-Draft-
2018 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska

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Contents

Executive Summary

This draft 2018 Annual Deployment Plan (ADP) documents how the National Marine Fisheries Service (NMFS) intends to assign fishery observers and electronic monitoring (EM) to vessels fishing in the North Pacific during the calendar year 2018.

- On August 8, 2017, NMFS published a final rule to integrate electronic monitoring (EM) into the North Pacific Observer Program (82 FR 36991). Any vessel interested being in the 2018 EM selection pool must request to participate using the Observer Declare and Deploy System (ODDS) by November 1, 2017. Any vessel that does not request to participate by this deadline will not be eligible for the 2018 EM selection pool and will be in the partial coverage observer pool.

- Based on analysis of EM costs (Appendix B) and the amount of funding currently available, the EM selection pool will be composed of up to 110 fixed gear vessels[1] (80 longline and 30 pot). If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS will prioritize deployment in the EM pool as follows: 1) longline vessels, whose data will be used for inseason management; 2) vessels that are already equipped with EM systems; and 3) vessels 40-57.5 ft LOA where carrying a human observer is problematic due to bunk space or life raft limitations. NMFS will notify the vessel owner whether that vessel has been approved or denied for the EM selection pool.

- Trip selection will be the sole method of assigning both observers and EM to at-sea fishing events in 2018. Vessels in the EM selection pool will also use ODDS to close each trip following the instructions in their Vessel Monitoring Plan (VMP) (Appendix E). The requirement to close a trip in ODDS provides the ability to instruct the vessel to send the video storage device after the trip to ensure the timeliness of EM data for inseason management. In addition, requiring a vessel operator to close the trip provides a mechanism to avoid monitoring bias by enabling 100 percent recording of trips and using a post-trip selection process through ODDS to randomly select trips for video review. NMFS intends to implement a post-trip selection process for EM in 2019. However, there are logistical and cost considerations with this approach since EM service providers will need to collect and delete data from hard drive from every trip and provide the boat with empty hard drives. In 2018, NMFS will work with EM service providers and vessel operators in the EM pool to determine cost estimates and develop efficient hard drive delivery protocols.

- The sampling design for observer deployment involves two elements: 1) how the population of partial coverage trips is divided (stratification scheme); and 2) what proportion of the total observer deployments are to occur within these divisions (allocation strategies). Four stratification schemes and three allocation strategies were evaluated (Appendix C). Overall, the analysis found that gear-based stratification schemes outperformed the schemes that include tenders. However, there are several reasons to continue the gear/tender stratification scheme. First, this stratification scheme, which was first implemented in 2017, has not been fully evaluated in the Annual Report process. Maintaining this stratification scheme for another year would enable analysis of

[1] Does not include 11 pot vessels that have EM systems installed by Saltwater Inc. under a NFWF grant.

the effects and performance of the designs. Further, tendering activity in pollock trawl fisheries continues to represent a sampling challenge. Although it has yet to be evaluated whether the addition of the tender strata fully alleviates this problem, it does ensure a certain level of coverage for those trips.

- NMFS recommends the following sampling strata for 2018:
  - EM selection pool: Fixed gear vessels that have opted-in and been approved to be in the EM selection pool and have an approved VMP.
  - Hook-and-line vessels greater than or equal to 40 feet (ft) length overall (LOA)
  - Hook-and-line vessels greater than or equal to 40 ft LOA delivering to tenders
  - Pot vessels greater than or equal to 40 ft LOA
  - Pot vessels greater than or equal to 40 ft LOA delivering to tenders
  - Trawl vessels
  - Trawl vessels delivering to tenders

- NMFS recommends that the "no-selection pool," which is the pool of vessels that will have no probability of carrying an observer for the 2018 fishing season, continue to be composed of catcher vessels less than 40 ft LOA and vessels fishing with jig gear.

- NMFS recommends observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut and Chinook PSC (as described in Appendix C). This allocation strategy provides a balance between the minimizing variability of discard estimates and prioritization of PSC-limited fisheries and the need to reduce gaps in observer coverage in the partial coverage category.

- NMFS uses estimates of anticipated fishing effort and available sea-day budgets to determine selection rates for each stratum. The final budget for 2018 is not yet certain and once it is established, simulation models will be used to refine expected coverage rates and will be provided in the final 2017 ADP. The ***preliminary*** deployment rates for the trip-selection strata in 2018 are:
  - No selection - 0%
  - EM selection pool - 30%
  - Hook-and-line - 16%
  - Tender hook-and-line - 15%
  - Pot - 15%
  - Tender Pot - 15%
  - Trawl - 19%
  - Tender trawl - 15%

- NMFS will continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. For vessels delivering to shoreside processors in the GOA pollock fishery the sampling protocol will remain unchanged; trips that are randomly selected for observer coverage will be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. For trips that are delivered to tender vessels and trips outside of the pollock fishery, NMFS recommends that salmon counts and tissue samples will be obtained from all salmon found within observer at-sea samples of the total catch.

1. Introduction

Purpose and Authority

This draft 2018 Annual Deployment Plan (ADP) documents how the National Marine Fisheries Service (NMFS) intends to assign at-sea and shoreside observers and electronic monitoring to vessels and processing plants engaged in fishing operations in the North Pacific. This plan is developed under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA FMP), and the Northern Pacific Halibut Act of 1982. Details on the legal authority and purpose of the ADP are found in the Final Rule for Amendment 86 to the BSAI FMP and Amendment 76 to the GOA FMP (77 FR 70062, November 21, 2012).

The ADP describes the science-driven method for observer deployment to support statistically reliable data collection. The ADP is a core element in implementation of section 313 of the MSA (16 U.S.C 1862), which authorizes the North Pacific Fishery Management Council (Council) to prepare a fisheries research plan that requires the deployment of observers into the North Pacific fisheries and establishes a system of fees. The purpose of the research plan is to collect data necessary for the conservation, management, and scientific understanding of the groundfish and halibut fisheries off Alaska.

Data collection by observers contributes to the best available scientific information used to manage the fisheries in the North Pacific. Information collected by observers provides a reliable and verifiable method for NMFS to gain fishery discard and biological information on fish, and data concerning seabird and marine mammal interactions with fisheries. Observers collect biological samples such as species composition, weights, and tissue samples and information on total catch, including bycatch, and interactions with protected species. Managers use data collected by observers to manage groundfish catch and bycatch limits established in regulation and to document fishery interactions with protected resources. Managers also use data collected by observers to inform the development of management measures that minimize bycatch and reduce fishery interactions with protected resources. Scientists use observer-collected data for stock assessments and marine ecosystem research. Much of this information is expeditiously available (e.g., daily or at the end of a trip, depending on the type of vessel) to ensure effective management.

On August 8, 2017, NMFS published a final rule to integrate electronic monitoring (EM) into the North Pacific Observer Program (82 FR 36991). An EM system uses cameras, video storage devices, and associated sensors to record and monitor fishing activities. The final rule established a process for owners or operators of vessels in the partial coverage category using nontrawl gear (i.e. hook and line or pot gear) to request to participate in the EM selection pool beginning with the 2018 fishing year. Vessels that are approved to participate in the EM selection pool will be required to log fishing trips and comply with EM deployment requirements; these vessels will not be required to carry an observer. The Council and NMFS developed EM for data collection for the nontrawl gear fisheries to address their desire for an alternative way to collect fisheries data in consideration of the operating requirements in these fisheries. EM systems can collect at-sea data for NMFS to estimate discards of fish, including halibut, and mortality of seabirds.

This draft ADP describes the method for deployment of observers and EM in the partial coverage category (50 CFR 679.51(a)) in the halibut and groundfish fisheries off Alaska in 2018.

Process and Schedule

On an annual basis, NMFS develops an ADP to describe how observers and EM will be deployed for the upcoming calendar year and prepares an annual report that evaluates the performance of the prior year's ADP implementation. NMFS and the Council created the ADP process to provide flexibility in the deployment of observers and EM to gather reliable data for estimation of catch in the groundfish and halibut fisheries off Alaska. The ADP process ensures that the best available information is used to evaluate deployment, including scientific review and Council input, to annually determine deployment methods.

The ADP specifies the selection rate—the portion of trips that are sampled—and NMFS and the Council recognized that selection rates for any given year would be dependent on available revenue generated from fees on groundfish and halibut landings. The selection rates can change from one calendar year to the next to achieve efficiency, cost savings, and data collection goals. The annual decision about how to apportion fees between observer deployment and EM system deployment is also made during the ADP process. The ADP process allows NMFS to adjust deployment in each year so that sampling can be achieved within financial constraints.

Some aspects of deployment can be adjusted through the ADP, including the assignment of vessels to a specific partial coverage selection pool, and the allocation strategy used to deploy observers and EM in the partial coverage category. The ADP also defines the criteria for vessels to be eligible to participate in the EM selection pool and can include factors such as gear type, vessel length, home or landing port, and availability of EM systems.

The schedule for the 2018 ADP is as follows:

- **June 2017:** NMFS presented the 2016 Annual Report (AFSC/AKR 2017) to the Council and the public. The 2016 Annual Report provided a comprehensive evaluation of Observer Program performance including costs, sampling levels, issues, and potential changes for the 2018 ADP. The 2016 Annual Report identified areas where improvements are recommended to 1) collect the data necessary to manage the groundfish and halibut fisheries, 2) maintain the scientific goal of unbiased data collection, and 3) accomplish the most effective and efficient use of the funds collected through the observer fees. This review informed the Council and the public about how well various aspects of the program are working.

- **August 2017:** NMFS published a final rule to integrate EM into the North Pacific Observer Program (82 FR 36991) and sent a letter to vessels notifying them of the 2018 EM selection pool (Appendix D).

- **September 2017:** Based on information and analyses from the 2016 Annual Report and Council recommendations, NMFS prepared and released this draft 2018 ADP containing recommendations for deployment methods in the partial coverage category.

- **September – October 2017:**

    - *Review of the draft ADP*: The Council and its Scientific and Statistical Committee will review this draft 2018 ADP and any associated Plan Team and Observer Advisory Committee recommendations. Based on input from its advisory bodies and the public, the Council may choose to clarify objectives and provide recommendations for the final 2018 ADP. NMFS will review and consider these recommendations; however, extensive analysis and large-scale revisions to the draft 2018 ADP are not feasible. This constraint is due to the short time available to finalize the 2018 ADP prior to the December 2017 Council meeting, and practical limitations on planning for deployment (including contracting with an observer provider) and associated processes that need to be in place by January 1, 2018.

    - *Requests to participate in EM selection pool:* Any vessel interested in being in the 2018 EM selection pool must request to participate using the Observer Declare and Deploy System (ODDS)[2] by November 1, 2017. Any vessel that does not request to participate by this deadline will not be eligible for the 2018 EM selection pool and will be in the partial coverage observer pool. If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS will prioritize deployment in the EM pool as follows: 1) longline vessels, whose data will be used for inseason management; 2) vessels that are already equipped with EM systems; and 3) vessels 40-57.5 ft LOA where carrying a human observer is problematic due to bunk space or life raft limitations. NMFS will notify the vessel owner whether that vessel has been approved or denied for the EM selection pool. Once NMFS approves a vessel for the EM selection pool, that vessel will remain in the EM selection pool for the duration of the calendar year.

- **December 2017:** NMFS will finalize the 2018 ADP and release it to the public prior to the Council meeting.

The analysis and evaluation of the data collected by observers and the ADP development is an ongoing process; in June 2018, NMFS will present the 2017 Annual Report that will form the basis for the 2019 ADP.

[2] The request to be part of the EM selection pool can also be made online at http://odds.afsc.noaa.gov or by calling the ODDS call center at 1-855-747-6377.

3. Annual Report Summary

As described in the previous section, NMFS releases an annual report in June of each year that evaluates observer deployment under the ADP and includes an overview of the fees and budget associated with deployment, enforcement of the Observer Program regulations, a summary of public outreach events, and a scientific evaluation of observer deployment conducted by the Observer Science Committee (OSC) (e.g. Faunce et al. 2017). NMFS has released four annual reports starting with the 2013 Annual Report (NMFS 2014), which was presented to the Council in June 2014, and most recently the 2016 Annual Report (AFSC/AKR 2017), which was presented to the Council in June 2017. This draft 2018 ADP builds on NMFS recommendations in the annual reports and input from the Council (Appendix A).

In 2016 the sampling design used for dockside monitoring remained unchanged from previous years; in the GOA the goal was to obtain counts of salmon caught as bycatch during offloads of pollock trawl catcher vessels from observed trips and to obtain tissue samples to enable stock of origin to be determined using genetic techniques. This information is important for the management of Chinook salmon prohibited species catch (PSC) and is used by the Alaska Fisheries Science Center (AFSC) to identify the stock of origin of Chinook salmon caught as bycatch in groundfish fisheries (e.g., Guyon et al. 2015). The 2016 Annual Report evaluated the results from dockside monitoring and concluded that while observers could conduct their normal duties onboard vessels delivering to tenders, they could not monitor the associated offload due to the act of delivering to the tender. Based on these results, NMFS recommended maintaining *status quo* for dockside monitoring of pollock deliveries to shoreside processing plants with no offload monitoring on tendered deliveries.

In the longer term, the annual report recommended considering broader solutions for monitoring Chinook salmon PSC for trawl trips delivering to tenders in the GOA. Longer term solutions could include:

- Establishment of an alternative program for obtaining genetic tissues for stock-of-origin estimates given that these estimates have been stable over the past 5 years in the GOA.
- Plant monitoring of offloads, including tender offloads, combined with EM for compliance monitoring purposes and full retention of all catch (or maximized retention, recognizing some species might still continue to be discarded). This approach would need take into consideration tender deliveries mixing catch from multiple vessels.

The Annual Report evaluated three trip selection strata (Trawl, Hook-and-line, and Pot) that were used for observer deployment in partial coverage in 2016. The program met expected rates of coverage in all strata and there was no evidence of temporal bias in observer deployments. However, some spatial bias was evident in all three gear-types and observer effects (different trip characteristics between observed and unobserved trips) were found in hook and line and trawl gear types. Differences between observed trips that delivered to a tender and unobserved trips delivered to a tender were also evident in trawl.

In a well-designed sampling program, the observer coverage rate should be large enough to reasonably ensure that the range of fishing activities and characteristics are represented in the sample data. The annual report evaluated sample size with a gap analysis to determine whether enough samples were collected to ensure adequate spatial and temporal coverage. The results in 2016 were similar to previous years and illustrated that the likelihood of at least one observation is increased with fishing effort and the probability of no observer data within a NMFS Reporting Area increased at low observer coverage rates. These results reinforce the results of simulated sampling evaluations of 2014 data that showed that most observer data gaps disappeared or were severely minimized at deployment rates greater than or equal to 15% (relative to a 50% probability of a post-strata being empty; NMFS 2015c).

Based on these results, the Annual Report recommended that, within budget constraints, sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area. Further, NMFS recommended and the Council supported (Appendix A) that this 2018 draft ADP include evaluation of a 15% coverage rates across all strata and equal coverage rates that can be afforded. The results of this analysis is provided in Appendix C.

The Observer Declare and Deployment System (ODDS) continued to perform as expected in 2016. An evaluation of selection rates showed no temporal bias in realized trips. However, the report found differential cancellation rates between selected and unselected trips. Based on these results, NMFS recommended making changes to ODDS to allow changing the dates for observed trips, rather than cancelling and inheriting observed trips, while maintaining the order of the trips.

Recognizing the challenging logistics of putting observers on small vessels and low levels of catch by these vessels, NMFS has placed vessels less than 40 ft LOA and jig vessels in the no-selection pool for observer coverage since 2013. However, each Annual Report (AFSC/AKR 2017, NMFS 2016; 2015b) and the supplement to the environmental assessment for the restructured Observer Program (NMFS 2015c) have highlighted the data gaps caused by not having any observer information on vessels less than 40 ft LOA. In recognition of both the challenging logistics and data gaps, the Annual Report supported the Council's recommendation to develop a discussion paper about incorporating vessels less than 40 ft LOA in the EM selection pool.

4. 2018 Deployment Methods

The Observer Program uses a stratified hierarchical sampling design where trips and vessels represent the primary sampling units. Observer and EM are deployed into strata that are defined through a combination of regulations and the annual deployment process. Subsequent and lower levels of the sampling design at sea include the sampling of hauls, conducting species composition, obtaining lengths and biological tissues including those used for ageing, sexual maturity and genetics. Dockside monitoring consists solely of conducting complete enumerations of salmon bycatch within the pollock fishery.

At-Sea Deployment Design

Following the publication of new regulations (82 FR 36991), EM is being incorporated into the at-sea deployment design in 2018 and will be used to collect data to account for retained and discarded catch for fixed-gear vessels.

