-Draft-
2017 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska

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Contents

Executive Summary

This draft 2017 Annual Deployment Plan (ADP) documents how the National Marine Fisheries Service (NMFS) intends to assign fishery observers to vessels fishing in the North Pacific during the calendar year 2017.

- In the 2015 North Pacific Observer Program Annual Report (Annual Report) NMFS recommended using the trip-selection method (i.e., the trip-selection pool) to assign observers to vessels in 2017. NMFS continues to support this recommendation.

- Also in the 2015 Annual Report, NMFS recommended and the Council supported (Appendix A) evaluating two additional strata for the 2017 ADP: 1) vessels delivering to tenders; and 2) partial coverage catcher-processors. Appendix B in this draft ADP evaluates alternative sampling designs that incorporate these two new strata and the three gear-based strata (hook-and-line, pot, and trawl) that were used in 2016.

- The sampling design for observer deployment involves two elements: 1) how the population of partial coverage trips is divided (stratification); and 2) what proportion of the total observer deployments are to occur within these divisions (allocation). Four stratification schemes and three allocation schemes were evaluated. The alternative designs were compared by simulating observer deployments and evaluating the variation between trips and relative cost of sampling trips within a sampling design category. The designs were then evaluated using a sample gap analysis to explore situations where observer data was likely to be sparse. Overall, the analysis found that gear and tender/non-tender stratification scheme outperformed the gear and partial coverage catcher-processor stratification scheme.

- NMFS recommends the following sampling strata for 2017:
    - 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 on any trips for the 2017 fishing season, be composed of two categories:
    - Catcher vessels less than 40 ft LOA and vessels fishing with jig gear.
    - Electronic monitoring (EM) selection pool: Fixed gear vessels that have opted-in to the EM selection pool and will participate in the 2017 EM cooperative research described in the 2017 EM Pre-Implementation plan (see Appendix C).

- NMFS recommends the optimal allocation based on discarded groundfish (as described in Appendix B). NMFS uses estimates of anticipated fishing effort and available sea-day budgets to

determine selection rates for each stratum. Once a stratification design for the final ADP is established, simulation models will be used to refine expected coverage rates and will be provided in the final 2017 ADP.

- ***Preliminary*** deployment rates for the strata in 2017 are —
  - No selection - 0%
  - Hook-and-line - 11%
  - Tender hook-and-line - 27%
  - Pot - 3%
  - Tender Pot - 6%
  - Trawl - 18%
  - Tender trawl - 14%

- NMFS will continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. The sampling protocol established in the 2016 ADP will again be used in 2017.

- NMFS recommends not granting any conditional releases or temporary exemptions to any vessels subject to observer coverage and, similar to 2016, will continue to mitigate the impact of observers on vessels through the 2017 EM Pre-implementation Plan and placing vessels into the EM selection pool with no requirement to carry an observer. Vessels that received a conditional release in previous years have the opportunity to opt in to the EM selection pool and will be given priority to participate in the EM pre-implementation program in 2017.

- Prior to the 2017 fishing year, NMFS expects implementing regulations authorizing the owner of a trawl catcher vessel to annually qualify, through a request to NMFS, to be placed in the full observer coverage category when directed fishing for groundfish using trawl gear in the Bering Sea and Aleutian Islands management area (BSAI). This regulated process will replace the interim policy that has been in place since 2013. If approved by NMFS, a trawl catcher vessel that would otherwise be in the partial observer coverage category may opt in to the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI for the upcoming calendar year; operators who opt in to full coverage would not be subject to the partial fee.

- NMFS will continue to communicate the details of the ADP to affected participants through letters, public meetings, and posting information on the internet. Outreach activities during 2016/2017 fall and winter will focus on changes to observer deployment in the 2017 ADP and the ongoing work to integrate EM into the North Pacific Observer Program (Observer Program).

Introduction

Purpose and Authority

This draft 2017 Annual Deployment Plan (ADP) documents how the National Marine Fisheries Service (NMFS or Agency) intends to assign at-sea and shoreside observers to vessels and processing plants engaged in fishing operations in the North Pacific 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.

Data collection by observers is currently the only reliable and verifiable method available for NMFS to gain fishery discard and biological information on fish, and data concerning seabird and marine mammal interactions with fisheries. On-board observers also perform the critically important task of collecting biological data such as species composition, weights, and tissue samples that are important for stock assessment scientists and researchers. 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.

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 follows 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 ADP describes the science-driven method for observer deployment that enables observers to perform their duties, including species identification, quantification and disposition of catch, documentation of interactions with marine mammals and seabirds, and collection of biological specimens to support research and assessment of biological resources in the North Pacific. This ADP specifically describes observer deployment for the partial coverage category (50 CFR 679.51(a)) in the halibut and groundfish fisheries in 2017.

Process and Schedule

NMFS and the Council created the ADP process to provide flexibility in the deployment of observers to gather reliable data for estimation of catch in the groundfish and halibut fisheries off Alaska. NMFS and the Council recognized that the amount of observer coverage available for any given year would be dependent on available revenue generated from fees on groundfish and halibut landings. The ADP process allows NMFS to adjust deployment in each year so that sampling can be achieved within financial constraints. Some aspects of observer 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 in the partial coverage category.

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. On an annual basis, NMFS develops an ADP to describe how observers will be deployed for the upcoming calendar year and prepares an annual report that evaluates the performance of the prior year's ADP implementation. The schedule for the 2017 ADP is as follows:

- June 2016: NMFS presented the 2015 Annual Report to the Council and the public. The 2015 Annual Report provided a comprehensive evaluation of Observer Program performance including costs, sampling levels, issues, and potential changes for the 2017 ADP. The 2015 Annual Report identified areas where improvements are needed 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.

- September 2016: Based on information and analyses from the 2015 Annual Report and Council recommendations, NMFS prepared and released this draft 2017 ADP containing recommendations for deployment methods in the partial coverage category.

- September – October 2016: The Council and its Scientific and Statistical Committee will review this draft 2017 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 2017 ADP. NMFS will review and consider these recommendations; however, extensive analysis and large-scale revisions to the draft 2017 ADP are not feasible. This constraint is due to the short time available to finalize the 2017 ADP prior to the December 2016 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, 2017.

- December 2016: NMFS will finalize the 2017 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 2017, NMFS will present the 2016 Annual Report that will form the basis for the 2018 ADP.

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. 2016). NMFS has released three annual reports starting with the 2013 Annual Report (NMFS 2014a), which was presented to the Council in June 2014, and most recently the 2015 Annual Report (NMFS 2016), which was presented to the Council in June 2016. This draft 2017 ADP builds on NMFS recommendations in the three annual reports and input from the Council (Appendix A).

