

Application for an exempted fishing permit for continued assessment of an electronic monitoring system designed to quantify at-sea discard of halibut.

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Purpose and Need

Amendment 68 to the Fishery Management Plan for the Groundfish of the Gulf of Alaska (FMP) established a rockfish pilot program (RPP) for quota-based management of the rockfish fisheries in the Central GOA. Under this program, catcher vessels with historic participation in the rockfish fisheries may form cooperatives. Each cooperative is allocated a share of the total allowable catch (TAC) for various rockfish species, sablefish and Pacific cod. The cooperatives are also allocated halibut prohibited species catch (PSC) to allow the prosecution of the quota fisheries. Under the program, all quota species must be retained by the vessel and delivered to a shoreside processor where they are weighed and debited from the cooperative's quota. Halibut PSC, however, must be discarded at-sea and, at this time, can only be effectively accounted against the cooperative's PSC quota if there is an observer onboard to estimate the amount of halibut catch in each haul.

When Amendment 68 was implemented, observer coverage for the participating catcher vessel fleet was increased from 30% to 100%. This increase was necessary to ensure that all quota species were retained and to allow for trip-specific estimation of halibut bycatch. RPP participants are concerned about the cost increase for observer coverage relative to the expected increase in revenues from the rockfish fishery. They are also concerned with the accuracy of halibut bycatch estimates based on present North Pacific Observer Program sampling methods which were not designed for estimating haul-specific catches on individual vessels. An issue for NMFS is that the agency seeks to account for quota catch based on full census accounting, rather than expanded estimates. This has not been possible for halibut PSC, which must be discarded at-sea and cannot be accounted for shoreside under the current system.

Cost Considerations for Observer Coverage in the RPP: Economies of scale for observing catches at-sea on Gulf rockfish trawlers are difficult to achieve. This is due to the relatively low catch volumes on these 60-100 foot catcher vessels relative to larger Bering Sea catcher boats and at-sea processors. To keep monitoring costs at a reasonable fraction of vessel revenues, one approach might be to rely on shoreside catch accounting in conjunction with at-sea monitoring technology to replace some of the monitoring duties that currently are assigned to observers. For rockfish fishermen, sampling catches at shoreside locations also makes sense for increasing safety by reducing the number of observer days on small boats.

Information on the relative costs of the current observer coverage requirements for GOA shoreside trawlers is available. The EA/RIR for Amendment 76 (Extension or Modification of the Program for Observer Procurement and Deployment in the North Pacific) reports that the GOA non-AFA CV trawlers in recent years have paid an average of approximately 2.3% of annual ex-vessel revenue for observer coverage (June 2006 public review draft; Table 5-7, page 196). The EA/RIR also documents that status quo observer costs for Gulf trawlers are relatively high at the 30% coverage level compared to other sectors of the trawl fishery.

For the west coast domestic whiting fishery and several west coast of Canada fisheries, shoreside sampling is currently in use as the primary mode of fishery data collection. Electronic monitoring (EM) is used on fishing vessels in those programs to help ensure that discards at sea do not occur. For the Rockfish Pilot Program, a similar application may be possible where quota catch is accounted for shoreside; and EM is used to monitor at-sea discards. In the case of the RPP, however, EM would not only be used to verify that required procedures for discarding at sea are followed ; but also to quantifiably account for at-sea discards of halibut in the manner that will be detailed below.

Issues related to quota catch accounting:

The EA prepared for the rockfish pilot program stated:

