AGENDA D-2(c)
DECEMBER 2009

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

ESTIMATED TIME
4 HOURS
(All D-2 items)

DATE: December 1, 2009

SUBJECT: Other management issues – halibut deck sorting EFP

ACTION REQUIRED

(c) Receive report from Halibut Deck Sorting EFP

BACKGROUND

In April 2009, the Council reviewed an application for an exempted fishing permit (EFP) to investigate on-deck sorting of Pacific halibut as a means of reducing halibut bycatch mortalities on Amendment 80 vessels. The EFP allowed three Best Use Cooperative (BUC) non-pelagic trawl vessels to sort halibut removed from a codend on the deck, and release those fish back into the water after accounting for halibut condition. All groundfish and halibut harvested were to be within the BUC's allocation for groundfish and halibut mortality. The permit was granted by NMFS, and the various field tests were conducted in May and June 2009.

The main objective of the EFP was to evaluate the potential for reducing halibut discard mortality rates by modifying the halibut handling procedures currently on Amendment 80 vessels. In addition, the study collected data on the fraction of the halibut catch that can be feasibly sorted out on deck and the time needed to complete sorting and halibut measurement/viability assessment under the fish handling procedures of the EFP. Finally, the study also evaluated the feasibility and efficacy of using an electronic monitoring system to monitor adherence to the deck sorting and halibut handling/discard protocols.

The final report was mailed to the Council in mid-November, and the principal investigator, Mr. Gauvin, will present a summary of the project's findings at this meeting. The introduction and summarized findings are attached as Item D-2(c)(1).

DRAFT Final report for EFP 09-02: Best Use Coalition's Halibut Deck Sorting EFP

Excerpt: pages 1-7 of 41

EFP 09-02

The focus of exempted fishing permit (EFP) 09-02 was to explore ways to reduce halibut bycatch mortality rates on trawl catcher processor vessels targeting flatfish and cod in the Bering Sea. The Best Use Cooperative's (BUC) application for the EFP was submitted to the NMFS Alaska Region in March of 2009 and was approved by NMFS in late April, 2009. The field work was performed in May-June of 2009. The principal investigator was John Gauvin who developed the study in consultation with Martin Loefflad of the NMFS Alaska Fishery Science Center's Fisheries Monitoring and Analysis (FMA) Division and Gregg Williams of the International Pacific Halibut Commission (IPHC).

Project Objectives

The main objective of EFP 09-02 was to evaluate the potential for reducing halibut discard mortality rates by modifying the halibut handling procedures currently on Amendment 80 vessels. For the EFP, catch handling procedures were modified so that halibut were sorted out of the trawl codend on deck and returned to the sea from the deck via a chute constructed for this purpose. This would return the halibut to the water faster than would otherwise be possible under existing regulation. Procedures for the EFP required full accounting of the number and length of each halibut via a census of halibut collected on deck and in the factory (halibut missed during sorting on deck) as well as assessment of viability for each halibut collected in the two locations.

The reason the EFP focused on modifications to catch handling procedures was that Amendment 80 vessels are currently required to place all of the net's contents into below-deck holding tanks without sorting any of the catch on deck. This requirement is to ensure that the on-board observers have an opportunity to sample all the fish in the catch. In terms of halibut bycatch mortality rates, however, the inability to sort halibut out of the catch on deck means that halibut, a prohibited species in flatfish fisheries, are returned to the sea only after they come out of the vessel's holding tanks and pass over the vessel's flow scale. This occurs slowly as the contents of the below-deck storage tank move across a conveyer belt towards the processing area. The "no sorting on deck" requirement results in some of the halibut remaining out of the water for several hours before being returned to the sea. As such, halibut discard mortality rates, which are based on viability assessments done by observers in the processing area, currently average 75% across the typical Amendment 80 fishery targets.