The sampling design for at-sea deployment of observers and EM in the partial coverage category involves three elements: 1) the selection method to accomplish random sampling; 2) division of the population of partial coverage trips into selection pools or strata (stratification scheme); and 3) the allocation of deployment trips among strata (allocation strategy).

Selection Method

Trip-selection refers to the method of selecting fishing trips as the sampling unit. Trip selection is facilitated through vessels logging their trips into the Observer Declare and Deploy System (ODDS) and being notified if the trip is selected for coverage. Trip selection will be the sole method of assigning both observers and EM to at-sea fishing events in 2018.

Vessels in the EM selection pool will also use ODDS to close each trip following the instructions in their Vessel Monitoring Plan (VMP) (Appendix E). For 2018 the VMP specifies that vessel operators are required to close their trips prior to logging another trip or within 2 weeks of the end of the trip, whichever is sooner.

The requirement to close a trip in ODDS provides the ability to instruct the vessel to send the video storage device after the trip to ensure the timeliness of EM data for inseason management. In addition, requiring a vessel operator to close the trip provides a mechanism to avoid monitoring bias by requiring 100 percent recording of trips and using a post-trip selection process through ODDS to randomly select trips for video review. NMFS intends to implement a post-trip selection process for EM in 2019. However, there are logistical and cost considerations with this approach since EM service providers will need to collect and delete data from hard drive from every trip and provide the boat with empty hard drives. In 2018, NMFS will work with EM service providers and vessel operators in the EM pool to determine cost estimates and develop efficient hard drive delivery protocols.

Selection Pools (Stratification Scheme)

Appendix C analyzes the performance of two stratification designs for observer deployment, one defined by gear and the second defined by both gear and tender/non-tender deliveries. The designs were evaluated using gap analysis (i.e., exploring situations where no observer data would be available). The gap analysis was used to determine which sampling designs would have a 50 percent probability of having at least one and three observed trips. Using this metric, the gear-based stratification schemes outperformed the schemes that include tenders (Table C–3). However, there are several reasons to continue the gear/tender stratification scheme. First, this stratification scheme, which was first implemented in 2017, has not been fully evaluated in the Annual Report process. Maintaining this stratification scheme for another year, while improving the allocation design, would enable analysis of the effects and performance of the designs. Further, as discussed in the Annual Report Summary, tendering activity in pollock trawl fisheries continues to represent a sampling challenge. Although it has yet to be evaluated whether the addition of the tender strata fully alleviates this problem, it does ensure a certain level of coverage for those trips.

NMFS recommends the following observer deployment strata for vessels in the partial observer coverage category (50 CFR 679.51(a)) in 2018:

- ***No-selection pool*:** The no-selection pool is composed of vessels that will have no probability of carrying an observer on any trips for the 2018 fishing season. These vessels are fixed-gear vessels less than 40 ft LOA[3] and vessels fishing with jig gear, which includes handline, jig, troll, and dinglebar troll gear.

- ***Electronic monitoring (EM) selection pool:*** Based on analysis of EM costs (Appendix B) and the amount of available funding that is currently available[4] for EM, the EM selection pool will be composed of up to 110[5] fixed gear vessels (80 longline and 30 pot) that have requested to participate in the EM selection pool in 2018 and are selected by NMFS. If a vessel also uses trawl gear within the year, they are not eligible to participate in the EM selection pool for 2018.

  Once NMFS approves a vessel for the EM selection pool, that vessel will remain in the EM selection pool for the duration of the calendar year. Vessels in the EM selection pool will be required to submit and follow an NMFS-approved Vessel Monitoring Plan (see Appendix E).

  EM system installations will be scheduled in the primary ports of Homer, Kodiak, and Sitka for longline vessels, and in Homer, Kodiak, and Sand Point for pot vessels. Secondary ports such as Juneau, Petersburg, Sand Point, King Cove, and Dutch Harbor may have periodic EM installation services available. Vessels not available during scheduled dates of EM installation in a secondary port will be required to travel to a primary port for EM installation services prior to the date of their first logged trip in ODDS. Primary and secondary port services apply to EM equipment installation and servicing only, there are no restrictions on where a vessel may make landings associated with this program. Once installed, the EM sensors and cameras will remain on the vessel until either 1) the boat opts out of the EM pool for the following year; or 2) NMFS determines that the vessel will not eligible to participate in the EM selection pool the following year.

- ***Hook-and-line trip-selection pool:*** This pool is composed of all catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing hook-and-line gear.

- ***Hook-and-line vessels delivering to tenders trip-selection pool:*** This pool is composed of all catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing hook-and-line gear and are delivering to tendering vessels.

- ***Pot trip-selection pool:*** This pool is composed of all catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing pot gear.

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[3] Length overall (LOA) is defined in regulations at 50 CFR 679.2 and means the centerline longitudinal distance, rounded to the nearest foot.
[4] Additional NFWF funds are also being requested by industry and if this request is successful, the number of EM boats could increase to the Council's recommendation of 165 boats total.
[5] Does not include 11 pot vessels that have EM systems installed by Saltwater Inc. under a NFWF grant.

- ***Pot vessels delivering to tenders trip-selection pool:*** This pool is composed of all catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing pot gear and are delivering to tendering vessels.

- ***Trawl trip-selection pool***: This pool is composed of all catcher vessels in the partial coverage category fishing trawl gear.

- ***Trawl vessels delivering to tenders trip-selection pool:*** This pool is composed of all catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing trawl gear and are delivering to tendering vessels.

Allocation Strategy

Allocation strategy refers to the method of allocating deployment trips among strata. For the EM stratum, in 2018 NMFS will use discretionary appropriated funds from its budget for EM system deployment. The number of vessels allocated to the EM selection pool will be based on analysis of EM costs (Appendix B) and the amount of available funding that is currently available.[6] If funding is insufficient to expand the EM pool up to 110 vessels, or if more than 110 vessels request to participate in the EM selection pool, NMFS will prioritize deployment in the EM pool as follows: 1) longline vessels, whose data will be used for inseason management; 2) vessels that are already equipped with EM systems; and 3) vessels 40-57.5 ft LOA where carrying a human observer is problematic due to bunk space or life raft limitations.

For allocation of observer deployment in 2018, an analysis in Appendix C compares 3 allocation strategies:

1. Equal allocation: an equal coverage rate is estimated for all strata.
2. 15% plus optimization: a "hurdle" approach to optimization where observer sea days are first allocated equally up to a 15% coverage rate; the remaining sea-days are allocated using an optimal allocation algorithm that maximizes precision for chosen metrics (such as discards or retained catch) for the least cost.
3. Optimized: All samples are allocated among strata using an optimal allocation algorithm that maximizes precision for chosen metrics (as described in #2).

For both the 15% plus optimized and the optimized strategy, two metrics for optimization were evaluated: 1) discards of groundfish and halibut PSC; 2) discards of Chinook PSC in addition to groundfish and halibut PSC.

Results indicate that optimized allocation (#3 above) has the most gaps in observer coverage (Figure C–4). Designs that use equal allocation or 15% plus optimized allocations result in far fewer gaps in coverage, and the potential gaps for these designs only occur when there is low fishing effort (Tables C-4 through C-7).

NMFS recommends an observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut and Chinook PSC. This allocation strategy provides a

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[6] Additional NFWF funds are also being requested by industry and if this request is successful, the number of EM boats could increase to the Council’s recommendation of 165 boats total.

balance between minimizing the variability of discard estimates, prioritization of PSC-limited fisheries, and the need to reduce gaps in observer coverage in the partial coverage category.

Estimated Deployment Rates

To determine the deployment rate for each stratum, NMFS uses available sea-day budgets and estimates of anticipated fishing effort.

The coverage rates for the EM selection pool for 2018 is based on prior recommendations from the Council[7], EM costs and available dedicated budget (Appendix B).

The final budget for 2018 observer deployment is not yet certain. However, NMFS anticipates a budget for 2018 observer deployment to be approximately $5.36M. The available budget for observer days in 2018 was estimated from carryover funds from the previous fiscal year, stable fee revenues between 2018 and 2019, and a $1M increase in Federal funding in fiscal year 2018.Using this anticipated budget, a preliminary at-sea budget for this draft ADP for the deployment of observers was set at 4,062 days for 2018.

In order to evaluate the relative performance of alternative stratification schemes and allocation strategies, the analysis in Appendix C is based on necessary assumption of future fishing effort, namely that fishing in 2018 will be identical to that in 2016. The analysis does not incorporate uncertainty in observer fee projections for 2018 nor uncertainty in the timing when the observer fees will be available. To mitigate this uncertainty and the simplified assumptions regarding fishing effort, a buffer of approximately 5 percent was applied to the rates in Appendix C (Rates *0.95) to calculate the preliminary selection rates for the proposed strata.

The ***preliminary*** deployment rates for the trip-selection strata in 2018 are:

- No selection - 0%
- EM selection pool - 30%
- Hook-and-line - 16%
- Tender hook-and-line - 15%
- Pot - 15%
- Tender Pot - 15%
- Trawl - 19%
- Tender trawl - 15%

Once a final budget for the 2018 ADP is established and EM participants identified, an updated and potentially more accurate estimate of anticipated fishing effort and simulation models (following methods outlined in NMFS 2015a) will be used to estimate expected coverage rates and will be provided in the final 2018 ADP.

Chinook Salmon Sampling in the Gulf of Alaska

For vessels delivering to shoreside processors in the in the GOA pollock fishery the sampling protocol for Chinook salmon will remain unchanged. Trips that are randomly selected for

[7] http://npfmc.legistar.com/gateway.aspx?M=F&ID=113c3395-7b72-41dd-b371-d60537d1894d.pdf

observer coverage will be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility.

For trips in the GOA pollock fishery that are delivered to tender vessels and trips outside of the pollock fishery, salmon counts and tissue samples will be obtained from all salmon found within observer at-sea samples of the total catch.

Conditional Release Policy

For 2018, NMFS will not grant any conditional releases or temporary exemptions to any vessels subject to observer coverage. The integration of EM into the Observer Program in 2018 is a mitigating factor in not granting any conditional releases. Vessels in the EM selection pool will carry EM equipment as described in the Vessel Monitoring Plan (Appendix E) and will not be subject to carrying an observer.

Annual Coverage Category Requests

Partial coverage catcher/processors

Under Observer Program regulations at 50 CFR 679.51(a)(3), the owner of a non-trawl catcher/processor can request to be in the partial observer coverage category, on an annual basis, if the vessel processed less than 79,000 lb (35.8 mt) of groundfish on an average weekly basis in a particular prior year. The deadline to request placement in the partial observer coverage category for the following fishing year is July 1 and the request is accomplished by submitting a form[8] to NMFS. Six catcher/processors requested, and NMFS approved, placement in the partial coverage category for the 2018 fishing year.

Full coverage catcher vessels

Under Observer Program regulations at 50 CFR 679.51(a)(4), the owner of a trawl catcher vessel may annually request the catcher vessel to be placed in the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI management area for the upcoming year. Requests to be placed into the full observer coverage in lieu of partial observer coverage category must be made in ODDS[9] prior to October 15, 2017 for the 2018 fishing year. NMFS will publish the list of catcher vessels that have been approved to be in the full coverage category on the website at: https://alaskafisheries.noaa.gov/fisheries/observer-program.

Observer Declare and Deploy System (ODDS)

For 2018, ODDS will be modified to add new functionality to incorporate EM into the observer program. These include the ability for vessels to request EM for the upcoming year, the ability for the NMFS to notify the EM provider of vessels requiring EM installation, the mutual tracking of EM installation and maintenance by EM provider and NMFS, and the storage and tracking of approved VMPs for vessels, providers and the NMFS .

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[8] The form for small catcher/processors to request to be in parital coverage is available at: https://alaskafisheries.noaa.gov/sites/default/files/obspartialcovreq.pdf

[9] Insturctions for catcher vessels to request to be in full coverage using ODDS are available at: https://alaskafisheries.noaa.gov/sites/default/files/bsaitrawlobsrequest.pdf

The user experience in ODDS will not change for a vessel operator. As in 2017, there will be a selection box to indicate whether the vessel will be delivering to a tender. NMFS will retain the current business operating procedure of allowing vessels to log up to three trips in advance and programming that prevents a 40 – 57.5’ fixed gear vessel from being selected for a third consecutive observer trip. Any observed trip that is canceled would automatically be inherited on the next logged trip. As described in the Annual Report Summary, NMFS has identified an improvement to the programming in ODDS that would allow vessels to change the dates for observed trips, rather than cancelling and inheriting observed trips. Although this modification is a priority for NMFS and the Council (Appendix A), the change will not go into effect in 2018. NMFS will consider whether it is feasible to include this programming change to ODDS in 2019.

Vessels are allowed to cancel or change any unobserved trips (logged trips that have not been selected to carry observer coverage) themselves, but any observed trips (logged trips that have been selected for observer coverage) that must be rescheduled need to be coordinated by contacting A.I.S., Inc., through the ODDS call center (1-855-747-6377).

eLandings Electronic Reporting System

NMFS modified the eLandings system in 2016 to enable the ODDS trip number to be entered on a groundfish landing reports in eLandings. When vessels log trips in ODDS, they are given an ODDS trip receipt with a unique trip number. When landing reports are entered in eLandings at the end of the trip, the vessel operators are asked to provide their ODDS trip number so that it can be entered on the landing report. Having ODDS trip numbers entered on groundfish landing reports facilitates data analysis and provides better linkage between ODDS and eLandings. Although many processors are now submitting this information, it is not consistently reported. In 2018, NMFS will continue further outreach to processors to increase reporting of the ODDS trip number.

5. Communication and Outreach

NMFS will continue to communicate the details of the ADP to affected participants through letters, public meetings, and information on the internet:

- Information about the Observer Program is available at https://alaskafisheries.noaa.gov/fisheries/observer-program
- Frequently Asked Questions are available at https://alaskafisheries.noaa.gov/sites/default/files/2016-observer-prog-faq.pdf
- For Frequently Asked Questions regarding ODDS go to http://odds.afsc.noaa.gov and click the “ODDS FAQ” button.

Information about EM, including Frequently Asked Questions are currently being developed and will be added to the NMFS website at https://alaskafisheries.noaa.gov/fisheries/observer-program. In addition, Observer Program staff are available for outreach meetings upon request by teleconference and/or WebEx pending staff availability and local interest. A community partner would be needed to organize a location and any necessary equipment to facilitate additional meetings. To request a meeting or suggest a topic for discussion, please contact Chris Rilling at 1-206-526-4194.

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Appendix A. Council motion on the Annual Report and ADP

Agenda Item C-1: Observer Program Annual Report & OAC Report
June 9, 2017

1) The Council recommends that the draft 2018 Annual Deployment Plan include the following:

- Maintain status quo for:
  - Dockside monitoring of observed pollock trips (see comments below for longer term solutions for tender offloads).
  - The trip-selection method to assign observers to vessels in partial coverage and continue to deploy observers in the trip selection pools defined by gear (pot, hook-and-line, and trawl).
  - Programming in ODDS that prevents a 40 – 57.5’ fixed gear vessel from being selected for a third consecutive observer trip.
  - Allowing vessels to log up to three trips in advance in ODDS.
  - Continuing to place vessels less than 40 ft in the no selection pool.
- Evaluate:
  - Whether to continue the tender strata definition in 2018.
  - Comparing the following alternative deployment designs: 1) 15% coverage rates across all strata; 2) equal coverage rates that can be afforded with available funding; and 3) optimization allocations based on discards that includes prioritization of PSC limited fisheries in the weighting schemes.
  - A preliminary evaluation of the method to split the fee budget between EM and human deployment.
- For the EM pool:
  - If funding is insufficient to expand the EM pool up to 165 vessels, prioritize deployment in the EM pool as follows: 1) longline vessels, whose data will be used for inseason management; 2) vessels that are already equipped with EM systems; and 3) vessels 40-57.5 ft LOA where carrying a human observer is problematic due to bunk space or life raft limitations
  - To the extent possible, the Council recommends that NMFS consult with the EM Workgroup and/or the OAC on policy choices made during the transition to an integrated EM program in the 2018 ADP.
- Reprogram ODDS to allow vessels to change the dates for observed trips, rather than cancelling and inheriting observed trips.

2) The Council recommends that NMFS incorporate the following in future annual reports:

- Evaluate pelagic trawl and non-pelagic trawl trips for evidence of observer effect;
- Include information on progress toward estimating variance of catch and bycatch;
- SSC comments, as appropriate.

3) The Council is concerned about the increase in Observer Program complaints for OLE priority issues of safety and creating a hostile work environment, and encourages the industry to work with OLE and observer providers to proactively engage in education and outreach effort to reduce the number of complaints.