In both the 2013 and 2014 Annual Reports (NMFS 2014a; 2015c), NMFS evaluated the deployment method and concluded that trip-selection was working well whereas the vessel-selection process had several problems. Based on these evaluations, NMFS recommended that participants in the vessel-selection category be placed in the trip-selection category, and this recommendation was implemented under the 2015 and 2016 ADPs (NMFS 2014b; 2015a). NMFS continues to recommend the trip-selection method for all vessels in 2017.

The annual reports have evaluated observer deployment in each of the sampling strata for each year. The strata definitions in 2013-2014 ADPs were based on gear and vessel size where all trawl vessels and fixed gear vessels greater than 57.5 ft length over all (LOA) were placed in one strata, and all fixed gear vessels from 40 to 57.5 ft LOA were placed in a separate strata. In the 2014 Annual Report, the OSC recommended exploring new strata definitions based on gear and FMP area (NMFS 2015c). They also noted that it would be important that sampling strata are defined by characteristics that are known before the trip begins and that each trip can be assigned to a single stratum at the time the trip is logged. Based on the analysis of 12 alternative designs in the draft 2016 ADP (2015b), NMFS implemented a design in 2016 with three sampling strata and samples allocated according to an optimal allocation based on total catch (both retained and discard).

In the 2015 Annual Report, NMFS recommended and the Council reiterated (Appendix A) that the gear-specific sampling strata (trawl, hook-and-line, and pot) defined in 2016, should be continued in 2017. In addition, NMFS recommended evaluating additional strata based on 1) vessels delivering to tenders, and 2) partial coverage catcher-processors. Appendix B analyzes the performance of four alternative sampling designs defined by gear, whether catch was delivered to a tender, and a partial coverage catcher-processor stratum.

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, the 2014 and 2015 Annual Reports (NMFS 2016; 2015c) and the supplement to the environmental assessment for the restructured Observer Program (NMFS 2015d) 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, NMFS proposes to continue placing vessels less than 40 ft LOA in the no-selection pool in 2017 and recommends that vessels less than 40 ft LOA be considered for testing of electronic monitoring in 2017.

For 2017, the Council's EM workgroup has developed a draft 2017 EM Pre-implementation Plan (Appendix C) for hook-and-line and pot vessels that will be presented to the Council at the Council's October 2016 meeting. NMFS proposes to no longer issue conditional releases, and instead proposes to mitigate the impact of observers on vessels through the EM Pre-implementation Plan and placing vessels into the EM selection pool with no requirement to carry an observer. The EM workgroup has proposed a maximum of 90 hook-and-line vessels and a maximum of 30 pot vessels be allowed to participate in the EM selection pool in 2017 (Appendix C).

2017 Deployment Methods

The Observer Program uses a stratified hierarchical sampling design where strata are defined through a combination of regulations and the annual deployment process. A multi-stage sampling design is used to sample the species composition of catch along with other catch components, such as biological information that is important for stock assessments. Both shoreside sampling methods (for salmon) and at-sea sample collections are nested within a trip. At-sea sampling methods follow a nested structure where samples are nested within hauls, and hauls are nested within trips.

At-Sea Deployment Design

A random selection of trips will be the sole method of assigning observers to at-sea fishing events in 2017. Trip-selection refers to the selection of the fishing trip as the sampling unit. Trip-selection is facilitated through the Observer Declare and Deploy System (ODDS).

The sampling design for at-sea deployment of observers involves two elements: 1) how the population of partial coverage trips is divided (stratification) into selection pools or strata; and 2) what proportion of the total observer deployments are to occur within these divisions (allocation).

Selection Pools (Stratification)

Appendix B analyzes the performance of alternative sampling designs defined by gear and tender or non-tender deliveries, and partial coverage catcher-processor strata. 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. The gaps associated with each design were compared to provide a relative ranking of sampling designs. The gap analysis found that gear and tender/non-tender stratification scheme more often outperformed the gear and partial coverage catcher-processor stratification scheme.

NMFS recommends the following observer deployment strata for vessels in the partial observer coverage category (50 CFR 679.51(a)) in 2017:

- ***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 2017 fishing season. These vessels are divided into two categories:
    - Fixed-gear vessels less than 40 ft LOA[1] and vessels fishing with jig gear, which includes handline, jig, troll, and dinglebar troll gear.
    - Electronic monitoring (EM) selection pool: Fixed gear vessels that have opted-in to the EM selection pool and will participate in the 2017 EM cooperative research described in the 2017 EM Pre-Implementation plan (see Appendix C).
- ***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.
- ***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.
- ***Trawl trip-selection pool***: This pool is composed of all catcher vessels in the partial coverage category fishing trawl gear.

[1] Length overall (LOA) is defined in regulations at 50 CFR 679.2 and means the centerline longitudinal distance, rounded to the nearest foot.

- ***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 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 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.

Projected Allocation At-Sea Deployment (Sample Size)

NMFS recommends using the optimal allocation based on discarded groundfish rather than optimal allocation based on retained or total groundfish because this metric is directly linked to the important function of observer data in supporting fisheries management—data collection by observers provides a reliable and independent assessment of discarded catch.

To determine the deployment rate for each stratum, NMFS uses available sea-day budgets and estimates of anticipated fishing effort. NMFS anticipates the budget for 2017 deployment to be approximately $3.9M. For this draft ADP, a preliminary at-sea budget for the deployment of observers in 2017 was set at 3,505 days.

In order to evaluate the relative performance of alternative stratification schemes, the analysis in Appendix B is based on simplified assumption of future fishing effort, namely that fishing in 2017 will be identical to that in 2015. The analysis also does not incorporate uncertainty in budget projections for 2017 or uncertainty in the timing when the observer fees will be available. To accommodate this uncertainty and the simplified assumptions regarding fishing effort, a buffer of approximately 10 percent was applied to the rates in Appendix B (Rates *0.9) to calculate the following preliminary selection rates for the proposed strata.

The ***preliminary*** deployment rates for the trip-selection strata in 2017 are:

- No selection - 0%
- Hook-and-line - 11%
- Tender hook-and-line - 27%
- Pot - 3%
- Tender Pot - 6%
- Trawl - 18%
- Tender trawl - 14%

Once a final stratification design for the final 2017 ADP is established, a more careful 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 2017 ADP.

Chinook Salmon Sampling in the Gulf of Alaska

Genetic sampling of Chinook salmon in the GOA remains a priority for NMFS in 2017. This priority follows the implementation of Amendment 93 to the GOA FMP (77 FR 42629, July 20, 2012), which required all vessels fishing for pollock in the central and western GOA to retain salmon until delivery to a processing facility. There have been several iterations of the sampling design used to obtain genetic samples from salmon bycatch for the purposes of stock of origin (Faunce 2015). The sampling protocol for Chinook salmon that was established in the 2014 ADP (NMFS 2013) and continued under the 2015 and 2016 ADPs (NMFS 2014b, 2015a) and will remain in effect for 2017. Trips that are randomly selected for observer coverage in the GOA pollock fishery will be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. Outside of the pollock fisheries, tissues will be obtained from all salmon found within observer at-sea samples of the total catch. These genetic samples are important for the management of Chinook salmon prohibited species catch and are 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).