In its application for this EFP, the BUC noted that reducing halibut mortality rates is an important component of the Cooperative's overall work to help prevent halibut prohibited species catch (PSC) limits from constraining its target groundfish catch. Other components of the Co-op's work to control halibut bycatch are improvements in halibut excluder devices and more effective use of the bycatch hotspot avoidance system (Sea State) that the fleet has been using for many years. A prime motivator for the Amendment 80 fleet in these endeavors is that the sector is in the second year of a four year

phased-in reduction of its halibut PSC mortality cap. This reduction of 200 MT (total) was approved as part of Amendment 80.

In addition to looking at potential for reducing halibut mortality, the EFP pilot study collected data on the fraction of the halibut catch that can be feasibly sorted out on deck and the time needed to complete sorting and halibut measurement/viability assessment under the fish handling procedures of the EFP. Other qualitative information of interest were such things as how much extra effort deck sorting would take, how well alternative accounting methods for halibut catches and mortality rates might work on Amendment 80 vessels, and how these may vary by vessel size, deck layout and target fishery.

Finally, the Best Use Cooperative also contracted with Archipelago Marine Research (AMR) of British Columbia, Canada to evaluate the feasibility and efficacy of using an electronic monitoring (EM) system to monitor adherence to the deck sorting and halibut handling/discard protocols during the EFP. To this end, an EM system was installed on one of the EFP vessels by AMR and the system functioned throughout that vessel's participation in the EFP. The results of the EM feasibility study included in the summary of findings below and AMR's full report is attached to this report as an appendix.

Summarized Findings for EFP 09-02

Phase I of the EFP field work was conducted from May 27 – June 27, 2009 on three Amendment 80/BUC Co-op vessels: F/T *Cape Horn,* F/T *Constellation* and the F/T *Ocean Peace.* The EFP vessels fished under the EFP but used their own Amendment 80 allowances of halibut PSC and groundfish. Although the pilot study relied on catch and PSC that was part of the participants' normal fishing allowances, an exempted fishing permit was needed to allow the EFP vessels to handle halibut differently from the manner in which they are currently required to handle halibut during their regular fishing activities.

To potentially help to defray the costs of participation in the EFP (costs for carrying two sea samplers on each EFP vessel in addition to each vessel's two regular observers, constructing specialized halibut discard chutes for the EFP, additional time and labor needed to sort halibut from the catch on deck) participating vessels were afforded the opportunity to utilize the halibut mortality savings from the EFP if they were able to achieve savings. This in theory would allow EFP participants to harvest fish in 2009 beyond what was possible under their pro-rata quotas of halibut PSC assuming their halibut allowances would be used before their groundfish allowances were fully harvested (a common occurrence in past years). The halibut mortality savings from the EFP (deemed Phase II of the EFP) would be determined on a formula based on the difference between the official halibut discard mortality calculated from official halibut mortality rates applied to catches per target fishery and the actual halibut mortality rates achieved during the EFP (in the target EFP fisheries) calculated from onboard viability assessments.

Error! Reference source not found.reports the target fisheries, areas fished (NMFS Reporting Areas), EFP fishing dates, total number of EFP and non-EFP tows per vessel (tows where weather did not allow deck sorting) and other relevant summary information.

Table S1: Target fisheries, Areas fished, EFP fishing dates, number of EFP and non-EFP tows per vessel and EFP project staff and Sea Samplers aboard each of the three participating EFP Amendment 80 vessels during Phase I of EFP 09-02.