4) The Council appreciates NOAA Acquisition and Grants Office (AGO) efforts to accommodate stakeholder input on the Statement of Work for the next partial coverage observer provider contract, including presentations at the OAC meeting. The Council requests that AGO schedule their upcoming outreach events during the October Council meeting.

5) Regarding tasking of observer projects:

- Low sampling rates: The Council approves the OAC's recommendation to create an OAC subgroup over the summer to scope out potential solutions for addressing low coverage rates.
- Tendering and dockside monitoring: The Council tasks staff to develop a discussion paper identifying specific data concerns with respect to vessels engaged in tendering, and to work with industry groups to develop both short term and long-term solutions, including potential regulatory changes.

6) The Council remains concerned about the combined effects of decreased funding and sequestration and other delays in release of the fees. The Council recommends that NMFS consider provide supplementary funds to help alleviate shortage in funding for observer deployment as well as continue to pursue solutions that remove these funds from sequestration rules and streamline the release of the collected funds.

Appendix B. Electronic monitoring fleet size

Introduction

This analysis evaluates the maximum size of the Electronic Monitoring (EM) fleet that can be afforded using funds available for EM deployment and video review in 2018, under the constraint that the risk of going over budget not exceed 10%. This analyses precedes the evaluation of possible deployment designs for the 2018 Draft ADP since vessels are removed from the human pool prior to an evaluation of possible selection rates in Appendix C. This analysis only considers budget and is not a surrogate for an evaluation of potential impacts to the data collected by the North Pacific Observer Program, nor does it provide an evaluation of how EM could be strategically used in conjunction with human observers.

Methods

Assumptions

This analysis is based on several necessary assumptions. First is the assumption that all vessels that volunteered for electronic monitoring and had EM systems installed by the end of 2017 would constitute the basis for a minimally sized EM strata in 2018 (i.e., it was assumed that these vessels would also volunteer to participate in EM and fish during 2018). This assumption was conveyed to the 2017 and 2018 EM provider Archipelago Marine Research, Inc. (AMR, subcontracted through Pacific States Marine Fisheries Commission) with a request of cost estimates to install and maintain an EM fleet of various sizes from minimum 2017 *status quo* levels up to 154 total vessels. This upper limit resulted from the difference between the North Pacific Fishery Management Council's June 2017 motion (Appendix A) that specified a desire to increase the EM fleet to 165 vessels and the number of EM vessels currently maintained by Saltwater Inc. under a separate grant from the National Fish and Wildlife Foundation Fisheries Innovation Fund[10]. It was assumed that the boats equipped with Saltwater EM systems will remain the same from 2017 to 2018 and that fishing effort in 2018 was best represented by the most recent full year of data (2016).

Data and Model

Information on the cost of deploying and maintaining EM of various fleet sizes was obtained from Memorandum from Archipelago Marine Research Inc. dated 4 May 2017, 21 August 2017, and 24 August 2017. When subsequent Memorandum contained the same information, the most recent estimate was used. While the memos contained information on budget categories such as services, EM products, travel expenses and other expenses, the metric of interest to this exercise is total cost of EM installation and maintenance (C_{IM}). Anticipating further activity for the year, the *status quo* number of vessels pre-wired for EM assumed by AMR was two vessels greater than the actual number of vessels for which EM systems had been actually installed. The number of new vessels to the EM program was derived from the difference between the total EM fleet size and the AMR *status quo* EM fleet size with one exception: for the current 2017 EM program, the number of new vessels was determined from the difference in the status quo EM fleet size and the number of vessels in that list that had EM installed during 2016.

[10] http://www.nfwf.org/fisheriesfund/Pages/home.aspx

The estimates of C_{IM} and the number of new EM vessels (V_n) allowed a functional relationship to be developed between these two metrics. The relationship chosen was

$$C_{IM} = ae^{B \cdot V_n} \qquad \text{Equation 1}$$

The linear form of this relationship (obtained through log transformation) was used to derive the parameters a and B, and the prediction intervals corresponding to the 5th and 95th percentiles (i.e. a 90% 'confidence interval') for C_{IM} was back-calculated for EM fleet sizes corresponding to every value of V_n. Note that parameter value a controls the cost start value, and B is the rate of growth. The value corresponding to the 90th percentile (C_{IM90}) was used for C_{IM} since this value incorporates the prediction interval that corresponds to the desired risk of going over budget in this analysis.

The true total cost of an EM program to the NMFS will be the sum of C_{IM} and the total cost of EM data review, C_R. While it is assumed here that C_{IM} is a cost that exponentially increases with the number of new vessels, there is considerable variation in the cost of EM data review for every value of V_n. The amount of EM data review for a given number of new vessels will depend on not only which vessels participate in EM, but also which trips are selected for review. Costs for review were assumed to be a function of the number of fishing days (d) totaled among all randomly selected trips (T) among all EM vessels (V) multiplied by the cost for an EM review day (c_d) or

$$C_R = \sum_{i=1}^{V} \sum_{i=1}^{T} d_i \cdot c_d \qquad \text{Equation 2}$$

The cost of a review day was determined from information in the AMR Memorandum dated May 4th and based on actual 2016 Review costs divided by the number of EM Review days (\$112 day^{-1}). Since both the participating vessels and the trips to be reviewed are random variables, iterative simulation was used to determine a range of possible C_R values for changing values in V_n. For this purpose, a database containing 2016 federal fishing trip dates (the most recent full year of prior data), and durations (days) for fixed gear vessels was used. This data set was enhanced with information about the 2017 deployment strata according to the 2017 Annual Deployment Plan (ADP; NMFS 2016). The resulting data represent a potential EM population for 2018, including details on stratification (based on the 2017 ADP).

Iterative simulation

The process used for iterative simulation has four steps (Figure B–1). The first step was to estimate the cost of EM review for pre-wired vessels. The second step was to estimate the cost of EM review for new vessels. The third step was to estimate the cost of EM installation and maintenance based on the number of new vessels from the model in equation 1, and the final step was to evaluate the costs against available budgets. In the first step, the trips associated with all known pre-wired vessels and two randomly drawn EM eligible vessels were assigned a random uniform number between zero and one, trips with values ≤ 0.3 were 'selected' for EM review and the sum of their days was determined from equation 2. This rate of selection was following NPFMC (2017). This random selection of trips and estimation of EM review costs was repeated

100 times for the same 75 pre-wired vessels. To account for vessel variability, the process of randomly selecting vessels, then randomly selecting trips and estimating review costs 100 times was itself repeated 100 times to yield 10,000 outcomes. The estimated cost of EM review for new vessels (C_{Rn}) was derived through the process of randomly selecting unwired vessels and trips, and associated review costs described above.

Since the costs of EM review for prewired vessels (C_{Rp}) would always be the same for any number of new vessels in the total EM program, given the budgetary risk desired, the 90th percentile of the values (C_{R90p}) was obtained and used to obtain total program costs (C), where

$$C = C_{R90p} + C_{Rn} + C_{IM} \quad \text{Equation 3}$$

The final step in the iterative simulation was to determine the likelihood of total program costs being greater than available budget. The number of outcomes that exceeded the budget divided by 10,000 yielded a Ratio value. If the Ratio value was less than 0.9, then the number of new EM vessels was reduced by one and the entire iterative simulation was repeated (Figure B–1).

Results

A total of six EM program cost estimates and one actual program cost were assembled that encompassed the full extent of potential EM program sizes to be evaluated (Table B–1). The relationship between the number of new vessels and total program cost was well described by equation 1 (Table B–2, Adjusted r^2 value = 0.961, df = 5; Figure B–2.). The total cost of the EM program was very sensitive to the number of new vessels due to the exponential form of the relationship in Figure B–2. The maximum size of the 2018 EM program, which will define the EM strata in the 2018 Annual Deployment Plan, was found to be 110 vessels (Table B–3). This EM program size represents an expansion of 35 new vessels, which is a 46.7% increase over 2017 levels. Although this number of vessels did not pass the Ratio value of 0.9 or greater, its risk of budget overage (1 - Ratio × 100% = 12%) was very close to the 10% permissible (Table B–3). The budget under this EM program size requires that $845,091.40 be allocated to AMR for the cost of installation and maintenance and $154,908.60 be allocated to PSMFC for EM Review. An EM program of 154 vessels (the maximum evaluated here) would require that $1,566,013 be allocated to AMR and that $198,128 be allocated for PSMFC for EM Review.

An EM strata of 110 vessels, equivalent to 73 pre-wired vessels and 37 randomly selected EM eligible vessels, was provided as an input to the evaluation of alternative sampling designs for the 2018 Draft Annual Deployment Plan (Appendix C).

Discussion

As stated in the introduction, this analysis was only concerned with evaluating the maximum size of the EM fleet afforded with dedicated funds for 2018 under the constraint that the risk of going over budget not exceed 10%. By design, this analysis is limited in its scope and utility. The relationship between the number of new EM vessels and the total program cost should not be used outside of this analysis. Its shape, while a good fit to the available information, implies that either there is no increase in operational efficiency with scale or that component of total EM installation and maintenance costs is minimal.

There are opportunities to improve the accuracy and utility of analyses to support EM implementation in future ADPs. In this analysis, although several estimates of program size and cost were available for use, and two of these points were either close to or represented actual values, there was no opportunity to gauge bias in AMR estimated costs of EM implementation and maintenance. Consequently model results only incorporated the variance in the estimates. Comparisons between estimates and actual values, such as those performed for observer sea days in Observer Program Annual Reports, provide the opportunity to gage whether further adjustments to model estimates are required, making them potentially more accurate. Infrastructure has been built into ODDS for 2018 to facilitate better tracking of actual costs of EM deployment and maintenance that should help build more informative accurate models of future costs for EM strata of the ADP. Incorporation of additional information on cost for EM Review from 2017 would also greatly improve future analyses. In addition, that participation in EM for 2018 is voluntary and only limited by the fixed gear status of a vessel greatly increased the variance in the potential costs of a future EM program since vessels and their associated trips had to be randomly drawn from a potentially large population. Additional information on the desired characteristics of participating EM vessels would narrow the range of potential program costs of a given size.

With the shift from a dedicated pool of money for EM to a shared pool of money for EM and observers in 2019, the utility of analyses of this type to support future ADPs could be improved by focusing on the strategic use of EM in the context of the entire observer program. For example, significant cost savings of using EM over observers may be possible by deploying these technologies on active vessels (i.e. those that fish for more than a three trips a year). The lack of specimen length or biological information from EM boats could be mitigated by deploying EM on active vessels that also fish in NMFS areas, seasons, and fisheries where there is also a high probability that observer data may be collected (for example where there is high fishing effort). Such probabilities are regularly produced in each ADP as part of the gap analyses (e.g., see Faunce 2016). Improvements to the analytic capacity and efficiency of the Observer Program staff made in 2017 should support research into how to efficiently and effectively deploy EM in future ADPs.

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NPFMC 2017. Final 2017 electronic monitoring pre-implementation plan. Available online at https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/Final2017EMPre-impPlan.pdf

Table B–1. Summary of collected EM program scenarios. The predicted relationships from equation 1 are also shown. Scenario 1 and Scenario 2 8.21 represent the full extent of the program sizes evaluated in this analysis.

Scenario	Total Vessels	New EM Vessels (V_n)	Pre-wired vessels (V_p)	AMR Estimate of Cost ($) ($C_{IM}$)	Predicted C_{IM}	Predicted C_{IM90}
Scenario 1	75	0	75	483,112	446,498	548,441
Scenario 2016	26	10	16	453,044*	510,538	621,165
Scenario 2	105	30	75	695,330	667,491	802,041
Scenario 2017	75	58	17	907,389	971,472	1,166,805
Scenario 3A	135	60	75	1,066,716	997,866	1,199,416
Scenario 3B	150	75	75	1,276,457	1,220,072	1,479,491
Scenario 2 8.21	154	79	75	1,232,032	1,287,268	1,566,013

* Actual

Table B–2. Parameter estimates and uncertainties associated with the linear form of equation 1. The p-value depicts the likelihood that the parameter value is equal to zero.

Coefficient	Estimate	Standard Error	*p*
a	13.009	0.058	<0.001
B	0.0134	0.001	<0.001

Table B–3. Summary of simulation iterations for a 30% EM trip review. The values in bold denote the final selected number of new vessels.

Number of Total EM Vessels	Number of new EM vessels (V_{new})	Ratio
154-113	73-38	0.00
112	37	0.16
111	36	0.40
110	**35**	**0.88**
109	34	0.99

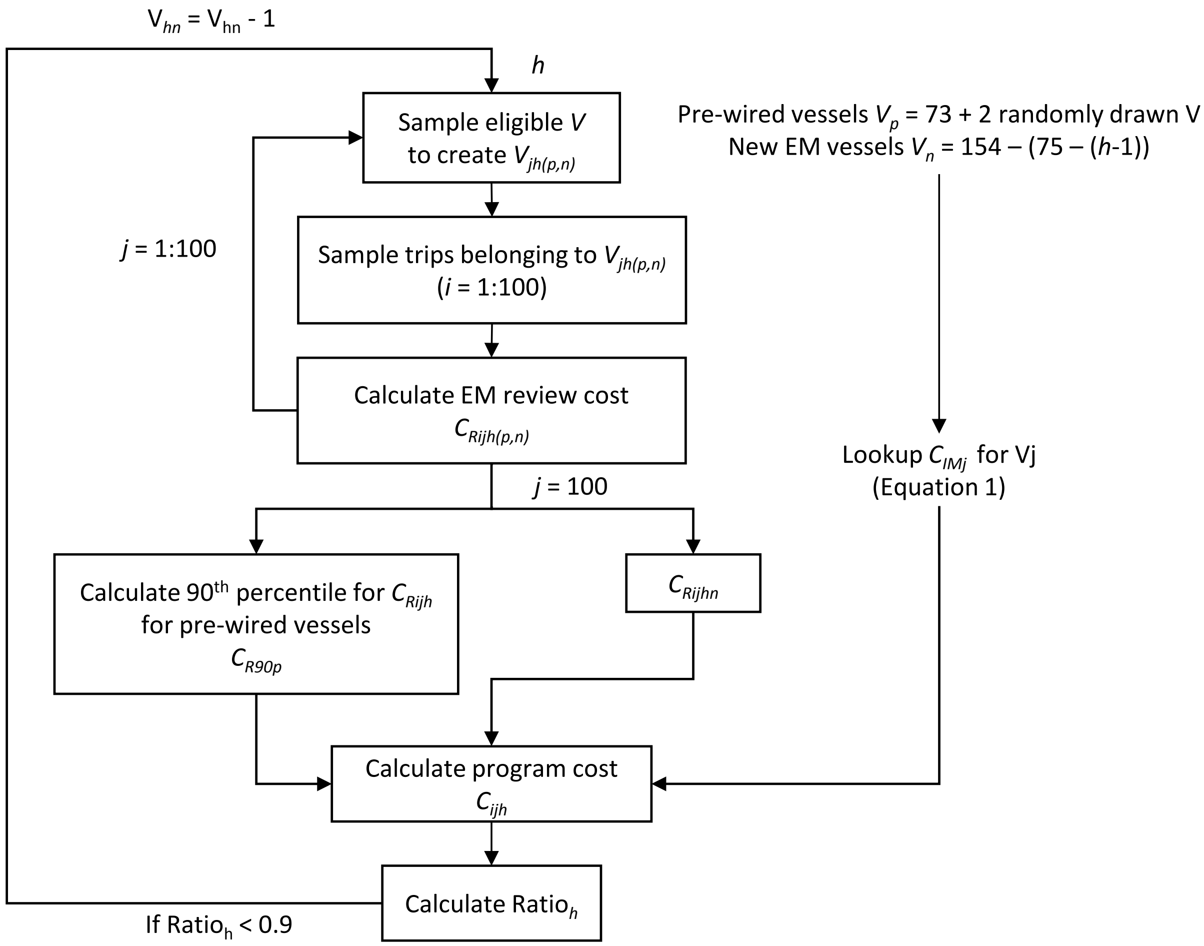

Figure B–1. Flow chart depicting methods used in this analysis. Abbreviations: V = vessels, i = iterations for the randomly drawn trips, j = iterations for the randomly drawn vessels, h = iterations for the number of new vessels in the EM strata for 2018.

