an EFP to do deck sorting in 2015 could create real halibut mortality saving next year and would create other benefits in terms of experience with deck sorting implementation details in a controlled, EFP setting to inform the eventual regulatory changes needed for full-scale program implementation.

Reconsider red king crab savings area and 516 time closure. Anecdotal information from captains indicates that as flatfish schools migrate across the shelf, PSC rates may increase when vessels are not able to follow these concentrations through area closures. For example, as yellowfin sole move into the RKCSA, vessels are forced to divert from that area despite the high yellowfin sole concentration and low halibut rate of the schools moving into the closed area. Allowing vessels to move with the school into the currently closed areas may actually decrease halibut.

We are working with the crab industry and members of the Crab Plan Team to jointly propose an EFP to assess the utility of these longstanding closures that were originally intended for protecting crab but may no longer served that purpose. At its May 2014 meeting, the Crab Plan Team expressed support for an EFP study of the efficacy of the RKCSA and Area 516 and development of an EFP application to allow controlled fishing in these areas without any additional PSC allowances is under development. The EFP will include expanded data collection requirements to evaluate crab abundance, sex and size data as part of our evaluation of the efficacy of halibut avoidance within the closure areas. AKSC captains believe the eventual reconsideration of these closed areas following the results of the EFP may also provide more flexibility to avoid halibut.

Reconsidering the January 20th trawl opening through an EFP may allow for halibut savings if halibut rates during the January 1-20 closure are lower than later in the year. As noted above, halibut reduction incentives are directly related to hard cap incentives to avoid halibut and focus on areas of target species concentration. Halibut catch is largely based on temperature. Depending on benthic temperatures during the period between January 1-20, clean fishing may be found during that time.