EFP Vessel:	*Cape Horn*	*Constellation*	*Ocean Peace*
Target Fishery/Area	Arrowtooth/Area 517 Cod/Area 521 (one tow) Flathead/Area 513	Arrowtooth/Area 517 Yellowfin-Btm poll/Area 514 Flathead-cod /Area 521, 513	Arrowtooth/Area 521 Yellowfin/Area 514
EFP fishing dates	May 28 - June 16, 2009	May 29 - June 26, 2009	May 30 - June 10, 2009
Total no. EFP hauls	82	153	46
Total no. non-EFP hauls	0	0	3
EFP Project staff aboard	*None*	K. McGauley (6/9-6/27)	K. McGauley (5/27-6/9)
Sea Samplers	J. Colling, R. Cartright	L. Cocas, R. Wolfe	K. McPeck, M. Cliff

The EFP results are presented in more detail in Table 4 of the Results section. Briefly, total EFP groundfish catch was 3,592.4 mt which included an incidental catch of 67.25 mt of halibut. Deck sorting for halibut went very well overall with crew members able to sort out approximately 85% of the total number of halibut in the EFP on deck and over 93% of the total by weight. In terms of numbers of halibut caught in the EFP there were a total of 19,649 individual halibut of which 16,986 were sorted out on deck, 2,663 in the factory. In total, only three deck halibut were not assessed for viability because they fell overboard before viability assessment by the sea samplers could occur.

The average halibut mortality rate for halibut sorted on deck was 45% (Table 4) which amounts to just 60% of the current average mortality rate assigned to the Amendment 80 vessels for the target fisheries of the EFP (75% is the average mortality rate applied to the BS/AI flatfish fisheries currently) . Average sorting time on deck for the EFP overall was approximately 27 minutes based on the time net was brought aboard to time the last halibut went back in the water or deck sorting was completed, whichever was longer. In practice, this included the time it took the crew to sort out the halibut (as little as 10 minutes on some tows) and the time it took the sea sampler on duty to measure and assess viability for each halibut.

The discard mortality rate for halibut recovered in the factory (missed during deck sorting operations) was approximately 84%. For factory halibut it took on average approximately 186 minutes to return the last halibut from a factory to the sea. The mortality rate for factory halibut in the EFP is somewhat higher than the rate currently assigned to halibut in the target fisheries for the EFP (75% on average). This may have been a result of the EFP requirement to collect all halibut missed during deck sorting by the factory crew where the halibut were placed in baskets or totes so the sea samplers could census the halibut catch and the fraction of halibut sorted on deck could be calculated. Given the overall set of duties for the sea samplers, viability assessments for factory halibut were frequently performed after all fish from a given tow had passed over the flow scale. The requirement that catch in the holding tank remain in the tank until the halibut sorting activities on deck were completed and the sea sampler was present in the factory also probably contributed to the higher mortality rate for halibut collected in the factory as well. Or it could just be a random difference from the average given that the 75% average

rate applied to the fishery overall is calculated from observer data collected across a whole fleet of flatfish vessels over the course of a year.

Halibut mortality savings:

Table S2 reports halibut mortality savings per EFP vessel based on the difference between each EFP vessel's halibut catch assessed at the official halibut mortality rate for its target fishery assignment and the halibut mortality rate actually achieved in the EFP. As can be seen from the table, the EFP concluded with a total estimated 17.15 mt of halibut mortality savings for use in Phase II. NMFS in-season managers and FMA (Observer Program) completed their review of EFP 09-02 data and calculations from Phase I on September 11, 2009. At that time the EFP holder's calculations of the halibut mortality savings from the EFP listed below were approved by NMFS and EFP participants were authorized to utilize their portion of the savings below in Phase II of the EFP. As will be described below, EFP participants did not actually utilize the Phase II savings.