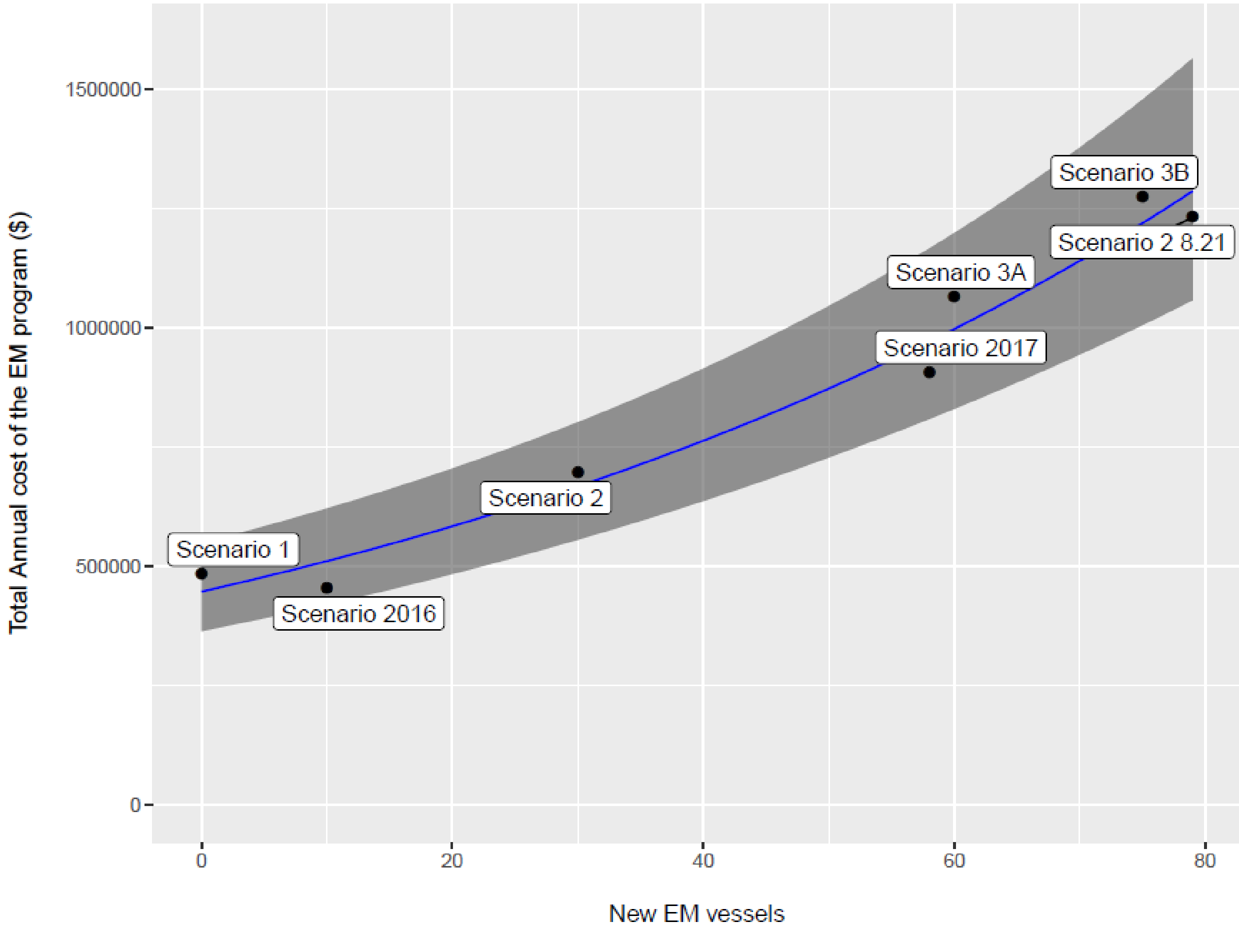

Figure B–2. Relationship between the number of new EM vessels and the estimated cost of EM installation and maintenance of the total EM program. Model fit and 90% confidence intervals from equation 1 depicted as blue lines and grey shaded areas respectively.

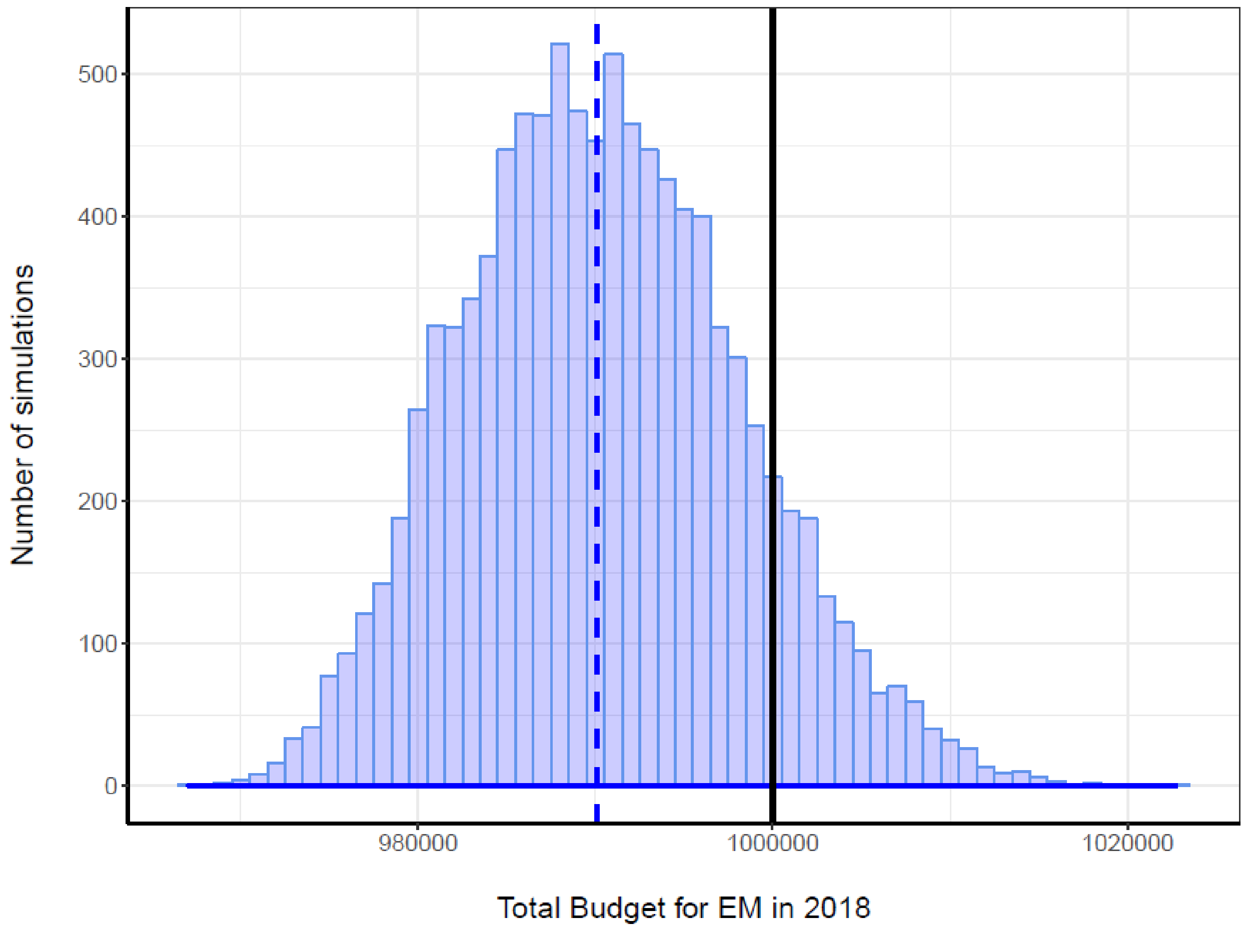

Figure B–3. Total EM program costs from 10,000 simulations of a population of vessels and trips belonging to the largest number of EM vessels permissible by budget given tolerable risk.

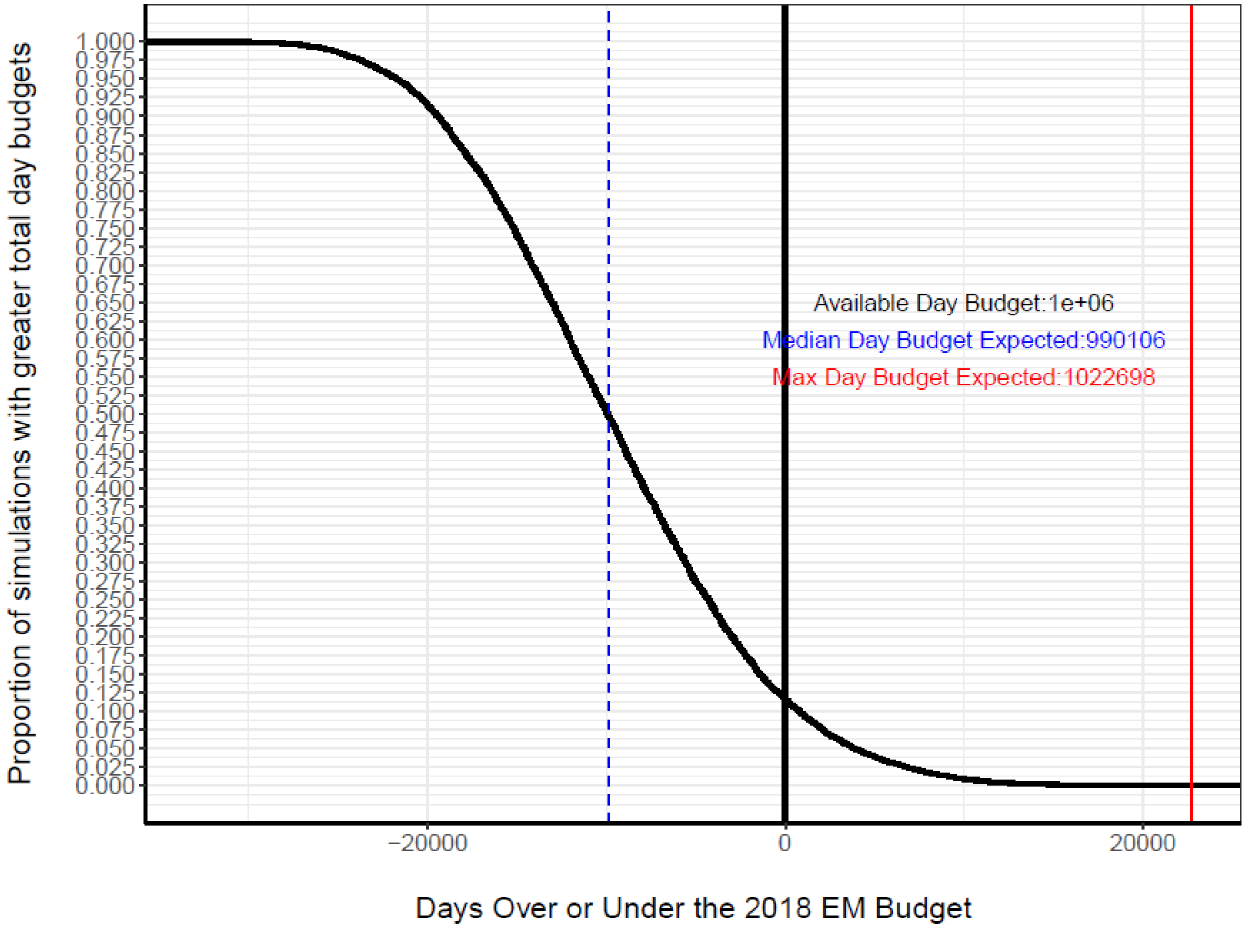

Figure B–4. Risk profile plot depicting the likelihood and amount of funds remaining from 10,000 simulations of a population of vessels and trips belonging to the largest number of EM vessels permissible.

Appendix C. Comparison of alternative sampling designs for 2018

Introduction

The North Pacific Observer Program uses a hierarchical sampling design with randomization at all levels to achieve unbiased data from fishing operations in the region. The Annual Deployment Plan (ADP) documents how NMFS plans to deploy observers in the partial coverage category onto fishing trips in the upcoming year under the limits of available funding

The ADP provides an annual process for NMFS and the Council to evaluate the sampling design used to deploy observers and EM. In the Draft 2017 ADP, NMFS presented six alternative stratification designs for deployment of observers (NMFS 2016a). The adopted design in the Final 2017 ADP allocates observed trips among six strata defined by gear and tendering activity according to an optimized allocation resulting from the interactions of stratum size and variance in total discarded catch with Pacific halibut PSC (NMFS 2016b). Following the most recent Annual Report (NMFS 2017) and subsequent Council motion (Appendix A) this analysis builds upon the 2017 ADP design by evaluating whether to continue the tender strata definition and compares the following alternative allocation designs: 1) equal coverage rates that can be afforded across all strata with available funding; 2) 15% coverage rates across all strata with optimization on anything above 15%; and 3) optimization of all partial-coverage trips. All allocation strategies evaluated include those based on discarded groundfish and halibut, Chinook salmon Prohibited Species Catch (PSC) and a blended combination of the two. In addition, this ADP accounts for the uncertainty introduced by Electronic Monitoring (EM) pool by simulating the full range of potential partial coverage populations in the hook-and-line and pot gear strata.

This analysis provides a comparison of the relative performance of alternative strata definitions, stratification schemes, and allocation designs for the deployment of observers into the partial coverage fleet for consideration in 2018.

Methods

Data Preparation: Defining the partial coverage fleet

The partial coverage fleet in general consists of the catcher vessel fleet when not participating in a catch sharing or cooperative style management program. Changes to this general design have resulted from NMFS policy, Council Action, and regulations. Activities expected to occur in 2018 that have been excluded from observer coverage in the past include 1) catcher vessels while fishing in state-managed fisheries, 2) catcher vessels fishing with jig gear, 3) catcher vessels fishing that are sized < 40 feet in length overall (LOA), and 4) vessels that volunteer for EM. It was assumed that AFA-endorsed trawl catcher vessels that volunteered to carry full observer coverage when fishing in the Bering Sea and Aleutian Islands in 2017 will continue to do so in 2018. Treatment of the voluntary EM stratum is discussed in Appendix B and in the section titled *Uncertainty due to Electronic Monitoring*.

A database containing 2014, 2015, and 2016 species-specific catch amounts, dates, locations, and disposition, and observation status was first enhanced with additional information from the Alaska Regional Office and FMA, then parsed to reflect the partial coverage fleet subject to observer coverage in 2017, and finally re-labelled according to the alternative deployment designs described below.

Budget Forecasting

The available budget for observer days in 2018 was estimated from carryover funds from the previous fiscal year, stable fee revenues between 2018 and 2019, and a $1M increase in Federal funding in fiscal year 2018. Sea-day expenditures were set so that the total number of observer days would remain stable between 2018 and 2019 and there would be no carryover funds after December of 2019. Budget forecasting is necessary to determine not only the number of sea-days expected for the upcoming calendar year, but also to determine how much money should be allocated for each contract year, which runs from June 17 of one year to June 16 of the next. For this reason, calendar years were divided into two seasons(s): a first half (FH) period from 1 January, 2017 to 16 June, 2017 and a second half (SH) from 17 June, 2017 to 31 December, 2018.

The exercise of budget forecasting starts in the SH of the calendar year (y) prior to the ADP (y - 1; here y is = 2018 and y - 1 = the SH of 2017). The forecasting process requires an estimation of available funds (F). The available sea day budget for the current fiscal year (B_o, comprised of SH 2017 and FH 2018) was determined by subtracting the expected travel for the current fiscal year from F. Expected travel (T_{exp}) was estimated from the division of the total observer day funds expended for each season of the previous fiscal year (E_o) into the total travel funds (T) expended in the previous fiscal year and multiplying this ratio (R) by the available funds for the current fiscal year, or

$$T_{exp} = \frac{\sum_{s=1}^{S} E_{o,\,y-1}}{\sum_{s=1}^{S} T_{y-1}} F = RF \,. \qquad \text{Equation 1}$$

In order to calculate the funds remaining at the end of the current fiscal year, the total number of sea days and their cost is needed. While the number of observer days (d_o) in FH 2017 are known, those of SH 2017 were assumed using the number of expected days from the 2017 ADP (NMFS 2016b). The expected expenditures of funds for observer days (E_o) for each season is the product of d_o and the cost of a sea-day from the contract between NMFS and its observer provider. Subtraction of E_o from B_o in SH 2017 yielded the value for F in the FH of 2018. Since FH 2018 is in the SH of the fiscal year, travel funds were already accounted for, so the only expenditure to account for in this time period is the expenditure of observer days. By setting (1) T_{exp} to equal a constant R with an updated F each fiscal year, (2) d_o FH $y + 1..n$ equal to d_o in FH 2018, and (3) d_o SH $y + 1..n$ equal to the ratio of d_o SH : d_o FH, the value for d_O FH 2018 could be used as the main input into initial cost forecasts. The value for d_o FH 2018 was adjusted until the E_o 2019 = B_o 2019, and d_o 2018 = d_o 2019.