Conditional Release Policy

For 2017, NMFS recommends not granting any conditional releases or temporary exemptions to any vessels subject to observer coverage. The expansion of the EM selection pool in 2017 (Appendix C) is a mitigating factor in NMFS' recommendation to not grant any temporary exemptions. For hook-and-line vessels, the Council endorsed the expansion of the pre-implementation pool in 2017 to 90 vessels of any length. First priority in this pool would continue to be given to small longline vessels (40 to 57.5 ft LOA) and vessels that have life raft or bunk space limitations with carrying an observer. The Council also endorsed developing EM pre-implementation deployment on 30 pot vessels of any length for 2017 (pot vessels were not included in EM pre-implementation prior to 2017). Vessels in the EM selection pool will carry EM equipment as described in 2017 EM Pre-implementation Plan, but will not be subject to carrying an observer.

Annual Requests for Full Coverage on BSAI Trawl Catcher Vessels

Since 2013, NMFS has provided trawl vessels fishing for Pacific cod an option to carry an observer at all times when fishing in the BSAI. The additional coverage benefits the management of that fishery and reduces the population of trips in the partial coverage category, thus increasing the coverage rates for the trips remaining in partial coverage.

NMFS has published a proposed rule to allow the owner of a trawl catcher vessel to request, on an annual basis, that NMFS place the vessel in the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI in the following calendar year. NMFS expects the final rule implementing regulations defining this annual request process to be published and effective prior to the 2017 calendar year. This regulated process will replace the interim policy in place since 2013. When approved by NMFS, a trawl catcher vessel will be placed in the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI for the upcoming calendar year. Vessels moved from partial coverage to full coverage will no longer contribute to the observer fee that funds full coverage since full-coverage vessels fund observer coverage under a pay-as-you-go model.

Observer Declare and Deploy System (ODDS)

For 2017, NMFS is not proposing any changes to ODDS, other than programming different selection rates for different gear types and for different gear types delivering to tenders. As in 2016, there will be a selection box to indicate whether the vessel will be delivering to a tender. NMFS proposes to retain the current business operating procedure of allowing vessels to log up to three trips in advance. Any observed trip that is canceled would automatically be inherited on the next logged trip. 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. However, in 2016, we did not achieve complete reporting. In 2017, NMFS will provide further outreach to processors to increase reporting of the ODDS trip number.

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.

Outreach activities are tentatively planned for the fall of 2016 and winter of 2017 to inform industry participants of changes to observer deployment in the 2017 ADP and ongoing work on the 2017 EM Pre-implementation Plan to integrate EM into the existing research plan.

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.

References

Faunce, C., J. Gasper, J. Cahalan, S. Lowe, S. Barbeaux, and R. Webster. 2016. Deployment performance review of the 2015 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-322, 54 p. doi:10.7289/V5/TM-AFSC-322. Available at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-322.pdf.

Faunce, C. H. 2015. Evolution of observer methods to obtain genetic material from Chinook salmon bycatch in the Alaska pollock fishery. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-288, 28 p. Available at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-288.pdf.

Guyon, J. R., C. M. Guthrie III, A. R. Munro, J. Jasper, and W. D. Templin. 2015. Genetic stock composition analysis of the Chinook salmon bycatch in the Gulf of Alaska walleye pollock (*Gadus chalcogrammus*) trawl fisheries. 26 p. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-291. Available at http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-291.pdf.

NMFS. 2016. North Pacific Groundfish and Halibut Observer Program 2015 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. May 2015. Available at https://alaskafisheries.noaa.gov/sites/default/files/2015observerprogramannualreport.pdf.

NMFS. 2015a. 2016 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available at https://alaskafisheries.noaa.gov/sites/default/files/final2016adp.pdf.

NMFS. 2015b. *Draft* 2016 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available at https://alaskafisheries.noaa.gov/sites/default/files/draft2016adp.pdf.

NMFS. 2015c. North Pacific Groundfish and Halibut Observer Program 2014 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. 101106 p. plus appendices. Available at https://alaskafisheries.noaa.gov/sites/default/files/annualrpt2014.pdf.

NMFS. 2015d. Supplement to the Environmental Assessment for Restructuring the Program for Observer Procurement and Deployment in the North Pacific. NMFS, Alaska Regional Office, Juneau. May 2015. Available at https://alaskafisheries.noaa.gov/sites/default/files/analyses/finalea_restructuring0915.pdf.

NMFS. 2014a. North Pacific Groundfish and Halibut Observer Program 2013 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available at https://alaskafisheries.noaa.gov/sites/default/files/annualrpt2013.pdf.

NMFS. 2014b. 2015 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available at https://alaskafisheries.noaa.gov/sites/default/files/final2015adp.pdf.

NMFS. 2013. 2014 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available at https://alaskafisheries.noaa.gov/sites/default/files/adp2014.pdf.

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Appendix A - Council motion on the Annual Report and ADP

C-1 Observer Annual Report
Council motion June 9, 2016

1) The Council recommends that the draft 2017 Annual Deployment Plan evaluate the following:

- Maintain dockside monitoring on pollock deliveries.
- Continue to place vessels under 40ft in the no selection pool.
- Continue to place vessels participating in the 2017 EM pre-implementation program into no selection pool, using the priority and number of vessels that will be determined through the EM workgroup and Council process.
- Maintain the 3 sampling strata defined by gear in 2017 and continue to use the optimal allocation to evaluate deployment rates while trying to maintain the expectation of at least 3 observed trips in each NMFS area.
- Continue to allow vessels to log 3 trips at a time in ODDS, and providing automatic release from coverage for the third observed trip for vessels 40-57.5 ft in length.
- Two additional strata for Council review in the 2017 draft ADP: 1) vessels delivering to tenders; and 2) partial coverage catcher-processors.

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

- Continue to track trips by both gear type and vessel size categories (e.g., Table 4-1 in the 2015 annual report)
- Provide an examination of observer sampling results (such as percent of hauls sampled versus total hauls per trip, and sample fractions by vessel type, size, and gear size) in Chapter 4, or as a separate report.
- Include information on debriefing times for full coverage observers.
- Continue to incorporate evaluation of the EM strata

3) The Council continues to express concern about the timeliness of the release from US Treasury of observer fees and the fact that timely distribution of the fees is critical to maintaining coverage throughout the year.

4) The Council encourages the agency to continue work on developing variance methods, incorporating recommendations from the SSC.

The Council also moves to write a letter to the National Marine Fishery Service thanking the agency for their financial support of the observer program and outlining the number of observer days and coverage rates that have been achieved. In addition, the letter would outline possible declines in observer days if additional federal funding is not received, and would request additional funding to maintain approximately the same number of annual observer days through the development and full integration of electronic monitoring in the observer program.