Table S2. EFP halibut mortality savings by vessel:

Vessel	Halibut mortality savings (mt)
Cape Horn	9.168
Constellation	6.113
Ocean Peace	1.869
Total:	**17.150**

Summary of results by Archipelago Marine Resources (AMR) for the Electronic Monitoring portion of the halibut deck sorting EFP project:

Despite some minor issues, the EM system performed very well and was successful in providing 100% data collection for the duration of EFP participation by the vessel it was installed on (totaling 21 days and 82 fishing events). Imagery was nearly complete, the majority of which was assessed as high quality for monitoring halibut deck sorting activities. Weather conditions (i.e. water droplets or condensation in the cameras) did not significantly hamper imagery analysis at the chute. A thorough review of the imagery showed that halibut could be reliably identified and counted in the discard chute. Crew handling procedures for halibut could also be easily assessed. Camera imagery for the trawl deck area provided a wider field of view and correspondingly did not resolve catch handling operations as clearly. Although none were caught during the EFP, it was the opinion of AMR that catches of large sharks or marine mammals being sorted and discarded on the trawl deck could have been easily detected, as would incidents of fish being discarded other than through the discard chute.

The EM portion of the overall study identified some areas for future improvements. After reviewing image data during catch stowage with each of the three camera configurations, it was evident that none were capable of fully monitoring all of the halibut deck sorting protocols and that more cameras were needed to meet these objectives. As was found in other studies (e.g., Bonney et al., 2008) monitoring can be enhanced through the strategic placement of multiple cameras, including both close up and wide

view cameras, and overlapping views. Two cameras were insufficient for the *F/V Cape Horn* and four would have yielded a more comprehensive view of the trawl deck, while still providing sufficient detail of the discard chute to validate data collection, catch handling, and discarding practices. Multiple cameras of the trawl deck area would improve monitoring assessments but the ability to identify and count catch items would likely still prove difficult. Camera requirements for other vessels in the fleet are likely to differ depending on vessel size and deck layout. The smaller vessels would likely only require two or three cameras.

Perspectives on the findings from EFP 09-02:

The project showed that halibut mortality rates on Amendment 80 trawlers can be reduced by sorting halibut out of the catch on deck so as to return them to sea as quickly as possible. Most of the modified halibut handling procedures used for the EFP appeared to be feasible for the EFP vessels in the arrowtooth, flathead sole, rex sole and Pacific cod fisheries – though probably not as feasible in the spring yellowfin sole fishery. This is because catch amounts per haul in that spring yellowfin sole fishing are typically greater than for most flatfish target fisheries and with the already low halibut bycatch rates in spring yellowfin sole fishing, the feasibility of sorting through the haul to remove a few or even no halibut is relatively low. Fall yellowfin sole fishing, however, is generally more like the cod and flathead sole fishing done in the EFP in terms of catch amounts per tow and size and number of halibut per tow so it might be a good candidate for reductions in halibut mortality rates with deck sorting.

The study overall was a valuable first step to look at potential for reducing halibut mortality rates and general feasibility. It is important to keep in mind, however, that because of design and cost issues, the project's value for evaluating relevant scientific questions may not be as high as some may have wanted. For example, these data are not ideal for analysis of relationships such as correlation between halibut viability and haul size (or tow time, bottom temperature, surface temperature). This is because on many tows, the halibut handling protocol of the EFP and specifically the requirement to measure and do viability assessment on every halibut served to significantly increase the time it took to return the halibut sorted on deck back to the water. In this regard, the EFP data show that it took an average of 27 minutes to sort and account for halibut length and viability for each EFP tow. But on many tows the deck crew was able to sort the halibut out of the catch on deck in as little as 10 minutes according to EFP participants and discussions with sea samplers following the EFP.

This outcome was that due in part to the design of the study and limits on resources. Because sea samplers were working on 12 hour shift and therefore only one was available at any time to account for halibut lengths and condition, halibut sometimes sat in a holding trough awaiting measurement and viability assessment by the sea sampler on duty. Conceptually, the delay is really not part of the process of sorting halibut and returning them to the sea, it was due more to the limited resources available in the EFP to measure the halibut catch and account for viability. If an alternative set up for the EFP had been used, such as having numerous sea samplers working on deck each shift, this would have sped up the accounting and viability assessments and halibut viability assessments and would likely have been higher on average. Most problematic here for covariate analysis is that, as noted below, there is no way

to separate the effects of halibut sorting and handling time by the crew from the added time needed for sea samplers in the EFP to account for halibut catch and viability.