NMFS will be forced to rely on expanded estimates of halibut mortality rather than a full census. With the exception of some species and fisheries in the multispecies CDQ program, NOAA Fisheries strives to base quota accounting on a full census of the quota species rather than an estimate of catch. The experience with the multispecies CDQ program has been that these estimates have been the source of much of the controversy surrounding issues of quota catch accounting. In most cases, this controversy has been the result of a vessel or CDQ group either flagging an individual species-composition sample as having an anomalously high incidence of a given species or attempting to influence estimation protocol in ways that result in a systematic bias of catch estimates in favor of vessels. Unfortunately, these incidents are not identified systematically but only when industry perceives that a different estimate would be to their advantage. The greater the expansion of a given sample, the more likely it is that real or perceived errors in the sample will cause controversy. Also, as sample expansion increases, the benefit of hiding a small quantity of a limiting species such as halibut is expanded as well. Observers in the catcher vessel fleet currently base their estimate of halibut PSC on 300 kilogram basket samples which are expanded to estimate halibut catch for the entire haul. The sampled hauls are then expanded to give an estimate of halibut for the unsampled hauls on a trip. NOAA Fisheries bases its estimates of total halibut catch on the halibut catch rate from only the sampled hauls to derive a halibut bycatch rate for each target. These rates are then applied to all deliveries to estimate total halibut mortality. Thus the degree to which a given quantity of halibut is expanded varies enormously depending on the fraction of observed vessels, the fraction of observed hauls on those vessels, and the fraction of sampled catch in the observed hauls. This issue is exacerbated by

high spatial/temporal variability of halibut bycatch as well as the inherently lower precision of an estimate of an uncommon species (such as halibut) compared to an estimate of a more common species for a given sample size.

EM generates census level estimates of halibut bycatch. To the extent that those estimates are accurate, this approach to halibut PSC catch accounting has the promise for generating halibut catch data that are more in line with established NMFS catch accounting goals.

The opportunity to use EM for fishery monitoring in the RPP:

Rockfish fishing for the major target species in the Central Gulf of Alaska (Pacific Ocean Perch, northern rockfish, and pelagic shelf rockfish) is relatively selective in terms of the percentage of the catch that is rockfish and the relatively high retention rates relative to flatfish and other GOA target fisheries. Selective fisheries where a high fraction of the catch is retained are logical candidates for reliance on shoreside sampling as the primary fishery data collection point and EM to monitor and account for at-sea discards.

In 2005, a pilot study was conducted to evaluate the use of EM to monitor discards in the Central Gulf of Alaska rockfish fishery (McElderry et al. 2005). The study evaluated the utility of EM video data obtained from camera placements to observe fish sorting and handling across the entire trawl deck. One key conclusion of the 2005 GOA EM pilot study was that the feasibility of using EM, including the practicality of reviewing the video data, is higher where discard volumes are relatively low. Another conclusion was that if discarding is done from multiple locations on the vessel deck (e.g. port and starboard scuppers, trawl ramp, and over the gunnels) some discrepancies between observer tallies of discards and estimates from EM can be expected.

Additionally, cameras used in the 2005 pilot study to observe the entire deck area posed some problems for exact classification of the fish being discarded. For fish with similar appearance (e.g. species in the flatfish and rockfish families respectively), fish identification was only possible to the family level rather than to specific species. Overall, however, the study concluded that EM can be very useful for accomplishing some of the monitoring duties needed for the Gulf of Alaska rockfish fishery. To this end, the report stressed that a logical way to make EM more effective would be to restrict discard locations to one or two locations where specific camera placements could be used to improve the ability to distinguish between species being discarded.

In 2007, AGDB conducted an exempted fishing permit (EFP) study to determine whether EM could quantify halibut discard accurately if the recommendations of the 2005 study were followed. In that study, a single vessel made six trips in a rockfish target. All catch other than halibut was retained on board and halibut was discarded through a single discard chute. All discarded halibut were also measured by project staff.

While a final report on this study has not been completed, a preliminary analysis by NMFS and AGDB staff would indicate that further investigation is warranted. Because it appears that an EM system can generate credible estimates of halibut catch we propose continuing our investigation of EM for this application. In addition to demonstrating the feasibility of EM, there are many issues that would need to be resolved prior to larger scale implementation of video catch accounting. The infrastructure necessary to collect, analyze and curate large volumes of video data is not in place and insufficient data exist to determine exactly what form that infrastructure should take. The 2005 study indicated that costs associated with EM could well be as high or higher than those associated with observer coverage but insufficient cost data exist to truly assess costs and where those costs occur. In order to manage quotas effectively, the industry must be able to monitor catch in the fishery on as close to a real time basis as possible. Clearly, the time necessary to analyze and report actual halibut bycatch from an EM system will induce a time lag, but the length of that lag has not been quantified. Finally, it is important to ensure that EM accounting for halibut is viable on a variety of vessels fishing under real world conditions.