Finally, the Council requests NMFS postpone action on AIS's application to be a full coverage observer provider until getting input from the Council after they have received the October white paper on LL2 observer issues that will include looking at the impacts of an observer provider being in the partial and full coverage categories in terms of (1) confidential fisheries information; (2) reimbursements by the Federal government; and (3) other unfair competitive advantages.

Appendix B – Comparison of alternative sampling designs for the 2017 Annual Deployment Plan

Introduction

The North Pacific Observer Program (observer program) uses a hierarchical sampling design with randomization at all levels to achieve unbiased data from fishing operations in the region and each Annual Deployment Plan (ADP) documents how NMFS plans to deploy observers into fishing activities for the upcoming year under the limits of available funding.

The ADP process provides a mechanism for NMFS and the Council to re-evaluate deployment and improve efficiency in the sampling design. In the draft 2016 ADP, NMFS presented 12 alternative designs for the deployment of observers to be considered by the Council (NMFS 2015a). The adopted 2016 ADP design allocates observed trips among three gear-based strata according to a blend of optimal allocations resulting from the interactions of stratum size and variance in total retained catch and total discarded catch (NMFS 2015b). The most recent Annual Report (NMFS 2016) and subsequent Council motion (June 9, 2016) recommended continuing to build upon the 2016 ADP design by evaluating the possibility of including additional strata for tendering activity, wherein a vessel delivers its catch to another vessel at-sea to be eventually delivered to a shore-based processor without returning to shore itself. In addition, the expansion of "partial coverage CPs" (vessels that have catcher processor endorsements but are not subject to full observer coverage) also warrant examination as potential separate strata (NMFS 2015c, NMFS 2016).

This analysis provides a comparison of the relative performance of alternative stratum definitions and allocation strategies for the deployment of observers into the fleet of vessels in partial coverage for consideration in the 2017 ADP.

Methods

Data Preparation – Defining the partial coverage fleet

The partial coverage fleet for 2017 needs to be defined for all potential design comparisons. 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 2017 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 electronic monitoring (EM) research and pre-implementation by September 20, 2016. In addition, fishing by seven vessels that carry both catcher vessel and catcher processor endorsements have been moved from full- to partial-coverage, and AFA endorsed trawl catcher vessels that voluntary choose to by the end of 2016 will carry full observer coverage when fishing in the Bering Sea and Aleutian Islands (hereafter termed Voluntary 100% BSAI vessels).

Since the actual list of vessels participating in electronic monitoring and voluntary 100% BSAI coverage are not known prior to the 2017 Draft ADP, assumptions must be made as to their composition. The list of 76 vessels expected to participate in EM during 2017 was obtained by first generating a list of all vessels that have volunteered for EM between 2014 and August 2016, and subtracting those vessels that have indicated as of August 2016 they will not be participating for EM in 2017. The number of voluntary 100% BSAI vessels volunteering has fallen from 41 in 2013, to 38 in

2014, to 32 in 2015, to 27 in 2016. A linear regression was used to predict that 22.5 vessels will volunteer in 2017. Each vessel that volunteered between 2013 and 2016 was given a score of 1 for each year it volunteered. This score, divided by four (number of years examined) yielded an occurrence score. The list of 21 vessels that had an occurrence score of 1 were used as a surrogate for voluntary vessels in 2017.

A database containing 2014 and 2015 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 stratification schemes described below.

Deployment Design

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

Stratification Schemes

Stratification is the division of sample units in the population into subpopulations. The subpopulations are individually called stratum (strata if plural). Stratified random sampling is the act of obtaining independently random samples from within each stratum in the population. 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 subpopulation is desired, when administrative convenience (field logistics) permits 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 homogenous subpopulations since the variance in the population total is dependent on the variances of the individual stratum means (Cochran 1977).

The collection of strata that together subdivide the population of trips in partial coverage constitutes a *stratification scheme*. In this study four stratification schemes were considered. These stratification schemes (with the number of the individual strata in parentheses) are as follows:

1. Gear (3 strata)

This *status quo* stratification divides the partial-coverage trips into three strata:

1) Hook and Line ≥ 40' LOA.
2) Pot ≥ 40' LOA.
3) Trawl.

2. Gear + Partial CP HAL (4 strata)

This stratification scheme is the same as the first with the addition of a new stratum. The new stratum is defined as trips undertaken by vessels with both a catcher vessel and catcher processor endorsement that have been granted exemption from full observer coverage when fishing with hook and line gear. During 2014-2015 five vessels would have participated in this new "Partial CP HAL" stratum. Although two pot vessels with both a catcher vessel and catcher processor endorsement have also been granted exemption from full observer coverage this is too few to warrant a separate stratum since all resulting data would be confidential under NMFS observer data reporting protocols.

3. Gear × Tender (6 strata)
This stratification uses the three gear types of stratification scheme #1 but further subdivides each of these into trips that either delivered catch to a tender vessel and those that did not. This results in 6 strata, 2 for each gear type (e.g. trawl non-tender; trawl tender; pot non-tender; pot tender; etc).

4. Gear × Tender + Partial CP HAL (7 strata)
This stratification combines the six strata in stratification scheme #3 with the new stratum of stratification scheme #2.

The stratification schemes 1-4 can be thought of as a continuum. The first scheme represents the chosen design of the 2016 Draft ADP and serves as a baseline for other comparisons. The relative "impact" of introducing either a new partial CP HAL stratum or new tender-based gear strata can be determined by comparing stratification schemes #2 and #3 to #1 respectively. Likewise, the relative "impact" of introducing all of these new strata can be determined by comparing stratification scheme #4 to #1, or by comparing stratification scheme #4 to stratification schemes #2 or #3.

Sample Allocation
Sample allocation is the term for how available observer deployments are apportioned to strata. "Optimal" allocation is that which achieves the most precision for the least cost (*c*). If *n* is the number of observed trips afforded for the year among all partial coverage fishing trips (*N*) that occur within *H* strata, and the estimate of catch from these trips 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}),

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

The partial coverage contract of the observer program pays for observer days according to the intersection of two variables: fixed costs for each deployment day, and variable costs in terms of transportation. While the fixed cost component of observer days are known and equal between deployments of observers, variable costs are not. However, there is a portion of the contract between NMFS and its partial-coverage observer provider that accounts for travel costs for the year. Assuming this cost is fully utilized, the monies available for observer deployment become total funds (*C*) minus travel costs (C_T). Likewise, because not all trips are of equal duration, the cost of an observed trip in each stratum (c_h) can be derived from the multiplication of its average trip duration and the cost of an observer day. 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 equation 1 as

$$n = \frac{(C - C_T)\sum_{h=1}^{H}\left(N_h S_h / \sqrt{c_h}\right)}{\sum_{h=1}^{H}\left(N_h S_h \sqrt{c_h}\right)} \text{ (Cochran 1977)} \qquad \text{Eq. (2)}$$

Once equation 2 is solved, the value for *n* can then be used to solve for the sample size in each stratum using equation 1. The resulting coverage rate in each stratum is obtained from the division of n_h by N_h.