The values for F_{2018} and the average cost of an observer day (from F_{2018} divided by d_o 2018) from above were then passed as inputs into the analyses described in the *Deployment Design* section below. From 1000 iterations of simulated sampling, the value for the ratio of d_o SH 2018 : d_o FH 2018 was determined and passed back into the budget forecasts. The values for d_o FH 2018 was then adjusted in an iterative process until E_o 2019 = B_o 2019, and d_o 2018 = d_o

2019. At this point the budgetary forecast was considered complete, and the values for F_{2018} and the average cost of an observer day in 2018 were passed a final time into the analyses described in the sections.

Deployment Design

The sampling design for observer deployment (hereafter 'deployment design') involves two elements; how the population of partial coverage trips is subdivided (*stratification*), and what proportion of the total observer deployments are to occur within these subdivisions (*allocation*).

Stratification Schemes

Stratification is the partitioning of units in the population into independent groups (or sub-populations). These groupings are individually called stratum (strata if plural). Stratified random sampling is the act of obtaining independently random samples from within each stratum. For this reason, strata need to be defined based on criteria known prior to the draw of the sample. This means that elements of fishing trips known prior to departure are valuable in defining deployment strata, whereas catch is not.

There are numerous reasons for creating strata. These include the following: when a separate estimate for a sub-population is desired, when administrative convenience (field logistics) requires it, and to increase the precision of sample-based estimates of the total. Increased precision is accomplished through the division of a heterogeneous population into homogeneous sub-populations, and the resulting variance of the population total being calculated from the variance of the individual stratum (Cochran 1977). The collection of strata that together subdivide the population of trips in partial coverage constitutes a stratification scheme. In this study two stratification schemes were considered. These stratification schemes (with the number of the individual strata in parentheses) are as follows:

1. Gear × Tender (6 strata)

This *status quo* stratification divides the partial coverage trips into six strata based on gear and tendering status:

- Hook and Line ≥ 40' LOA (HAL).
- Tender Hook and Line ≥ 40' LOA (Tender HAL).
- Pot ≥ 40' LOA (POT).
- Tender Pot ≥ 40' LOA (Tender POT).
- Trawl (TRW).
- Tender Trawl (Tender TRW).

2. Gear (3 strata)

This stratification was used in 2016 and is comprised of HAL, POT, and TRW vessels.

Sample Allocation

Sample allocation refers to the allotment of trips in a stratum. Three allocation strategies were compared for 2018 observer deployment (the full workflow for the methods used in these designs is found in Figure C–1):

1. Equal Allocation

This allocation design estimates the equal coverage rate (trips sampled/total trips) across strata that can be afforded with available funding. Unlike previous years when optimal allocation was used, this design allocates samples proportional to fishing effort in a stratum. Similar to past years, the number of fishing trips (N) that occur within H strata was assumed to be equal to the most recent years' fishing activity. The cost of an observed trip in each stratum (c_h) is estimated as the product of the mean trip duration in a stratum and the cost of an observer day. The equal coverage rate afforded (r) across all strata was then calculated as

$$r_h = \frac{F_{2018}}{\sum_{h=1}^{H} c_h \, N_h}, \qquad \text{Equation 2}$$

where F_{2018} is the estimated funds from the budget forecasting.

2. 15% + Optimized

Unlike equal rates afforded, this sample allocation adopts a "hurdle" approach to optimization. Optimization aims to maximize precision for the chosen metrics for the least cost. In this allocation strategy, observer sea days are first allocated equally up to a 15% coverage rate. Once 15% has been met, an optimal allocation algorithm (described below) is used to allocate remaining monitored trips among strata. If available funding does not permit equal allocation up to 15%, the total amount of additional funds needed to meet 15% is estimated. The minimum 15% coverage rate was recommended by the Observer Science Committee, because it has been shown to eliminate or minimize severe gaps in observer data (Faunce et al. 2017, NMFS 2017, NMFS 2015c p. 98). This allocation first estimates the number of trips left over in each stratum after 15% coverage has been met

$$N_{h+} = N_h - (0.15 \times N_h) \qquad \text{Equation 3}$$

and then calculates the new budget (F_+) available for optimized allocation among strata

$$F_{2018+} = \sum_{h=1}^{H} c_h \, N_{h+} \, . \qquad \text{Equation 4}$$

The F_{2018+} and N_{h+} are then used in the optimization algorithm, where F_{2018+} and N_{h+} are substituted for F_{2018} and N_h, respectively, in the following equations.

3. Optimized

This design was used in the 2016 and 2017 ADP and has no minimum sample size requirement. If n is the number of observed trips afforded for the year among all partial coverage fishing trips in each strata (N_h), and the estimate of the chosen metric of interest has S^2 variance, the number of samples that is considered optimum for each stratum (n_h) is denoted by the product of the total sample size and the optimal weighting (W_{hopt}),

$$n_h * W_{hopt}, \quad \text{where } W_{hopt} = \frac{\frac{N_h S_h}{\sqrt{c_h}}}{\sum_{h=1}^{H}\left(\frac{N_h S_h}{\sqrt{c_h}}\right)} \quad \text{Cochran (1977).} \qquad \text{Equation 5}$$

While equation 1 gives the allocation of observed trips among strata, it does not give the total sample size. To obtain this we can rearrange the previous equation as

$$n = \frac{F_{2018}\sum_{h=1}^{H}\left(\frac{N_h S_h}{\sqrt{c_h}}\right)}{\sum_{h=1}^{H}\left(N_h S_h \sqrt{c_h}\right)} \quad \text{Cochran (1977).} \qquad \text{Equation 6}$$

The value for n is used to solve for the sample size in each stratum using the stratum weightings described previously. The resulting coverage rate in each stratum is obtained from the division of n_h by N_h.

Blended allocations

Optimized sample allocations were generated using the variance of discarded catch with Pacific halibut PSC included. However, optimizations may be conducted on more than one target metric. Following the June 9, 2017 Council Motion that emphasized PSC-limited fisheries, we included an additional variable of Chinook PSC counts into the optimization. Cochran (1977) shows that the *blended optimal allocation* (m_h) is derived from the average number of optimal sample sizes measured across L metrics,

$$m_h = n \times \bar{n}_h, \quad where \ \bar{n}_h = \frac{\sum_{l=1}^{L} n_{l,h}}{L} \qquad \text{Equation 7}$$

It is worth noting that unless n_h among all metrics are positively correlated, the resulting compromise allocations may be substantially different from n_h for any individual target metric.

Evaluation of Alternative Designs

Data from 2014, 2015, and 2016 were combined and treated as a single meta-year for the calculation of optimal allocation weightings (W_{hopt}) in each strata. Distributions of the trip duration, discarded catch with halibut PSC, and Chinook PSC counts for each stratification scheme were plotted since these form the raw ingredients for the sample size allocation formulae (Figure C–2).

Gap analyses

Observers provide an invaluable service to the generation of total catch estimates; if there are no observer data in a given domain of interest, then data must be borrowed from similar or adjacent sampling units, resulting in poor inference about the total catch. An insufficient level of observer coverage can have implications for in-season quota management, catch estimation, stock assessment, and management of protected resources. The evaluation of alternative designs was determined using gap analysis following previous evaluations of observer program deployments (NMFS 2015a, NMFS 2015b, NMFS 2016a, NMFS 2016b). Gap analysis estimates the probability of observing a trip in a given domain of interest; the fewer the gaps, the better the design.

The gap analyses and all subsequent analyses were performed using 2016 data under the assumption that immediate past fishing activity is a good predictor of future fishing activity (Figure C–1). Similar to the 2017 ADP, the number of partial coverage trips corresponding to each stratification scheme was summed into domains defined by gear and NMFS reporting area (NMFS 2016a, NMFS 2016b).

The hypergeometric distribution was used to calculate the probability of observing at least one and three trips within a domain for each stratification and allocation design. These probabilities were made binary (0 and 1) based on whether or not they exceeded 50%. This value was chosen as the minimum acceptable value since it represents equal chance of meeting the needs of variance calculation within a domain. The proportion of domains that passed the three or more criteria was calculated for comparison and represented as a G score (G) for each allocation strategy. This G score was divided by the maximum G score within a given stratification scheme to provide a relative metric. This relative G score ranges from 0.00 to 1.00, where 1.00 is best.

Uncertainty due to Electronic Monitoring

The EM pool will remain a voluntary stratum in the partial coverage category in 2018. Methods used to estimate costs and allocate funds for maintenance and growth of the EM program in 2018 are discussed in Appendix B. This analysis estimates that there will be sufficient funding available to wire 35 new vessels for monitoring in 2018, for a total of 110 EM vessels. Enrollment into the EM stratum is open until November 1, 2017, after the publication date and presentation of the Draft ADP to the NPFMC. The Final Rule for EM states that hook-and-line and pot gear vessels in the partial coverage category are eligible to volunteer for the EM stratum. Because the open enrollment period extends beyond the date of completion of the ADP, the 2018 population of vessels in the HAL and POT strata are unknown. To account for this uncertainty, 10,000 simulations of random draws of 35 new vessels from the HAL and POT strata were performed and coverage rate and gap analyses on the vessels remaining in the partial coverage category were evaluated from each simulation. The differences in the outcomes from each simulation were depicted as error bars around the resulting coverage rates and a subset of random draws from the outcomes of the gap analyses. All resulting tables show the mean estimates of coverage rates and probabilities from the gap analyses from the simulation outcomes.

Results and Discussion

The total number of observer days available for deployment in the Observer Program is is 4,062. Depending on the deployment design chosen, the ratio between the SH and FH days is 0.876 - 0.879 : 1.

The optimization algorithm puts more samples where 1) strata are larger, 2) variance of a chosen metric is larger, and 3) costs are lower (Cochran 1977). This accommodates differential trip duration and differential costs between observation types (for example human vs. cameras) that may be needed in future ADPs. Moreover, the comparison of coverage rates using equal allocation, 15% plus optimization, and full optimization elucidates the tradeoff between minimizing gaps in coverage and emphasizing the importance of certain metrics such as groundfish discards and PSC.

Whether resulting rates of observer coverage differ between deployment designs depends upon how the rates are compared (Figure C–3, Table C–1; Table C–2). Coverage rates differ substantially between allocation designs, in particular between designs that use equal or 15% + optimized allocation and designs that rely solely on optimization based on chosen metrics. Within a given allocation design, coverage rates vary minimally within a stratum between stratification schemes. For example, within the 15% + optimized on discarded groundfish catch including Pacific halibut PSC allocation, the rates for TRW, HAL, and POT vary minimally between stratification scheme (TRW = 18.08%, 18.16%; HAL = 17.33%, 17.32%; POT = 15.59%, 15.56% for Gear and Gear × Tender, respectively; Table C–1 and Table C–2). The lack of difference in coverage rates within a stratum and allocation design is due to the fact that tendering strata are relatively small in terms of total trips compared to gear-based strata based (N_{h2018} in Table C–1 and Table C–2). The Optimized allocation based on blended discarded groundfish catch with halibut and Chinook PSC results in the lowest rates for HAL and POT and the highest rates in TRW (HAL = 10.76%, 10.86%; POT = 2.20%, 2.04%; TRW = 31.15%, 34.42% for Gear and Gear × Tender, respectively).

Results from deployment design gap analyses indicate that allocation based solely on optimization results in the most gaps in observer coverage (Figure C–4, where the curves that reach the top the fastest, or the furthest to the left, represent designs that result in the fewest gaps in coverage). The optimized allocation based on blended discarded groundfish catch with halibut and Chinook PSC has the most gaps, whereas designs that use equal or 15% + optimized allocations result in far fewer gaps in coverage (indicated by high relative G scores in Table C–3). The best performing designs result in a predicted 76 and 62% of cells with at least a 50% probability of having three or more observed trips in the Gear and Gear × Tender stratification, respectively. A closer examination of resulting gaps by NMFS Reporting Area and stratum combination in the Bering Sea and Aleutian Islands (Table C–4 and Table C–5) and the Gulf of Alaska (Table C–6 and Table C–7) suggests that potential gaps (shown in bold) in designs that use equal or 15% + optimized allocations only occur when there is low fishing effort (fewer than 12 fishing trips) in that cell.

Results from the simulation analysis, which was conducted to account for uncertainty introduced by open-enrollment of HAL and POT boats into EM, suggests that its impact on ADP results is relatively minor. The “error” bars shown in Figure 3 are undetectable except in the HAL Tender stratum. The variability in HAL Tender can be accounted for by the small number of predicted trips in this stratum (7 trips, Table C–2). The variability seen in the gap analyses is also relatively minor, with the probability of observing at least three trips shifting less than 10% across deployment designs (Figure C–4).

The 15% + optimized allocation is a balance between the prioritization of PSC-limited fisheries in optimization weighting schemes and the need to reduce gaps in observer coverage in the partial coverage category. Within this allocation design, the gear-based stratification scheme that optimizes on discarded groundfish catch and halibut PSC performs the best in the gap analysis (Figure C–4). However, there are numerous reasons to select the Gear × Tender stratification. First, the Gear × Tender stratification scheme, which was first implemented in 2017, has not been fully evaluated in the Annual Report process. Maintaining this stratification scheme for another year, while improving the allocation design, would allow the Observer Program to fully analyze the effects and performance of these designs. Further, as discussed in the 2016 Observer Program Annual Report, tendering activity in pollock trawl fisheries continues to represent a sampling challenge for the Observer Program (NMFS 2017). Although it has yet to be evaluated whether the addition of a Tender TRW stratum fully alleviates this problem, it does ensure an expectation for a certain level of coverage for that operation type.

This analysis relies on several key assumptions and has limitations. For example, it is assumed that discarded catch on each sampled trip is known without variance, and a simple single stage estimator of trip variances are used in optimization algorithms. The variances used in this analysis are not the same that will arise from the five-stage sampling design of the observer program (Cahalan et al. 2014). Previous studies have demonstrated that although the vessel was a significant factor in estimating total discards, the first stage of nested sampling designs (vessel or trip) is often the stage with the least amount of variance (Allen et al. 2002, Borges et al. 2004). Multi-stage based estimates of variance for each stratum and metric will be used in subsequent analyses when they become available.

The resulting coverage rates for observer deployment depend upon the amount of fishing effort and the available number of observer days. Since this analysis is focused on the relative performance of alternative stratification schemes, it uses a simplified assumption of future fishing effort- namely that fishing in 2016 will be identical to that in 2018. This assumption is made in anticipation that for the Final 2018 ADP, when a stratification scheme is selected, a more careful estimate of anticipated fishing effort would be made at that time, and resulting rates adjusted to reflect this new prediction. This approach was adopted for the Final 2017 ADP (NMFS 2016b).

Finally, the resulting coverage rates presented in this study should only be considered preliminary estimates and may differ from rates determined in the Final ADP or realized in 2018. Once a stratification design for the Final ADP is established and EM participants known, more focused simulated sampling procedures will be used to estimate expected coverage rates following the methods described in the Final 2016 and 2017 ADPs (NMFS 2015b, NMFS 2016).

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Table C–1. Comparison of the number of trips in a stratum (N_{h2018}), the optimal sample weighting (W_{hopt}), preliminary predicted observed trips (n_h), days (d_h), and coverage rates (r_h) resulting from the Gear-based stratification scheme under three allocation designs: (1) Equal allocation, (2) 15% + Optimized, and (3) Optimized. Metrics used for optimization included (1) discarded groundfish catch with Pacific halibut prohibited species catch (PSC) and (2) a blended optimization of (1) and Chinook PSC (in numbers of fish).

Stratum (*h*)	**Metric**	N_{h2018}	W_{hopt}	n_h	d_h	r_h **(%)**
Equal Allocation						
HAL	None	2,237		388	1,896	17.36
POT	None	963		167	599	17.36
TRW	None	2,686		466	1,567	17.36
15% + Optimized						
HAL	Discards w/ halibut PSC (*Status quo*)	2,237	0.37	388	1,892	17.33
POT	Discards w/ halibut PSC (*Status quo*)	963	0.04	150	538	15.59
TRW	Discards w/ halibut PSC (*Status quo*)	2,686	0.59	486	1,632	18.08
HAL	Blended: Discards w/ halibut PSC + Chinook PSC	2,237	0.21	365	1,784	16.33
POT	Blended: Discards w/ halibut PSC + Chinook PSC	963	0.02	147	528	15.29
TRW	Blended: Discards w/ halibut PSC + Chinook PSC	2,686	0.77	521	1,751	19.40
Optimized						
HAL	Discards w/ halibut PSC (*Status quo*)	2,237	0.41	417	2,035	18.63
POT	Discards w/ halibut PSC (*Status quo*)	963	0.04	42	151	4.38
TRW	Discards w/ halibut PSC (*Status quo*)	2,686	0.55	558	1,877	20.79
HAL	Blended: Discards w/ halibut PSC + Chinook PSC	2,237	0.23	241	1,175	10.76
POT	Blended: Discards w/ halibut PSC + Chinook PSC	963	0.02	21	76	2.20
TRW	Blended: Discards w/ halibut PSC + Chinook PSC	2,686	0.75	836	2,811	31.15

Table C–2. Comparison of the number of trips in a stratum (N_{h2018}), the optimal sample weighting (W_{hopt}), preliminary predicted observed trips (n_h), days (d_h), and coverage rates (r_h) resulting from the Gear × Tender stratification scheme under the allocation designs described in Table 1. Bold values denote NMFS recommendations for the 2018 ADP.