In light of this, a time stamp on each halibut viability assessment would have made the data more useful for analysis of covariates. Such a time stamp would have enabled us to at least look at viability rates for halibut sorted first compared to ones at the end of a backlog during a particular tow. This would have been helpful for inferences about the effects of holding time awaiting viability assessment. But a time stamp was not feasible because recording a time for each halibut by the sea sampler would clearly have involved even more time needed before getting halibut back in the water. For this reason, recording time data with each halibut was abandoned at the start of the EFP fieldwork.

The underlying tradeoff here was one of balancing competing objectives of collecting information on feasibility versus collecting scientific data. The complement of sea samplers for the EFP was based on minimizing costs per EFP vessel given that the objective of looking at average reduction in mortality rate and fraction of halibut that could be sorted out on deck. For those objectives, it was decided that project participants should have two sea samplers (one sea sampler per 12 hour shift) to record halibut length and viability. In retrospect, this had a potentially larger effect on the results than was anticipated but there was no way of knowing from the outset that the crews' halibut sorting activities would occur faster than halibut accounting and viability assessment by the sea samplers.

A follow up study to explicitly look at all the separate factors affecting viability of individual fish would clearly require a different design and a larger scientific data collection crew or more flexibility in the permit to allow crew members to assist in recording scientific data. In the end, however, our data are useful for looking at halibut mortality rate reduction under a set up where halibut are sorted on deck and catch amount and viability rates are accounted for with one sea sampler available per 12 hour shift. This is valuable for knowing something about how halibut mortality rates could be reduced assuming that every halibut needs to be measured and assessed for viability by a single sea sampler. But EFP participants envision other more potentially efficient arrangements such as mechanized length or weight assessment that is potentially faster. For viability assessment, EFP participant want to explore whether a random sub-sample of viabilities could be used to accurately characterize viability while potentially avoiding the slowdowns and bottlenecks that sometimes occurred during the EFP. These ideas are discussed below in the context of recommendations for next steps for further work on deck sorting halibut.

Despite these acknowledged shortcomings, the study did show that significant halibut mortality savings could be attained with modifications to the procedures for handling halibut on Amendment 80 vessels. Although the 17 MT of halibut mortality savings from the EFP were not actually used by EFP participants, participants felt the savings were considerable and that more work is merited to explore how to reduce halibut mortality rates on Amendment 80 vessels. They believe that the ability to generate mortality reductions is very important in terms of the objective of optimizing flatfish catches under the halibut mortality allowance constraints particularly if halibut bycatch rates had remained as high as they were for the first part of this fishing year.

Finally, it must be recognized that these halibut mortality savings came at considerable cost to both industry participants and fishery managers. Cost s to managers were such things as EFP development, analysis of the permit application, and review of EFP data to confirm the calculations of halibut mortality savings. These add up to an estimated 170 hours of additional agency work according to the NMFS Alaska Region.

Thinking beyond the pilot study, further work to change halibut handling requirements to allow sorting on deck in a larger fishery-wide setting would also need to take into account a broader set of considerations. These include the question of how to best quantify the catch of halibut, and apply the right mortality estimate in season. If a census is not viable for either halibut catch or viability, then the proper mix of sampling approaches and precision tradeoffs would need to be worked out. The tradeoffs between post debriefing analysis and development of mortality rates to be applied "fleet wide" versus *in situ* measurement of viability rates and application of these data in-season to a fishing cooperative would need to be resolved. Additional work to determine the best use of the video technology would also be required given that the initial findings for the EM portion of the project were encouraging but further work is needed to ensure EM can monitor crew compliance with the sorting protocols. There are certainly ways to address all of these challenges, but as with all issues involving federal fisheries off Alaska, rigorous work will need to be applied before modifications in halibut handling procedures can be adopted into the regular fishery.