Optimized sample allocations were generated using both variances for total retained catch and total discarded catch. However the challenge is how to allocate when there is more than one target metric. In these cases, Cochran (1977) shows that the *compromise optimal allocation* (m_h) is derived from the average number of optimal sample sizes measured across L metrics,

$$m_h = n * \bar{n}_{h\ opt,} \text{where } \bar{n}_h = \frac{\sum_{l=1}^{L} n_{lh}}{L} \qquad \text{Eq. (3)}$$

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.

Data from 2014 and 2015 were combined and treated as a single meta-year for the calculation of optimal allocation weightings (W_{hopt}) in each strata, the sample size available for the 2017 ADP (equation 2), and sample sizes for each strata (equation 1). This process was repeated using variance of retained catch and variance of discarded catch. The compromised optimal allocations of samples in each stratum for 2017 was calculated from equation 3. Using the N_h values from 2015 data only, anticipated rates of coverage for 2017 were obtained for 2017 under the assumption that 2017 fishing effort will be equivalent to 2015 (r_h, Figure 1). Distributions of the average trip duration and retained and discarded catch for each stratification scheme were plotted since these form the raw ingredients for the sample size allocation formulae.

Evaluation of Alternative Designs

The evaluation of alternative designs was determined through gap analysis following previous evaluations of observer program deployments (NMFS 2015a, NMFS 2015c). This is because of the invaluable service observers provide in the generation of total catch estimates; if there is no observer data in a given domain of interest, then data must be borrowed from similar or adjacent sampling units and incorrect inference about the total catch can result. This has implications for the in-season quota management used in Alaska.

In gap analysis the interest is in predicting the performance of each sampling plan using the most recent data. For this reason gap analyses and all subsequent analyses were performed on the 2015 subset of the source data (Figure 1). Following the June 2016 Council motion, the number of partial coverage trips corresponding to each stratification scheme was summed into domains defined by Gear and NMFS Area; unlike examinations of potential designs for the 2016 ADP- Target species was not included and NMFS Areas in the Bering Sea were not combined.

The hypergeometric distribution was used to calculate the probability of observing at least one and three trips within a domain for each sampling scheme based on compromise optimal allocation. These probabilities were made Boolean 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 were calculated for comparison and represented as a G score (G) for each stratification scheme. This G score for each sampling scheme was then divided by its minimum among sampling designs to provide a relative metric. This relative G score ranges from 0 to 100, where 100 is best.

Results and Discussion

The total number of observer days available for deployment in the observer program is dependent upon the available budget and the average cost of an observed day. This analysis uses a total amount of observer days that should remain constant for 2017 and 2018 given equal annual fee revenues and no additional Federal funding resulting in a financially sustainable observer program. The number of total observer days that results from this projection is 3,505. Depending on the deployment design chosen, approximately 53-59% of available sea days will be used between January 1 and June 16 of each calendar year.

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 2015 will be identical to that in 2017. This assumption is made in anticipation that for the Final 2017 ADP, when a stratification scheme is selected, a more careful estimate of anticipated fishing effort would be made for 2017, and resulting rates adjusted to reflect this new prediction. This approach was adopted for the draft and final 2016 ADPs. For the final 2016 ADP, a stable trend in hook and line and pot fishing was evident from 2013-2015 but a noticeable and consistent linear increase in the number of trawl fishing days was evident during that time (NMFS 2015b). This resulted in new predictions for the number of sea-days that would occur in the trawl fishery for 2016 and coverage rates were adjusted between the draft and final 2016 ADP.

The optimization algorithms in this analysis account for the differential potential costs associated with observing longer trips in some strata- an improvement upon prior analyses that used simplified Neyman optimization that assumes the cost of each observed trip is the same. The optimization algorithm employed here puts more samples where 1) strata are larger, 2) variance is larger, and 3) costs are lower (Cochran 1977). The methods used herein truly maximize the observer program “bang for the buck” and can not only be used to accommodate differential trip durations but also differential costs between observation types (for example human vs. cameras) in future ADPs.

Whether resulting rates of observer coverage differ between deployment designs depends upon how the rates are compared. While rates of coverage substantially differ among strata within each design (Table 1, Table 2, Table 3), they do not substantially differ within a given stratum (Figure 2). This lack of differences in coverage rates within a stratum with changes in stratification schemes is due to the fact that the new strata in schemes 2-4 are relatively small in terms of total trips compared to the strata based on gear alone. The distributions of trip durations and catches are presented in Figure 3 and Figure 4. Compromise optimal allocation results in the lowest rates within the hook and line stratum (7.7 %) and the highest rates within the tender trawl stratum (32.7 %, Table 1), discarded optimal allocation results in the lowest rates within the pot gear stratum (4.4 %) and the highest rates within the trawl stratum (19.5 %, Table 2) and retained optimal allocation results in the lowest rates within the hook and line gear stratum (3.3%) and the highest rates within the tender trawl stratum (49.4 %, Table 3).

Some of the sampling rates result in very low number of observed trips within a stratum. For example, under any optimal allocation strategy the number of expected observed trips in the tender hook and line stratum is between 2 and 3, despite a 20-30 % coverage rate. This is because only ten trips occur in that stratum. Similar low sample sizes are expected within the partial CP HAL under all optimal allocations (n_h = 2-10, Tables 1-3) and tender POT strata under discard optimal allocation (n_h = 12, Table 2). This is problematic because the ODDS trip-selection system currently allows for up to three trips to be logged at once and trips can be cancelled. With these policies in place, and the captains prior knowledge of observed and unobserved trips, it is likely that no observed trips will be realized in these strata under these designs during 2017 unless near 100% probability of selection for observer coverage is implemented.

An alternative to increasing the selection rate on small strata is to select stratification schemes that have fewer, but larger strata. Indeed, the Gear (3) stratification scheme outperformed all other stratification schemes in gap analyses since each stratum contains over a thousand trips each (Table 4). The presence of the partial CP HAL stratum in some stratification schemes causes those schemes to have a disproportionate number of NMFS Areas with low likelihoods of one or more observed trips in each of them (Figure 5). This phenomenon is because this stratum is associated with low numbers of fishing trips in numerous NMFS Areas (Table 5 - Table 10).