The RPP is unique among quota programs in that prohibited species quota (halibut) must be discarded at sea whereas all other quota species must be landed and may not be discarded at sea. Thus observers must not only ensure that halibut discard is estimated on a haul by haul level, they must also monitor for illegal discard. An effective EM system must also be effective at achieving both of these goals. EM systems designed to monitor for illegal discard are currently in use in the hake fishery off the Pacific coast. While it appears that the technology is sufficiently advanced for this application, it also appears that there have been issues related to implementation that have prevented these systems from realizing their full potential. We hope that by testing an EM system in an actual fishery, on a larger group of boats, that many of the aspects of logistics and coordination between various portions of NMFS and the fishing industry can be proactively addressed.

This application seeks to build upon the potential for EM described in the 2005 and 2007 EM pilot studies and to focus on implementation issues associated with this approach.

Specific goals for our study are thus:

1. Determine the time lags between vessel arrival in Kodiak and data available to quota managers under different scenarios (analysis of the data in Kodiak, vs analysis of the data in an off-site location).
 2. Develop NMFS catch accounting data base infrastructure for handling EM data and linking EM data to the source delivery.
 3. Determine whether crew behavior is different when scientific staff or observers are not present. Specifically, whether the no discard of non-halibut and single point of halibut discard rules will be followed.
 4. Determine whether EM systems can be effectively deployed on a wider variety of vessels fishing under real world conditions.
 5. More fully assess the costs associated with various components of an EM program (equipment, support, and analysis).
 6. Assess the qualitative effectiveness of EM for quantifying halibut and ensuring compliance with no discard rules.
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1. While this project is designed to assess primarily qualitative issues associated with larger scale implementation, AGDB and NMFS staffs agree that further quantitative assessment of the accuracy of EM across vessels may be desirable depending on the final analysis of the data from the 2007 EFP. To the extent that such research appears necessary, and NMFS staff and funding resources can be made available, additional census data will be collected in a manner similar to that used in the 2007 EFP.

Methods

The EFP study will deploy an EM system on all of the vessels fishing for a single cooperative. The systems will be deployed for the entire fishing season, May 1st until November 15th or until the cooperative declares the termination of fishing under the Rockfish Pilot Program. The vessels will be based in Kodiak and will make multiple trips each lasting two to three days including travel time. Two to five hauls per day will be made depending on the time needed for sorting and discarding activities as well as associated monitoring and catch sampling. The EFP vessels will be typical of the CGOA catcher vessels used for rockfish fishing with certain specific additional requirements for the testing of EM. Vessels participating in the project will have halibut PSC catch attributed to their quota accounts based on the fleet rate rather than an individual vessel-level estimate. Because of this difference in quota accounting, NMFS has determined that it will be necessary to work with all of the vessels fishing for a single cooperative rather than a selection of vessels fishing for multiple cooperatives.

Because of funding constraints the cooperative selected for this project must have between three and five vessels fishing for it and all vessels fishing for the coop must be able to accommodate a discard chute for discard of halibut at a single location. Based

on fishing patterns during 2007, there are three cooperatives that could theoretically participate in the project. AGDB and NMFS staff will meet with all three coops to determine which are actively interested in participating in the project and to ensure that all vessels wish to participate. To the extent that more than one coop and all of its participating vessels wish to participate, a cooperative will be chosen based on the overall suitability of the vessels and the affiliated processor.

With the exception of halibut, all fish caught during the EFP must be retained. Halibut will be sorted and then discarded by vessel crew through a single chute between the trawl alley and the vessel bulwarks. The discard chute will be marked with length lines to assist the EM data reviewer in estimating the length of each halibut.