Stratum (*h*)	**Metric**	N_{h2018}	W_{hopt}	n_h	d_h	r_h **(%)**
Equal Allocation						
TRW	None	2,427		421	1,377	17.34
HAL	None	2,231		387	1,890	17.34
POT	None	858		149	517	17.34
Tender TRW	None	259		45	196	17.34
Tender HAL	None	7		1	4	15.46
Tender POT	None	105		18	78	17.31
15% + Optimized						
TRW	Discards w/ halibut PSC (*Status quo*)	2,427	0.55	441	1,442	18.16
HAL	Discards w/ halibut PSC (*Status quo*)	2,231	0.37	386	1,888	17.32
POT	Discards w/ halibut PSC (*Status quo*)	858	0.03	133	464	15.56
Tender TRW	Discards w/ halibut PSC (*Status quo*)	259	0.04	44	194	17.13
Tender HAL	Discards w/ halibut PSC (*Status quo*)	7	0.00	1	4	15.42
Tender POT	Discards w/ halibut PSC (*Status quo*)	105	0.01	17	72	16.02
TRW	**Blended: Discards w/ halibut PSC + Chinook PSC**	**2,427**	**0.75**	**480**	**1,571**	**19.78**
HAL	**Blended: Discards w/ halibut PSC + Chinook PSC**	**2,231**	**0.21**	**364**	**1,781**	**16.34**
POT	**Blended: Discards w/ halibut PSC + Chinook PSC**	**858**	**0.02**	**131**	**456**	**15.28**
Tender TRW	**Blended: Discards w/ halibut PSC + Chinook PSC**	**259**	**0.02**	**42**	**182**	**16.06**
Tender HAL	**Blended: Discards w/ halibut PSC + Chinook PSC**	**7**	**0.00**	**1**	**4**	**15.42**
Tender POT	**Blended: Discards w/ halibut PSC + Chinook PSC**	**105**	**0.00**	**16**	**70**	**15.46**
Optimized						
TRW	Discards w/ halibut PSC (*Status quo*)	2,427	0.52	530	1,736	21.86
HAL	Discards w/ halibut PSC (*Status quo*)	2,231	0.41	416	2,035	18.67
POT	Discards w/ halibut PSC (*Status quo*)	858	0.03	35	121	4.07

Stratum (*h*)	**Metric**	N_{h2018}	W_{hopt}	n_h	d_h	r_h **(%)**
Tender TRW	Discards w/ halibut PSC (*Status quo*)	259	0.03	31	136	11.99
Tender HAL	Discards w/ halibut PSC (*Status quo*)	7	0.00	1	4	15.47
Tender POT	Discards w/ halibut PSC (*Status quo*)	105	0.01	7	29	6.50
TRW	Blended: Discards w/ halibut PSC + Chinook PSC	2,427	0.73	835	2,733	34.42
HAL	Blended: Discards w/ halibut PSC + Chinook PSC	2,231	0.23	242	1,184	10.86
POT	Blended: Discards w/ halibut PSC + Chinook PSC	858	0.02	18	61	2.04
Tender TRW	Blended: Discards w/ halibut PSC + Chinook PSC	259	0.02	16	68	6.02
Tender HAL	Blended: Discards w/ halibut PSC + Chinook PSC	7	0.00	0	0	0.01
Tender POT	Blended: Discards w/ halibut PSC + Chinook PSC	105	0.00	4	16	3.62

Table C–3. Results of gap analyses by deployment design. G scores are the proportion of cells with at least a 50% chance of observing three (G3) or one (G1) trips during the year. G Relative is the G score for each allocation design divided by the maximum, where G relative equal to 1.00 represent the designs with the fewest predicted gaps in coverage. Allocations are listed in descending order by G3.

Allocation design	**G3**	**G3 Relative**	**G1**	**G1 Relative**
Gear Stratification				
Equal Allocation	0.76	1.00	0.91	1.00
15% + Optimized on Discards + Halibut + Chinook PSC	0.76	1.00	0.91	1.00
15% + Optimized on Discards + Halibut PSC	0.76	1.00	0.91	1.00
Optimized on Discards + Halibut PSC	0.73	0.96	0.91	1.00
Optimized on Discards + Halibut + Chinook PSC	0.64	0.84	0.79	0.87
Gear × Tender Stratification				
Equal Allocation	0.62	1.00	0.84	1.00
15% + Optimized on Discards + Halibut + Chinook PSC	0.62	1.00	0.84	1.00
15% + Optimized on Discards + Halibut PSC	0.62	1.00	0.84	1.00
Optimized on Discards + Halibut PSC	0.58	0.93	0.80	0.95
Optimized on Discards + Halibut + Chinook PSC	0.47	0.75	0.64	0.76

Table C–4. The number of trips and associated likelihood of observing at least three trips within each NMFS Reporting Area and stratum combination in the Bering Sea and Aleutian Islands for each allocation design under the Gear-based stratification scheme. If the likelihood of observing at least three trips is less than 0.50, the cell is bolded in order to identify potential gaps more easily. The number of trips in an Area Stratum combination are not whole numbers since fishing trips can span more than one NMFS Reporting Area.

BSAI Gear Stratification

NMFS Area_Stratum	Trips	Equal Allocation	15% + Optimized on Discards + Halibut PSC	15% + Optimized on Discards + Halibut + Chinook PSC	Optimized on Discards + Halibut PSC	Optimized on Discards + Halibut + Chinook PSC
509_POT	129.0	1.00	1.00	1.00	0.94	0.56
509_TRW	133.7	1.00	1.00	1.00	1.00	1.00
513_HAL	5.4	**0.06**	**0.06**	**0.05**	**0.07**	**0.02**
514_HAL	11.2	**0.31**	**0.31**	**0.28**	**0.35**	**0.12**
517_HAL	5.4	**0.06**	**0.06**	**0.05**	**0.07**	**0.02**
517_POT	96.4	1.00	1.00	1.00	0.81	**0.36**
517_TRW	104.7	1.00	1.00	1.00	1.00	1.00
518_HAL	32.7	0.94	0.94	0.92	0.96	0.70
518_POT	18.6	0.65	0.58	0.57	**0.05**	**0.01**
519_HAL	21.3	0.74	0.74	0.70	0.78	**0.41**
519_POT	195.5	1.00	1.00	1.00	0.99	0.83
519_TRW	39.7	0.98	0.98	0.99	0.99	1.00
521_HAL	30.8	0.92	0.92	0.89	0.94	0.66
521_POT	0.5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
523_HAL	4.2	**0.03**	**0.03**	**0.03**	**0.04**	**0.01**
524_HAL	12.0	**0.35**	**0.35**	**0.32**	**0.40**	**0.13**
541_HAL	76.3	1.00	1.00	1.00	1.00	0.99
541_POT	1.0	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
542_HAL	25.2	0.83	0.83	0.80	0.87	0.52
543_HAL	2.2	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Table C–5. The number of trips and associated likelihood of observing at least three trips within each NMFS Reporting Area and stratum combination in the Gulf of Alaska for each allocation design under the Gear-based stratification scheme. If the likelihood of observing at least three trips is less than 0.50, the cell is bolded in order to identify potential gaps more easily. The number of trips in an Area Stratum combination are not whole numbers since fishing trips can span more than one NMFS Reporting Area.

GOA Gear Stratification

NMFS Area_Stratum	Trips	Equal Allocation	15% + Optimized on Discards + Halibut PSC	15% + Optimized on Discards + Halibut + Chinook PSC	Optimized on Discards + Halibut PSC	Optimized on Discards + Halibut + Chinook PSC
610_HAL	192.3	1.00	1.00	1.00	1.00	1.00
610_POT	256.8	1.00	1.00	1.00	1.00	0.95
610_TRW	940.1	1.00	1.00	1.00	1.00	1.00
620_HAL	148.9	1.00	1.00	1.00	1.00	1.00
620_POT	90.0	1.00	1.00	1.00	0.77	**0.32**
620_TRW	503.2	1.00	1.00	1.00	1.00	1.00
630_HAL	764.6	1.00	1.00	1.00	1.00	1.00
630_POT	175.1	1.00	1.00	1.00	0.99	0.77
630_TRW	964.3	1.00	1.00	1.00	1.00	1.00
640_HAL	176.2	1.00	1.00	1.00	1.00	1.00
649_HAL	74.9	1.00	1.00	1.00	1.00	0.99
650_HAL	419.7	1.00	1.00	1.00	1.00	1.00
659_HAL	234.0	1.00	1.00	1.00	1.00	1.00

Table C–6. The number of trips and associated likelihood of observing at least three trips within each NMFS Reporting Area and stratum combination in the Bering Sea and Aleutian Islands for each allocation design under the Gear ×Tender stratification scheme. If the likelihood of observing at least three trips is less than 0.50, the cell is bolded in order to identify potential gaps more easily. The number of trips in an Area Stratum combination are not whole numbers since fishing trips can span more than one NMFS Reporting Area.

BSAI Gear × Tender Stratification

NMFS Area_Stratum	Trips	Equal Allocation	15% + Optimized on Discards + Halibut PSC	15% + Optimized on Discards + Halibut + Chinook PSC	Optimized on Discards + Halibut PSC	Optimized on Discards + Halibut + Chinook PSC
509_POT	124.8	1.00	1.00	1.00	0.90	**0.48**
509_Tender_POT	4.2	**0.03**	**0.02**	**0.02**	**0.00**	**0.00**
509_Tender_TRW	1.5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
509_TRW	132.2	1.00	1.00	1.00	1.00	1.00
513_HAL	5.4	**0.06**	**0.06**	**0.05**	**0.07**	**0.02**
514_HAL	11.2	**0.31**	**0.31**	**0.28**	**0.35**	**0.12**
517_HAL	5.4	**0.06**	**0.06**	**0.05**	**0.07**	**0.02**
517_POT	92.2	1.00	1.00	1.00	0.74	**0.29**
517_Tender_POT	4.2	**0.03**	**0.02**	**0.02**	**0.00**	**0.00**
517_Tender_TRW	0.5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
517_TRW	104.2	1.00	1.00	1.00	1.00	1.00
518_HAL	32.7	0.94	0.94	0.92	0.96	0.70
518_POT	18.6	0.65	0.58	0.57	**0.04**	**0.01**
519_HAL	21.3	0.74	0.74	0.70	0.78	**0.42**
519_POT	194.6	1.00	1.00	1.00	0.99	0.79
519_Tender_POT	0.9	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
519_TRW	39.7	0.98	0.98	0.99	1.00	1.00
521_HAL	30.8	0.92	0.92	0.89	0.94	0.66
521_POT	0.5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
523_HAL	4.2	**0.03**	**0.03**	**0.03**	**0.04**	**0.01**

BSAI Gear × Tender Stratification

NMFS Area_Stratum	Trips	Equal Allocation	15% + Optimized on Discards + Halibut PSC	15% + Optimized on Discards + Halibut + Chinook PSC	Optimized on Discards + Halibut PSC	Optimized on Discards + Halibut + Chinook PSC
524_HAL	12.0	**0.35**	**0.35**	**0.32**	**0.40**	**0.14**
541_HAL	76.3	1.00	1.00	1.00	1.00	0.99
541_POT	1.0	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
542_HAL	25.2	0.83	0.83	0.80	0.87	0.52
543_HAL	2.2	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Table C–7. The number of trips and associated likelihood of observing at least three trips within each NMFS Reporting Area and stratum combination in the Gulf of Alaska for each allocation design under the Gear ×Tender stratification scheme. If the likelihood of observing at least three trips is less than 0.50, the cell is bolded in order to identify potential gaps more easily. The number of trips in an Area Stratum combination are not whole numbers since fishing trips can span more than one NMFS Reporting Area.

GOA Gear × Tender Stratification

NMFS Area_Stratum	Trips	Equal Allocation	15% + Optimized on Discards + Halibut PSC	15% + Optimized on Discards + Halibut + Chinook PSC	Optimized on Discards + Halibut PSC	Optimized on Discards + Halibut + Chinook PSC
610_HAL	192.3	1.00	1.00	1.00	1.00	1.00
610_POT	191.1	1.00	1.00	1.00	0.99	0.78
610_Tender_POT	65.6	1.00	1.00	1.00	0.91	**0.47**
610_Tender_TRW	250.5	1.00	1.00	1.00	1.00	1.00
610_TRW	689.6	1.00	1.00	1.00	1.00	1.00
620_HAL	148.9	1.00	1.00	1.00	1.00	1.00
620_POT	70.8	1.00	1.00	1.00	0.56	**0.17**
620_Tender_POT	19.2	0.70	0.64	0.61	**0.11**	**0.02**
620_Tender_TRW	5.3	**0.06**	**0.06**	**0.05**	**0.02**	**0.00**
620_TRW	497.9	1.00	1.00	1.00	1.00	1.00
630_HAL	764.6	1.00	1.00	1.00	1.00	1.00
630_POT	164.3	1.00	1.00	1.00	0.97	0.68
630_Tender_POT	10.8	**0.30**	**0.25**	**0.24**	**0.02**	**0.00**
630_Tender_TRW	1.0	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
630_TRW	963.3	1.00	1.00	1.00	1.00	1.00
640_HAL	176.2	1.00	1.00	1.00	1.00	1.00
649_HAL	74.9	1.00	1.00	1.00	1.00	0.99
650_HAL	419.7	1.00	1.00	1.00	1.00	1.00
659_HAL	227.5	1.00	1.00	1.00	1.00	1.00
659_Tender_HAL	6.6	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

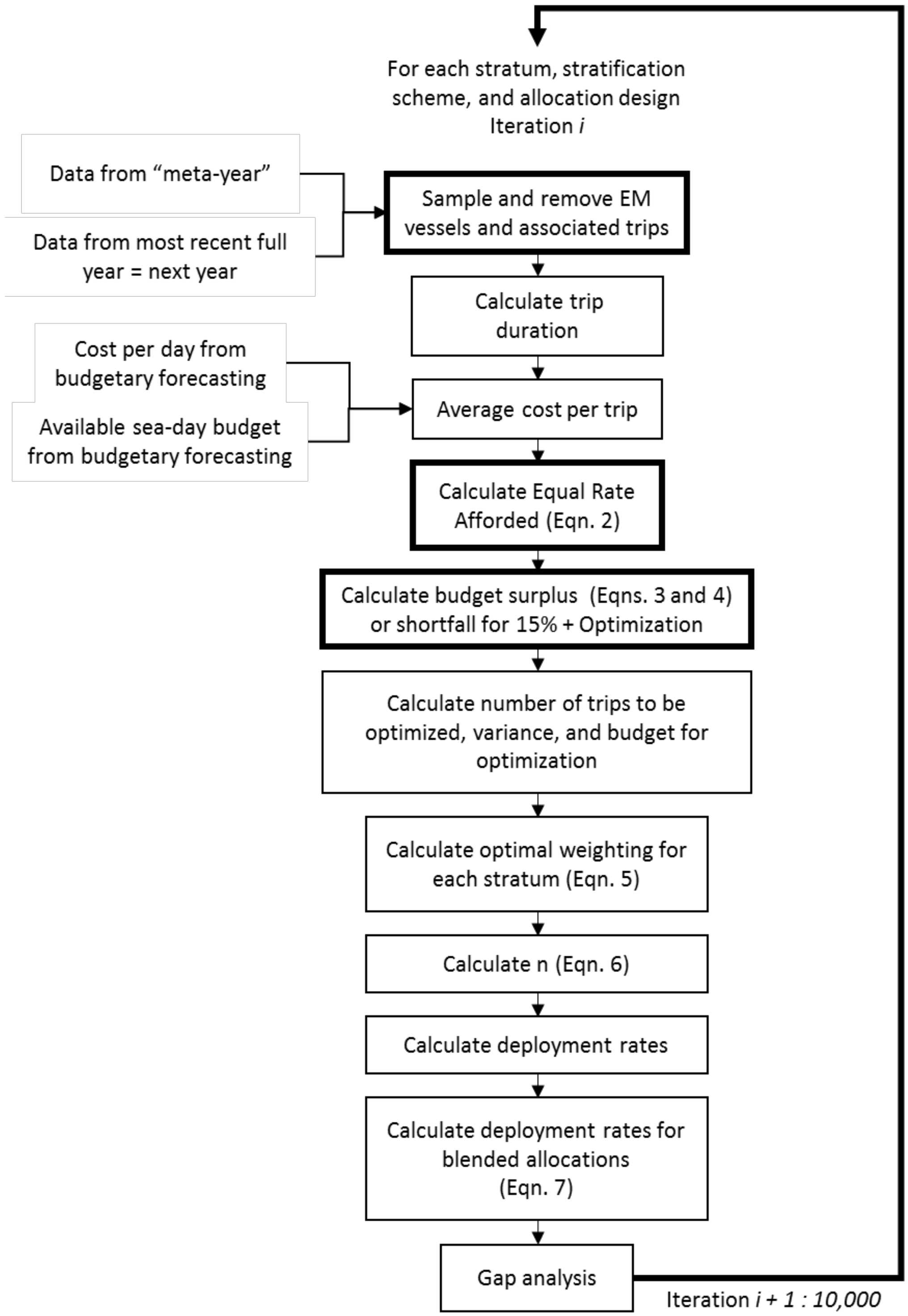

Figure C–1. Flow chart depicting methods used in this analysis for each allocation and stratification design under consideration for the 2018 ADP. Blocks highlighted in bold are new methods this year.