Whether or not it is warranted to include the partial CP HAL stratum in the 2017 ADP depends upon how valuable resulting information would be. If, for instance these vessels fish in similar areas, fisheries, etc. from other hook and line vessels of similar size, then it would not make sense to create a separate stratum. Examination of the fishing characteristics of the partial CP HAL stratum trips to other catcher vessel hook and line trips is presented in Figure 6[2]. Although on average partial CP HAL vessels had fewer discards, less diverse retained catch, landed fewer species, and some were larger in vessel length than other catcher vessels fishing with hook and line gear, none of these differences were very striking (Figure 6, top panels). In contrast, while the proportion of management program codes fished and tender trips undertaken were similar between these two groups of hook and line vessels, partial CP HAL vessels fish later in the year, predominantly in the sablefish fishery, and fish nearly exclusively in the Aleutian Islands (NFMS Areas 541:543; Figure 6, bottom panels).

The fact that the partial CP HAL vessels fish predominantly in the Aleutian Islands is important since the review of the 2015 observer program deployment found that no trips had observed within the 40-57.5’ class of vessels from the Aleutian Islands when sampled at a 12% rate, and there were no observed trips within NMFS Areas 543 and less than expected coverage in NMFS Area 542 within the 57.5’ ≥ class of vessels when sampled at a 24% rate (NMFS 2016). Given the anticipated low coverage rates for 2017 and beyond, it seems prudent to attempt to improve the ability of the observer program to obtain samples from within this unique set of vessels in the Aleutian Islands. Similarly, prior observer program Annual Reports have highlighted the differences between tender and non-tender trips and the difficulty of the observer program in observing tender deliveries, particularly from within the trawl pollock fishery in the Gulf of Alaska (NMFS 2015a).

The 3,505 anticipated observer days for 2017 is an amount that will result in multi-year sample size and financial stability for the observer program given the 1.25% fee revenue. Unfortunately, it represents the lowest total sample size since the restructured program was initiated in 2013. For comparison, the observer program deployed observers for 3,533 days in 2013, 4,573 days in 2014, 5,318 days in 2015, and is expected to observe 4,900 days in 2016 (NMFS 2015b, NMFS 2016). The number of observed days for 2017 represents a 30.7 % decrease from the average number of sea-days deployed during 2013-2016. For the number of observed days for 2017 and beyond to be equal to the prior four year average (4,581) would require an increase in the observer fund fee from 1.25% to 1.63%.

[2] Due to the nature of the way partial CP HAL vessels were created, the amount of their catch is much more like catcher vessels than catcher processors so full-coverage CP data was excluded from comparisons.

The resulting coverage rates presented here are well below the rates that could result in temporal and spatial bias in observer deployment. For example, in simulated sampling evaluations of 2014 data, most observer data gaps disappeared or were severely minimized at deployment rates greater than or equal to 15% (NMFS 2015d, p.98). In 2015, selection rates in the 40-57.5' class of vessels were 12%, and an actual observation rate of 11.2% was achieved (NMFS, 2016). At this level of coverage numerous NMFS Areas without any observer coverage resulted. The temporal bias present in the 57.5' ≥ class of vessels in 2014 when selection rate was 15% was no longer present in 2015 when selection rates were set at 24% (NMFS, 2016). It is likely that observer coverage in 2017 will be both spatially and temporally biased with several strata unlikely to be sampled at all under some deployment designs.

Conclusions, Caveats and Potential Improvements

This analysis builds upon those presented for the 2016 Draft ADP. As such, the methods presented in Figure 1 are somewhat streamlined from those presented in that former document. The relative performance of the stratifications schemes in terms of precision and accuracy are not evaluated- only gap analyses were used as a performance metric. This simplification was done in recognition that the resulting variances are already captured in the optimization algorithm and resulting rates of coverage are already set according to where they benefit the most in terms of variance reduction and cost.

The catch on each sampled trip was assumed to be known without variance, and a simple single stage estimator of trip variances are used in optimization algorithms. This is a necessary oversimplification. 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, but not always, the stage with the *least* amount of variance (Allen et al. 2002, Borges et al. 2004). More appropriate estimates of variance for each stratum and metric will be used in subsequent analyses when they become available.

Some of the assumptions used in this analysis were adequately addressed through additional analysis while some could not. While regression analysis could be used to estimate the number of voluntary 100% BSAI trawl vessels when fishing Pacific cod in the Bering Sea, there are no such tools or information available to estimate the number of EM boats for 2017. As of August 31, 2016, the observer program estimates only 30 hook and line vessels will participate in EM in 2017. This number is far below the list of 76 vessels used in this analysis, and still further below the 90 hook and line boats targeted by the Council's EM Workgroup (Appendix C). If the number of EM participants in 2017 is below 76, coverage rates for human observation presented here for strata using hook and line gear will decrease further. This is because their fishing effort would now be included in the number of fishing trips in the appropriate stratum. A list of vessels participating in EM should be known prior to the December, 2016, Council meeting to reduce the uncertainty in the anticipated rates for 2017.

<u>Finally, for all of the reasons already listed in this section, the resulting coverage rates presented in this study should only be considered preliminary estimates that are likely high relative to what will be presented in the final ADP or realized in 2017.</u> Once a stratification design for the final ADP is established, more robust simulated sampling procedures that take true trip duration into account will be used to estimate expected coverage rates following the methods described in the final 2016 ADP (NMFS 2015b).

While in the 2016 Draft ADP only designs that had above average G scores were forwarded as candidates for the 2016 Final ADP, here all designs are forwarded as potential candidates for the 2017

Final ADP**.** This is in recognition that the observer program has had considerable difficulty in both 1) observing tender vessel trips and 2) trips in the Aleutian Islands where the partial CP HAL stratum vessel trips occur. However, the 'all inclusive' seven strata design was the worst performer in terms of gap analyses. If only one either tendering or partial CP HAL were to be included as additional strata beyond the *status quo* Gear (3) stratification scheme, gap analyses show that the Gear × Tender (6) stratification scheme tends to outperform the Gear + partial CP HAL stratification scheme.

Citations

Allen, M., D. Kilpatrick, M. Armstrong, R. Briggs, G. Course, and N. Perez. 2002. Multistage cluster sampling design and optimal sample sizes for estimation of fish discards from commercial trawlers. Fish. Res. 55: 11-24.

Borges, L., A. F. Zuur, E. Rogan, and R. Officer. 2004. Optimum sampling levels in discard sampling programs. Can. J. Fish. Aquat. Sci., 61: 1918-1928.

Cahalan, J., Mondragon, J., and J. Gasper. 2014. Catch sampling and estimation in the federal groundfish fisheries off Alaska, 2015 edition. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-286, 46 p.

Cochran, W. G. 1977. Sampling Techniques (Third Edition), New York, NY: John Wiley & Sons.

NMFS. 2016. North Pacific Groundfish and Halibut Observer Program 2015 Annual Report. Published May 2016. 104 p. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/2015observerprogramannualreport.pdf

NMFS. 2015a. Draft 2016 Annual Deployment Plan for observers in the groundfish and halibut fisheries off Alaska. Available online at: http://alaskafisheries.noaa.gov/sustainablefisheries/observers/draft2016adp.pdf.