In order to simulate normal fishing conditions that an EM system would be required to operate under, the vessels will have reduced observer coverage. The exact manner in which observers will be deployed will be based on the fishing plan submitted by the chosen cooperative and developed in cooperation with NMFS staff. Under the EFP we will seek to ensure that observer coverage is distributed evenly across time and vessels, and that trips targeting secondary species (Pacific cod and sablefish) are fully observed. The target observer coverage level will be 30%. However, depending on the structure of the fishing plan, the actual coverage level may be somewhat higher. A 30% coverage level has been determined to be appropriate for this project and represents the level of coverage that existed prior to the implementation of the RPP. However, there is no indication that this level of coverage would be appropriate in the event that NMFS and the NPFMC decide to implement video monitoring.

When an observer is present on the vessel, they will complete their normal duties as set forth in the 2008 Observer Sampling Manual (http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2008.pdf). If conditions allow NMFS staff or their designates may be deployed aboard different EFP vessels to conduct census counts of halibut for comparisons with EM system data using the methodologies set forth in the 2007 EFP.

Crew on vessels participating in this project will be required to discard nothing but halibut and to only discard those halibut through a single, predetermined discard chute. Vessel captains will also record any discard in their logbook.

EM cameras on the selected vessels will be installed to accomplish two key objectives: first, they must provide lower resolution/high spatial coverage data to verify that discard only takes place at the specified location; second, they must give detailed images of each discarded fish which passes through the discard chute. This will require the installation of at least two cameras; one or more to give a full view of the deck area (deck camera) and one focused on the discard chute (chute camera) to give quantifiable imagery of each discarded fish. The EM system used for the EFP will also be equipped with a GPS to determine the time and location of fishing/sorting activities, and hydraulic pressure sensors to determine when the hydraulics are engaged (presumably when net deployment/haulback is taking place). Data from the cameras and the sensors will be recorded to an onboard computer and removable hard drive. In order to obtain accurate lengths of discarded halibut a properly designed discard chute will be installed on each participating vessel. The discard chute will be premarked with lines every 5 cm and will

be designed to ensure that fish slide flat and at an appropriate speed when being discarded. Following the installation of the EM system and marked discard chute, all cameras will be tested at the dock to ensure that the equipment is operating properly.

Fishing under this EFP will begin on May 1st. For the first several trips an EM technician will greet the vessel when it returns to port in order to troubleshoot and repair any problems encountered with the EM system. The technician will also collect and replace the hard drives in each system. In general, vessels require at least 16 hours to complete an offload before returning to the fishing grounds. During this time the video data will be given preliminary review. The reviewer will determine whether or not the vessel discarded fish in unauthorized locations or discarded catch other than halibut. In the event that this occurs, the vessel will be eliminated from the project. The reviewer will also assess whether or not the video data are of sufficient quality to quantify any halibut discard. In the event that there are data quality issues, the technician will modify the EM system on the vessel while it is in port.

During offload, the quantity of halibut accidentally landed will be closely monitored by NMFS staff or other personnel in order to accurately determine the total quantity of halibut caught on each trip. Catcher vessels fishing out of Kodiak are generally not well equipped for sorting at-sea and though vessels are required to discard all halibut PSC at the time it is caught, the high volume nature of the fishery coupled with the low percentage of halibut taken often preclude complete at-sea sorting. Observer sampling estimates the total quantity of halibut caught in a given haul at the time the halibut are caught so the quantity of halibut discarded at-sea versus the quantity inadvertently landed shoreside is irrelevant. On the other hand EM censuses the quantity of halibut discarded and, to the extent that all halibut are not discarded at-sea, it cannot give an accurate estimate of halibut catch without also incorporating shoreside data. Developing mechanisms for reliably associating the haul level halibut counts from EM with the shoreside weights of landed halibut will be necessary if this approach is to be used for actual quota accounting.