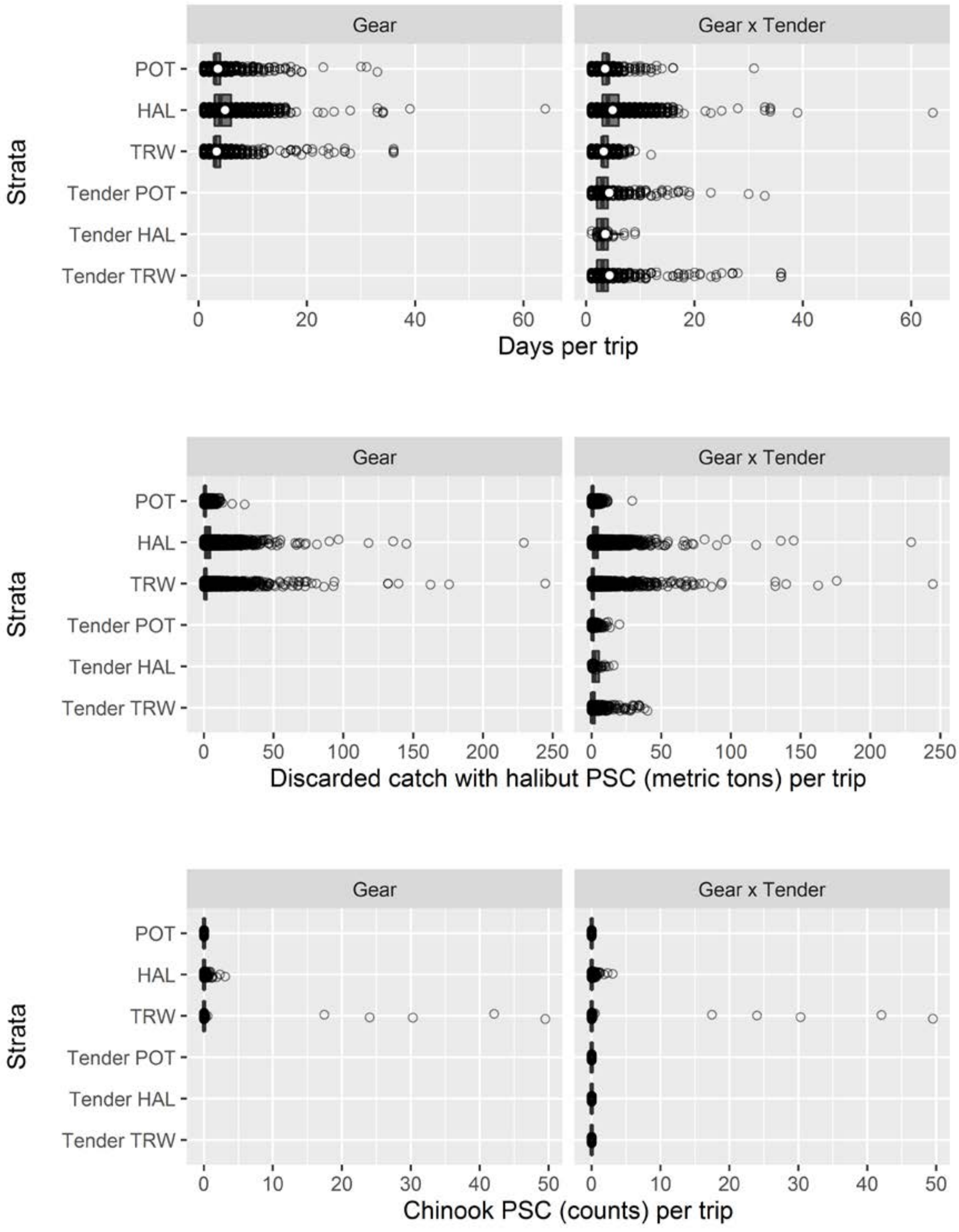

Figure C–2. The distribution of trip duration in days (top panels), discarded groundfish catch including Pacific halibut PSC in metric tons (middle panels), and Chinook PSC in counts (bottom panels) for each stratum in the Gear and Gear × Tender stratification schemes. Shaded boxes denote the 25th, 50th, and 75th percentiles, and individual trips are shown as open circles.

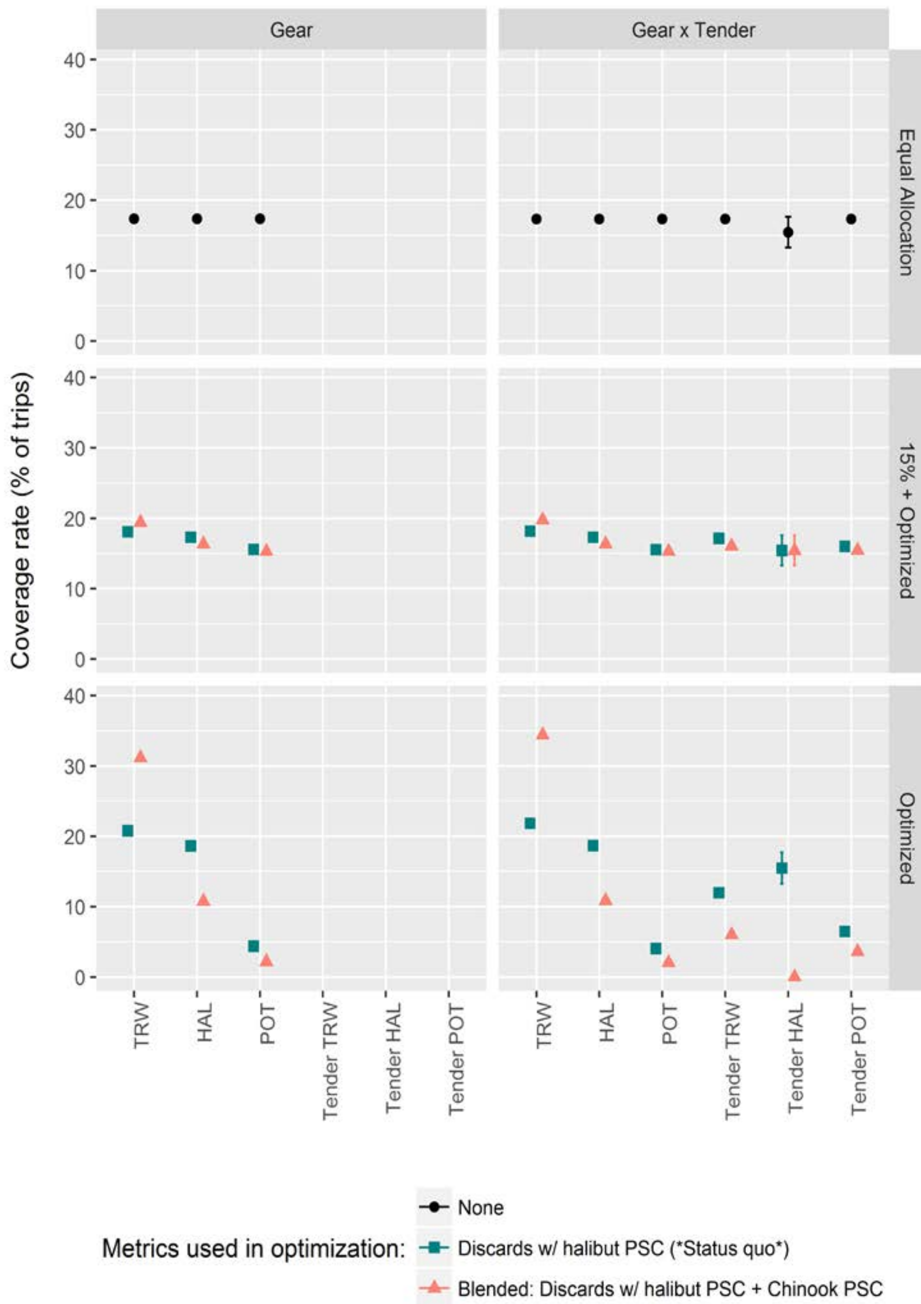

Figure C–3. Comparison of preliminary draft coverage rates resulting from two stratification schemes (Gear and Gear × Tender) and three allocation designs (Equal Allocation, 15% + Optimized, and Optimized). Metrics used for optimization included discards with Pacific halibut prohibited species catch (PSC) (teal) and a blended optimization of discards with Pacific halibut and Chinook PSC (blue). Rates in the top panels are shown in black because no optimization occurred. Error bars depict uncertainty (+/- 1 standard deviation) in predicted coverage rates caused by the fact that the population of hook-and-line (HAL) and pot gear (POT) vessels in the partial coverage category is not defined in the Draft 2018 ADP due to open enrollment into Electronic Monitoring.

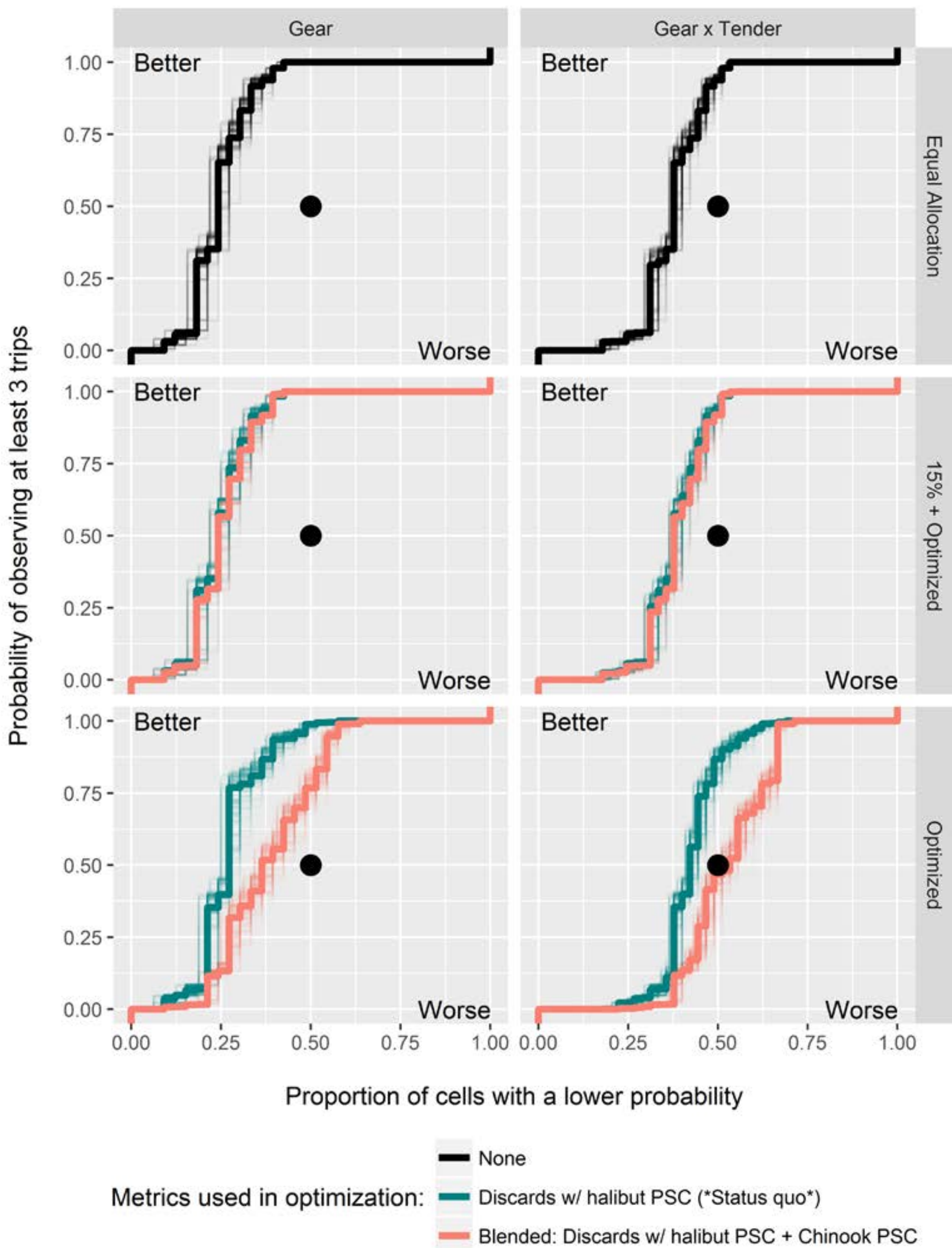

Figure C–4. Empirical cumulative distribution curves for the probability of observing at least three trips in a domain defined by NMFS Area and stratum for two stratification schemes (Gear and Gear × Tender) and three allocation designs (Equal Allocation, 15% + Optimized, and Optimized). Metrics used for optimization included discards with Pacific halibut prohibited species catch (PSC) (teal) and a blended optimization of discards with Pacific halibut and Chinook PSC (blue). Curves in the top panels are shown in black because no optimization occurred. Better performing designs are those that reach a value of 1 furthest to the left of the plot. The shaded regions around the curves reflect uncertainty in the gap analyses caused by the fact that the population of hook-and-line and pot gear vessels in the partial coverage category is not defined due to open enrollment into Electronic Monitoring.

Appendix D. Letter Notifying Vessels of the Electronic Monitoring (EM) Selection Pool for 2018

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
Fisheries Monitoring and Analysis Division
7600 Sand Point Way N.E.
Seattle, WA 98115-0070

August 16, 2017

Dear Vessel Owner,

The National Marine Fisheries Service has published a final rule (82 FR 36991, August 8, 2017) to integrate electronic monitoring (EM) into the North Pacific Observer Program beginning with the 2018 fishing year. The final rule establishes a process for owners or operators of vessels in the partial coverage category using nontrawl gear (i.e. hook and line or pot gear) to request to participate in the EM selection pool. Any vessel interested in participating in the 2018 EM selection pool must request to do so through the Observer Declare and Deploy System (ODDS) http://odds.afsc.noaa.gov by **November 1, 2017**. Any vessel that does not request to participate by November 1, 2017 will not be eligible for the 2018 EM selection pool and will be required to participate in the 2018 partial coverage observer pool per Federal regulations. You must request to be in the 2018 EM selection pool through ODDS even if you have previously participated in EM selection pools. No temporary exemptions from observer coverage due to life raft limitations or bunk space will be issued in 2018.

Each year, NMFS develops an Annual Deployment Plan (ADP) that describes how NMFS plans to deploy observers to vessels and processors in the partial coverage category in the following year. The draft ADP for the upcoming year is published each year in early September. In the ADP, NMFS and the Council will define the criteria for vessels to be eligible to participate in the EM selection pool. The criteria for being in the EM selection pool may include, but are not limited to, gear type, vessel length, area fished, number of fishing trips or total catch, sector, target fishery, home or landing port, and the availability of EM systems. The ADP will also specify the EM selection rate—the portion of trips that are sampled—for each calendar year. NMFS and the Council may change the EM selection rate from one calendar year to the next to achieve efficiency, cost savings, and data collection goals.
NMFS will select vessels that meet the 2018 EM selection pool criteria set out in the ADP, and that have requested to participate through ODDS. Any vessels that do not meet the criteria, or are not selected for the EM selection pool, will be notified by NMFS in writing. Vessels that are participating in the 2018 EM selection pool will not be required to carry an observer for the entire 2018 calendar year, however these participants will be required to log all eligible fishing trips into ODDS, and comply with EM deployment requirements. Once NMFS approves a vessel for the EM selection pool, that vessel will remain in the EM selection pool for the duration

of the calendar year. For 2018, requests to participate in the EM selection pool must be made before November 1, 2017. Only vessels that request through ODDS to participate in the EM selection pool for the upcoming year will be considered. In future years, vessels currently participating in the EM selection pool will automatically stay in the EM selection pool unless the vessel owner or operator requests to leave the pool. Beginning in 2018, requests to participate in or leave the EM selection pool must be made each year between September 1 and November 1.