NMFS. 2015b. 2016 Annual Deployment Plan for observers in the groundfish and halibut fisheries off Alaska. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/final2016adp.pdf.

NMFS. 2015c. North Pacific Groundfish and Halibut Observer Program 2015 Annual Report. Published May 2016. 104 p. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/annualrpt2014.pdf

NMFS. 2015d. Draft Supplement to the Environmental Assessment for Restructuring the Program for Observer Procurement and Deployment in the North Pacific. NMFS, Alaska Regional Office, Juneau. May 2015. Available online at https://alaskafisheries.noaa.gov/sites/default/files/analyses/finalea_restructuring0915.pdf.

Table 1 Comparison of the number of trips in a stratum (N_h), the optimal sample weighting (W_{hopt}), preliminary draft observer coverage rates (r_h) and days observed (d_h) resulting from four stratification schemes and compromise optimal sample allocations.

Stratification Scheme	Stratum (*h*)	N_{h2017}	W_{hopt}	n_h	r_h (%)*	d_h
Compromise Optimal Allocation						
Gear (3)	HAL	2800	0.243	220	7.86	1053
Gear (3)	POT	1162	0.143	137	11.79	488
Gear (3)	TRW	2538	0.614	576	22.7	1963
Gear + Partial CP HAL (4)	HAL	2745	0.236	213	7.76	1011
Gear + Partial CP HAL (4)	POT	1162	0.143	137	11.79	488
Gear + Partial CP HAL (4)	TRW	2538	0.615	576	22.7	1963
Gear + Partial CP HAL (4)	Partial CP HAL	55	0.007	6	10.91	40
Gear x Tender (6)	HAL	2790	0.243	219	7.85	1050
Gear x Tender (6)	Tender HAL	10	0.003	2	20	8
Gear x Tender (6)	POT	979	0.102	96	9.81	331
Gear x Tender (6)	Tender POT	183	0.036	34	18.58	142
Gear x Tender (6)	TRW	2370	0.558	516	21.77	1714
Gear x Tender (6)	Tender TRW	168	0.058	55	32.74	254
Gear x Tender + Partial CP HAL (7)	HAL	2735	0.235	212	7.75	1008
Gear x Tender + Partial CP HAL (7)	Tender HAL	10	0.003	2	20	8
Gear x Tender + Partial CP HAL (7)	POT	979	0.102	96	9.81	331
Gear x Tender + Partial CP HAL (7)	Tender POT	183	0.036	34	18.58	142
Gear x Tender + Partial CP HAL (7)	TRW	2370	0.559	516	21.77	1714
Gear x Tender + Partial CP HAL (7)	Tender TRW	168	0.058	55	32.74	254
Gear x Tender + Partial CP HAL (7)	Partial CP HAL	55	0.007	6	10.91	40

*NOTE: RATES PROVIDED HERE ARE FOR COMPARISON PURPOSES ONLY AND ARE MADE UNDER THE ASSUMPTION THAT EACH TRIP IN A STRATUM IS IDENTICAL IN LENGTH, THAT OBSERVER DEPLOYMENTS ARE PERFECTLY EXECUTED, AND FISHING EFFORT IN 2015 IS EQUIVALENT TO FISHING EFFORT IN 2017.

Table 2 Comparison of the number of trips in a stratum (N_h), the optimal sample weighting (W_{hopt}), preliminary draft observer coverage rates (r_h) and days observed (d_h) resulting from four stratification schemes and discarded optimal sample allocations.

Stratification Scheme	Stratum (*h*)	N_{h2017}	W_{hopt}	n_h	r_h (%)*	d_h
Optimal Discarded Groundfish Allocation						
Gear (3)	HAL	2800	0.39	346	12.36	1657
Gear (3)	POT	1162	0.059	52	4.48	185
Gear (3)	TRW	2538	0.551	488	19.23	1663
Gear + Partial CP HAL (4)	HAL	2745	0.377	334	12.17	1586
Gear + Partial CP HAL (4)	POT	1162	0.059	52	4.48	185
Gear + Partial CP HAL (4)	TRW	2538	0.552	488	19.23	1663
Gear + Partial CP HAL (4)	Partial CP HAL	55	0.012	10	18.18	66
Gear x Tender (6)	HAL	2790	0.388	344	12.33	1649
Gear x Tender (6)	Tender HAL	10	0.004	3	30	12
Gear x Tender (6)	POT	979	0.042	37	3.78	128
Gear x Tender (6)	Tender POT	183	0.014	12	6.56	50
Gear x Tender (6)	TRW	2370	0.523	464	19.58	1541
Gear x Tender (6)	Tender TRW	168	0.03	27	16.07	125
Gear x Tender + Partial CP HAL (7)	HAL	2735	0.374	332	12.14	1578
Gear x Tender + Partial CP HAL (7)	Tender HAL	10	0.004	3	30	12
Gear x Tender + Partial CP HAL (7)	POT	979	0.042	37	3.78	128
Gear x Tender + Partial CP HAL (7)	Tender POT	183	0.014	12	6.56	50
Gear x Tender + Partial CP HAL (7)	TRW	2370	0.524	464	19.58	1541
Gear x Tender + Partial CP HAL (7)	Tender TRW	168	0.03	27	16.07	125
Gear x Tender + Partial CP HAL (7)	Partial CP HAL	55	0.012	10	18.18	66

*NOTE: RATES PROVIDED HERE ARE FOR COMPARISON PURPOSES ONLY AND ARE MADE UNDER THE ASSUMPTION THAT EACH TRIP IN A STRATUM IS IDENTICAL IN LENGTH, THAT OBSERVER DEPLOYMENTS ARE PERFECTLY EXECUTED, AND FISHING EFFORT IN 2015 IS EQUIVALENT TO FISHING EFFORT IN 2017.

Table 3 Comparison of the number of trips in a stratum (N_h), the optimal sample weighting (W_{hopt}), preliminary draft observer coverage rates (r_h) and days observed (d_h) resulting from four stratification schemes and retained optimal sample allocations.