Full data review will either take place in Kodiak or off-island. One of the goals of this EFP is to assess the nature of the time lag between the vessel arriving in port and halibut discard data being available to NMFS staff and coop managers. By assessing the time lags for both approaches to data analysis, we will be better able to assess the cost/time tradeoffs associated with various approaches to collecting and analyzing the EM data. In addition to estimating the length and number of halibut discarded, using the protocols developed during the 2007 EFP, the reviewers will give a qualitative score to each image used to determine halibut length (1=image quality good, high confidence in estimate, 2=image quality less than optimal but adequate to estimate length with some degree of certainty, 3=image quality poor, impossible to estimate length or length estimate suspect). A subset of the EM data from each vessel will be re-reviewed independently by a second individual. During the 2007 EFP, qualitative notations were made by reviewers when image quality was suspect. Based on preliminary examination of the results from that EFP, it appears that “suspect” data were no less reliable than “non suspect” data. However, we believe that this aspect of data quality needs to be further examined.

To the extent that funding and staff resources can be identified, and the results of the 2007 EFP indicate a need, additional census data will be collected using the protocols developed during the 2007 EFP, and vessels participating in the EFP will be expected to carry AGDB or NMFS staff in addition to observers. A specific experimental design for this aspect of the project would be developed separately by NMFS and AGDB staff.

Expected Project Outcomes:

This EFP is primarily directed towards a qualitative assessment of how large scale EM would work in a real world environment. While quantitative projects such as the 2007 EFP are necessary to determine whether EM can provide statistically defensible estimates of halibut PSC catch, quantitative projects to develop the infrastructure necessary for large scale program implementation are also necessary. This EFP seeks to provide information necessary for NMFS and the fishing industry to assess not just the technical feasibility, but also the practical logistics associated with implementing a dramatically new means of assessing one component of catch. Such an assessment will better inform the Council and NMFS staff as they seek to develop new and innovative regulatory programs dependent on EM technology and help to ensure that these programs can be implemented with the fewest possible issues. In that light, this project seeks to identify issues associated with implementation and possible solutions to those issues. Because many of these issues involve the interaction between EM data and the existing NMFS catch accounting infrastructure, the final report will be prepared by NMFS staff with consultation from AGDB. The report will seek to:

1. Produce an accurate time/cost analysis. Using time budget records kept by the EM contractor and NMFS staff, it will be possible to accurately assess the costs associated with various aspects of EM on a larger scale. Because this project will cover all of the vessels fishing for a cooperative over an entire season, these costs should be more representative of the costs associated with large scale implementation. Because data will be analyzed in multiple locations, more accurate projections of the time lag between fishing activity and data being made available to coop managers and NMFS staff can be developed. The combination of accurate cost projections and reliable time lines will better inform decisions concerning the optimal tradeoff between faster data availability and lower costs.
2. Develop a proposed infrastructure for handling EM data. Raw EM data files are quite large and NMFS does not currently have a system for integrating either the EM data themselves or the resultant catch data into the existing catch accounting infrastructure. Before large scale EM programs can be implemented, systems for efficiently collecting, reviewing, documenting and curating large volumes of EM data must be developed. Further, system for handling the numeric catch data resulting from EM review and integrating those data into the existing catch accounting system must be developed. Finally, NMFS must investigate how to develop an appropriate Quality Assurance /Quality Control program.
3. Quantify differences in crew behavior on observed versus unobserved EM trips. Data from the overview camera will be used to quantify the extent to which crew comply with the discard rules. As currently envisioned, it would not be possible

- to accurately account for halibut discard unless discard all takes place at a single point, and only halibut are discarded at-sea. If this is not feasible, this approach to monitoring will have to be reassessed.
4. Qualitatively assess the quality of EM imagery from a variety of vessels and develop real-world expertise at ensuring the adequacy of camera installations. Because each image used to measure halibut will be given a qualitative quality score, it will be possible to compare the overall level of image quality between vessels. This information coupled with the data gained from multiple reviews of the same haul should allow us to determine the extent to which image quality and the resultant agreement between reviewers is vessel dependent.
 5. To the extent that additional census level data can be collected, a separate report will be prepared by NMFS staff that will quantitatively examine the differences in halibut count/length estimation accuracy among participating vessels and between participating vessels and the 2007 EFP vessel.