All EM equipment in 2018 will be provided by NMFS. Installation of EM equipment will begin in late fall of 2017 and continue as necessary. EM system installations can be routinely scheduled in the primary ports of Homer, Kodiak, and Sitka for longline vessels, and in Homer, Kodiak, and Sand Point for pot vessels. Secondary ports such as Juneau, Petersburg, Sand Point, King Cove, and Dutch Harbor may have periodic EM installation services available. Vessels not available during scheduled dates of EM installation in a secondary port will be required to travel to a primary port for EM installation services prior to the date of their first logged trip in ODDS. Once installed, the EM sensors and cameras will remain on the vessel until NMFS has determined that your vessel will not be participating in the EM selection pool the following year. Primary and secondary port services apply to EM equipment installation and servicing only, there are no restrictions on where a vessel may make landings associated with this program.

If you would like to request and be considered for the 2018 EM selection pool, please make this request through ODDS by **November 1, 2017**. The request to be part of the EM selection pool can also be made by calling the ODDS call center at 1-855-747-6377. To find out more about the requirements of the program, please refer to the Final Rule that published in the Federal Register on August 8. We look forward to working with you in this EM selection pool in 2018.

Chris Rilling
Director
Fisheries Monitoring and Analysis Division
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA 98115

Appendix E. Description of EM Vessel Monitoring Plan for 2018

Introduction

A Vessel Monitoring Plan (VMP) describes how fishing operations on the vessel are conducted, including how gear is set, how catch is brought on board, and where catch is retained and discarded. It also describes how the EM system and associated equipment is configured to meet the data collection objectives and purpose of the EM program, including camera locations to cover all fishing activities, any sensors to detect fishing activities, and any special catch handling requirements to ensure the data collection objectives can be met. The VMP also includes methods to troubleshoot the EM system and instructions for ensuring the EM system is functioning properly.

Vessel operators will meet with the EM service provider to develop this VMP using a **VMP template that is available on the NMFS Website:** https://alaskafisheries.noaa.gov/fisheries/observer-program.

Here we provide an excerpt of the VMP so that vessel operators can preview the sections that describe vessel operator responsibilities and troubleshooting instructions.

Each VMP must be approved annually by NMFS. Once the VMP is complete and the vessel operator agrees to comply with the components of the VMP, the vessel operator must sign and submit the VMP to NMFS for approval. If changes are needed to the VMP after approval, vessel operators should work with EM service provider to make those changes and sign and submit those changes to NMFS. Once submitted the vessel operators may begin a fishing trip.

If a vessel operator has repeat problems with EM system reliability or video quality or are unable to comply with the requirements in this VMP, NMFS may disapprove a VMP for the following calendar year and the vessel may be removed from the EM pool the following calendar year.

Excerpt from VMP template - Operator Responsibilities

Your vessel has been placed into the EM selection pool for the duration of 2018 and you must fully comply with the provisions of this VMP. The EM deployment model in 2018 will be Trip-selection. The Observer Declare and Deploy System (ODDS) will be used to randomly select trips for EM coverage at a 30% rate.

Prior to Trip

Work with EM service provider: Once your vessel has been selected to be in the EM pool, you must contact the EM service provider as soon as possible to make arrangements to have the EM systems installed on your vessel. You must make the vessel available for the installation of EM equipment by the EM service provider and provide access to the vessel's systems and reasonable assistance to the EM service provider.

Register the trip in ODDS: Vessel owner/operators must register each 2018 fishing trip in ODDS prior to the start of a fishing trip. You will need an ODDS Users ID and password and can register the trip on the web (http://odds.afsc.noaa.gov) or by calling the ODDS call center at: 1-855-747-6377.

Notification of using exemption at §679.7(f)(4) to fish IFQ Fishing in Multiple Areas: If you plan to use EM to retain IFQ or CDQ halibut or IFQ or CDQ sablefish onboard in excess of the total amount of unharvested IFQ or CDQ, that is currently held by all IFQ or CDQ permit holders aboard in that vessel category and IFQ or CDQ regulatory area(s), you must notify NMFS in ODDS and you must follow all the requirements at §679.51(f)(6) and the section below.

When a trip is selected for coverage, you must comply with operator responsibilities listed below.

Each Trip

- **EM Effort logbook**: Complete the EM Effort Logbook noting the Trip Start/End: date, time, port etc.
- **Power**: Maintain uninterrupted electrical power to the EM unit while the vessel is underway.
- **Function Test**: Prior to leaving port, the vessel operator must turn the system on and conduct a system function test following the instructions provided in Guide for Vessel Operators provided by the EM service provider. If the function test identifies a malfunction, the vessel operator must follow the guidance in the malfunction matrix and the troubleshooting guidelines listed in Guide for Vessel Operators provided by the EM service provider.
    - Confirm Hard Drive Storage Space: The vessel operator must ensure that the system has adequate storage to record the entire trip.
- **Maintain Equipment**: Ensure EM system components are not tampered with, disabled, destroyed, or operated or maintained improperly unless directed to make changes by NMFS, the EM service provider, or as directed in the troubleshooting guide of the VMP.

Each Day

- **Logbook**: You must complete one of the following:
    - If you are required to complete a NMFS or IPHC logbook then you can provide a copy of that logbook and add in the comments section the ODDS trip number, whether the vessel fished at night during the trip, and if there were any EM malfunctions.
    - If you are not required to complete a NMFS or IPHC logbook then you must complete the EM Effort Logbook (examples available at: https://alaskafisheries.noaa.gov/fisheries/observer-program)

Each catch handling event (haul or set)

- **Prior to each catch handling event**, the vessel operator is required to:
    - Verify that all cameras are recording and all sensors and other required EM system components are functioning as instructed in Guide for Vessel Operators provided by the EM service provider.
    - Check the monitor and verify that the camera views are consistent with the images provided in Vessel Installation Details section of the VMP.
    - Clean camera lenses to maintain video quality and ensure camera views remain unobstructed. Video quality will be reported in the vessel trip report by PSMFC.

- **Longline Catch Handling**:
  - The vessel operator is responsible for ensuring all catch is handled within view of the cameras as defined in the camera descriptions and deck diagram in Vessel Installation Details section of the VMP.
  - The vessel operator must ensure that all catch handling is complete from the previous set prior to hauling the next set.
  - **Seabirds**: The vessel operator is required to hold incidentally caught seabirds up to the camera for 2-3 seconds and ensure that certain key parts of the animal, such as the beak, are captured by the hauler view camera. When displaying a seabird to the camera:
    - Grasp by the outermost bend in wing, with wings out-stretched and show the bird to the hauler camera showing the ventral and dorsal sides;
    - For albatross, show a profile of the bill by holding the bird by the neck against the side of the boat. Ensure that the view is not obstructed; and
    - If possible, hold the bird beak near a scaled reference item (e.g., measurement board with large grid) to assist with identification.
  - **Marine Mammal Depredation**: Note in the comments section of the logbook each set that marine mammals were observed feeding on the catch as it was brought aboard.

- **Pot Catch Handling**:
  - On retrieval of a pot, the crew must ensure that ALL catch is emptied from the pot onto the sorting table. Any fish left in the pot or fish that land on the deck when the pot is emptied must be placed on the sorting table.
  - Crew must process all retained catch and leave discards on the sorting table until after the retained catch are placed in the fish hold.
  - If there is no sorting table, all catch must be sorted in view of the cameras and discards left on deck in view of camera after retained fish are placed in the fish hold.
  - Crew must completely clear all catch, especially Pacific cod, off the table and deck before the next pot is dumped (so that catch from 2 pots is not mixed).
    - If the entire table is covered with catch, then Pacific cod should be cleared from the table a few at a time (to allow EM reviewer to count the retained catch).
    - If all of the snails and sea urchins are not cleared off the table or deck before the next pot is dumped, they should be cleared by the next pot or as soon as feasible.
    - Vessel owners may propose alternatives to this procedure by submitting plans that allow all catch to be accounted using the EM system to NMFS for approval. Vessels may not use this alternative until approved by NMFS.
  - The vessel operator is responsible for ensuring all catch is handled within view of the cameras as defined in the camera descriptions and deck diagram in the Vessel Installation Details section of the VMP.

Trip End

- **Within 2 business days after each EM selected trip**, ensure that the hard drive is mailed to the contact provided EM Program Contacts.
- **If an EM selected trip ends at a tender**, the hard drive must mailed within 2 business days of tender's arrival in a port with regular postal service to the contact provided in EM Program Contacts.
- **If the fishing trip ends in a remote port with limited postal service**, the vessel operator should notify NMFS using the contacts on first page of the VMP, if possible, to inform of the expected delay.
- Along with the hard drive, submit a copy of the trip's Logbook (IPHC or NMFS logbook or EM effort logbook, as appropriate).
- **Prior to logging another trip or within 2 weeks of the end of the fishing trip** selected for EM coverage, you must close the fishing trip in ODDS. You will need an ODDS Users ID and password and can close the trip on the web (http://odds.afsc.noaa.gov) or by calling the ODDS call center at: 1-855-747-6377.
- **Trips ending at a tender**. If your trip ends at a tender you must 1) manually turn on the EM system during the offload to allow the EM reviewer to verify the end of the trip, and 2) record the location of the offload in your logbook.

Vessels using the Exemption at §679.7(f)(4) to Fishing IFQ in Multiple Areas

- The vessel operator is still responsible for meeting all the requirements for use of an EM system on every trip when fishing using the exemption at §679.7(f)(4) to fishing IFQ in multiple areas.
- The EM system must be powered continuously during the fishing trip. If the EM system is powered down during periods of non-fishing, you must describe alternate methods to ensure location information about the vessel is available for the entire fishing trip in your VMP.
- If an EM system malfunction identified as "high" priority in the malfunction matrix occurs during a fishing trip, the vessel operator must cease fishing immediately; follow the troubleshooting guidelines listed in the VMP, and contact NOAA OLE immediately.
- The vessel operator may choose to purchase additional equipment, such as cameras or control centers, at their own expense to reduce lost fishing time. This additional equipment and its purpose should be described in your VMP.
- The vessel operator may also describe alternate methods, such as VMS, to ensure location information about the vessel is available for the entire fishing trip in the VMP.
- If a "high" priority malfunction occurs, every effort should be made to contact OLE while at sea, but if the vessel operator is unable to contact OLE while at sea, the vessel operator is not required to abandon fishing gear. The vessel operator should also contact the EM service provider to facilitate the repair.
- The vessel operator may contact OLE using a cell phone or satellite phone, or may contact the U.S. Coast Guard via VHF or single side band radio to request the Coast Guard contact OLE.
- The vessel operator must not set additional gear once a "high" priority malfunction is detected and must return to port immediately if unable to contact OLE at sea.

Equipment Malfunction Discovered During Pre-Departure EM System Function Test

If the function test identifies a malfunction, the vessel operator must follow the troubleshooting guidelines provided by the EM service provider.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Monitor	***High***	Connect a different monitor	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
GPS	***High***	Restart system	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
Insufficient Storage	***High***	Replace with spare data drive[1]	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
Control Center	***High***	Restart system	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
Insufficient Lighting	***High***	Replace lights	Vessel may fish but cannot retrieve gear at night.
Hauling Camera(s)	***High***	Restart system; replace with spare camera[1]	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
Discard Camera(s)	***High***	Restart system; replace with spare camera[1]	Vessel operator must remain in port up to 72 hours to allow for repairs. After 72 hours, vessel operator may depart on trip and next trip whether logged in ODDs or not is selected for EM coverage. Repair must occur prior to departing on the next trip.
Streamer line Camera	Low	Restart system; replace with spare camera[1]	Vessel operator may depart on trip. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Rotation Sensor	Low	Carry spare rotation equipment[11]	Vessel operator may depart on trip, but must trigger video manually. Must contact EM service provider before departing on another trip selected for EM coverage.
Hydraulic Sensor	Low	Restart system.	Vessel operator may depart on trip, but must trigger video manually. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Keyboard/ Mouse	Low	Replace with another keyboard/mouse[1]	Vessel operator may continue fishing provided that the sensors are properly triggering automatic recording. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.

[11] Vessels may choose to purchase additional spare parts, such as cameras or sensors but these items will not be provided by NMFS

Equipment Malfunction at Sea

- If the system passed the function test prior to leaving port, and remains continuously powered during the trip, the vessel operator is NOT required to return to port in the event of a breakdown. Follow the instructions provided in *Guide for Vessel Operators* provided by the EM service provider
- If the malfunction cannot be resolved following the troubleshooting guide and/or with remote support, the vessel operator should continue to run the system with all functional parts, and must contact the service provider immediately (from sea if possible) to assist with scheduling service at the time of landing.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Monitor	***High***	Connect a different monitor	Vessel operator must attempt to repair prior to retrieving gear. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next EM selected trip.
GPS	***High***	Restart system	Vessel operator must attempt to troubleshoot issue prior to retrieving gear. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next EM selected trip.
Insufficient Storage	***High***	Replace with spare data drive	Perform a data retrieval and swap data drive with a new blank data drive. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next EM selected trip.
Control Center	***High***	Restart system	Vessel operator must attempt to repair prior to retrieving gear. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next EM selected trip.
Insufficient Lighting	***High***	Replace lights	Vessel may fish but cannot retrieve gear at night.
Hauling Camera(s)	***High***	Restart system; replace with spare camera[2]	Vessel operator must attempt to repair prior to retrieving gear. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next trip.
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[2]	Vessel operator must attempt to repair prior to retrieving gear. If cannot repair must contact EM service provider at end of trip. Repair must occur prior to departing on the next EM selected trip.
Streamer line Camera	Low	Restart system; replace with spare camera[2]	Vessel operator may depart on trip. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Rotation Sensor	Low	Carry spare rotation equipment.[12]	Vessel operator may continue trip, but must trigger video manually. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Keyboard/Mouse	Low	Replace with another keyboard/mouse[2]	Vessel operator may continue fishing provided sensors are triggering automatic recording properly. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Hydraulic Sensor	Low	Restart system	Vessel operator may continue trip, but must trigger video manually. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.

[12] Vessels may choose to purchase additional spare parts, such as cameras or sensors but these items will not be provided by NMFS

Equipment Malfunctions for Vessels Fishing IFQ in Multiple Areas using the Exemption at §679.7(f)(4)

For any malfunction identified as "High" priority, the vessel operator must cease fishing immediately; follow the troubleshooting guidelines listed in *Guide for Vessel Operators* provided by the EM service provider, and contact NOAA OLE immediately.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Continuous Power to System	***High***	Check power supply to system	Vessel operator must ceasing fishing and contact OLE or vessel operator may not embark on trip using exemption. If system powered down during non-fishing, VMP must describe alternative methods to record location information
Monitor	***High***	Connect a different monitor[13]	Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption.
GPS	***High***	Restart system	Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption unless vessel has operating VMS and hauling and discard cameras are functioning.
Insufficient Storage	***High***	Conduct data retrieval and replace with spare data drive	If vessel does not have a spare data drive, Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption.
Control Center	***High***	Restart system	Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption.
Insufficient Lighting	***High***	Replace lights	Vessel may fish but cannot retrieve gear at night
Hauling Camera(s)	***High***	Restart system; replace with spare camera[3]	Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption.
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[3]	Vessel must cease fishing and contact OLE or vessel operator may not embark on trip using exemption.
Streamer line Camera	Low	Restart system; replace with spare camera[3]	Vessel operator may depart on trip or continue trip. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Rotation Sensor	Low	Restart system. Carry spare sensor[3]	Vessel operator may depart on trip or continue trip, but must trigger video manually. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.
Hydraulic Sensor	Low	Restart system. Carry spare sensor[3]	Vessel operator may depart on trip or continue trip, but must trigger video manually. Must contact EM service provider before departing on another trip where EM is required.
Rotation and Hydraulic Sensor	Low	Restart system. Carry spare sensors[3]	Vessel operator may depart on trip or continue trip, but must trigger video manually. Must contact EM service provider to schedule repair before departing on another trip where EM is required.
Keyboard/Mouse	Low	Replace with another keyboard/mouse[3]	Vessel operator may continue fishing provided sensors are triggering automatic recording properly. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.

[13] Vessel owners may choose to purchase additional spare parts, such as cameras or sensors but these items will not be provided by NMFS