Stratification Scheme	Stratum (*h*)	N_{h2017}	W_{hopt}	n_h	r_h (%)*	d_h
Optimal Retained Groundfish Allocation						
Gear (3)	HAL	2800	0.096	94	3.36	450
Gear (3)	POT	1162	0.226	222	19.1	790
Gear (3)	TRW	2538	0.678	664	26.16	2263
Gear + Partial CP HAL (4)	HAL	2745	0.094	92	3.35	437
Gear + Partial CP HAL (4)	POT	1162	0.226	222	19.1	790
Gear + Partial CP HAL (4)	TRW	2538	0.678	664	26.16	2263
Gear + Partial CP HAL (4)	Partial CP HAL	55	0.002	2	3.64	13
Gear x Tender (6)	HAL	2790	0.098	94	3.37	451
Gear x Tender (6)	Tender HAL	10	0.002	2	20	8
Gear x Tender (6)	POT	979	0.162	156	15.93	538
Gear x Tender (6)	Tender POT	183	0.059	57	31.15	238
Gear x Tender (6)	TRW	2370	0.593	569	24.01	1890
Gear x Tender (6)	Tender TRW	168	0.086	83	49.4	384
Gear x Tender + Partial CP HAL (7)	HAL	2735	0.096	92	3.36	437
Gear x Tender + Partial CP HAL (7)	Tender HAL	10	0.002	2	20	8
Gear x Tender + Partial CP HAL (7)	POT	979	0.162	156	15.93	538
Gear x Tender + Partial CP HAL (7)	Tender POT	183	0.059	57	31.15	238
Gear x Tender + Partial CP HAL (7)	TRW	2370	0.593	569	24.01	1890
Gear x Tender + Partial CP HAL (7)	Tender TRW	168	0.086	83	49.4	384
Gear x Tender + Partial CP HAL (7)	Partial CP HAL	55	0.002	2	3.64	13

*NOTE: RATES PROVIDED HERE ARE FOR COMPARISON PURPOSES ONLY AND ARE MADE UNDER THE ASSUMPTION THAT EACH TRIP IN A STRATUM IS IDENTICAL IN LENGTH, THAT OBSERVER DEPLOYMENTS ARE PERFECTLY EXECUTED, AND FISHING EFFORT IN 2015 IS EQUIVALENT TO FISHING EFFORT IN 2017.

Table 4 Results of gap analysis for each design and optimal allocation. G scores are the proportion of domains with at least a 50% chance of three (G3) or more or one (G1) or more observed trips during the year. Grelative is the G score of each stratification scheme divided by the maximum. Stratifications are listed in descending order by G3; order by G1 is not always equal to G3 order since the likelihood of having three or more observed trips in a cell sized < 3 is zero.

Stratification scheme	G3	G3 relative	G1	G1 relative
Compromise Optimal Allocation				
Gear (3)	0.66	1.00	0.80	1.00
Gear x Tender (6)	0.57	0.87	0.77	0.96
Gear + Partial CP HAL (4)	0.52	0.80	0.68	0.85
Gear x Tender + Partial CP HAL (7)	0.48	0.73	0.68	0.85
Discard Optimal Allocation				
Gear (3)	0.66	1.00	0.86	1.00
Gear + Partial CP HAL (4)	0.55	0.83	0.80	0.93
Gear x Tender (6)	0.53	0.81	0.83	0.97
Gear x Tender + Partial CP HAL (7)	0.46	0.71	0.79	0.92
Retained Optimal Allocation				
Gear (3)	0.57	1.00	0.69	0.98
Gear x Tender (6)	0.55	0.97	0.70	1.00
Gear x Tender + Partial CP HAL (7)	0.46	0.81	0.61	0.86
Gear + Partial CP HAL (4)	0.45	0.80	0.57	0.81

Table 5 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Bering Sea and Aleutian Islands for each of the four stratification schemes compared with Compromise Optimal Allocation. The number of trips in an Area Stratum combination are not whole numbers since some actual fishing trips span more than one NMFS Area.

BSAI Compromise Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
509_POT	120.50			1.00	1.00
509_POT	131.83	1.00	1.00		
509_Tender_POT	11.33			0.90	0.90
509_TRW	129.83	1.00	1.00	1.00	1.00
513_HAL	5.50	0.39	0.38	0.39	0.38
513_TRW	0.50	0.23	0.23	0.22	0.22
514_HAL	9.00	0.52	0.52	0.52	0.52
516_TRW	1.83	0.40	0.40	0.39	0.39
517_HAL	8.92	0.52	0.52	0.52	0.52
517_POT	60.50			1.00	1.00
517_POT	63.83	1.00	1.00		
517_Tender_POT	3.33			0.46	0.46
517_TRW	145.00	1.00	1.00	1.00	1.00
518_HAL	34.92		0.94		0.94
518_HAL	36.25	0.95		0.95	
518_Partial_CP_HAL	1.33		0.11		0.11
518_POT	24.00	0.95	0.95	0.92	0.92
519_HAL	57.17	0.99	0.99	0.99	0.99
519_POT	248.00			1.00	1.00
519_POT	254.00	1.00	1.00		
519_Tender_POT	6.00			0.71	0.71
519_TRW	33.83	1.00	1.00	1.00	1.00
521_HAL	18.92	0.79	0.79	0.79	0.79
523_HAL	7.08	0.44	0.43	0.44	0.43
524_HAL	9.50	0.56	0.55	0.56	0.55
541_HAL	54.17		0.99		0.99
541_HAL	72.33	1.00		1.00	
541_Partial_CP_HAL	18.17		0.92		0.92
541_POT	3.00	0.31	0.31	0.27	0.27
542_HAL	14.83		0.70		0.70
542_HAL	31.50	0.93		0.93	
542_Partial_CP_HAL	16.67		0.90		0.90
543_HAL	1.83		0.15		0.15
543_HAL	4.67	0.34		0.34	
543_Partial_CP_HAL	2.83		0.30		0.30

Table 6 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Gulf of Alaska for each of the four stratification schemes compared with Compromise Optimal Allocation. The number of trips in an Area Stratum combination are not whole numbers since some actual fishing trips span more than one NMFS Area.

GOA Compromise Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
610_HAL	211.50	1.00	1.00	1.00	1.00
610_POT	190.00			1.00	1.00
610_POT	264.83	1.00	1.00		
610_Tender_POT	74.83			1.00	1.00
610_Tender_TRW	154.50			1.00	1.00
610_TRW	414.50			1.00	1.00
610_TRW	569.00	1.00	1.00		
620_HAL	171.00				1.00
620_HAL	172.00			1.00	
620_HAL	175.50		1.00		
620_HAL	176.50	1.00			
620_Partial_CP_HAL	1.00		0.11		0.11
620_POT	42.00			0.99	0.99
620_POT	82.00	1.00	1.00		
620_Tender_HAL	4.50			0.73	0.73
620_Tender_POT	40.00			1.00	1.00
620_Tender_TRW	13.50			1.00	1.00
620_TRW	770.00			1.00	1.00
620_TRW	783.50	1.00	1.00		
630_HAL	1048.50				1.00
630_HAL	1051.00		1.00		
630_HAL	1052.50			1.00	
630_HAL	1055.00	1.00			
630_Partial_CP_HAL	4.00		0.38		0.38
630_POT	291.00			1.00	1.00
630_POT	338.50	1.00	1.00		
630_Tender_HAL	2.50			0.49	0.49
630_Tender_POT	47.50			1.00	1.00
630_TRW	872.50	1.00	1.00	1.00	1.00
640_HAL	201.83		1.00		1.00
640_HAL	206.83	1.00		1.00	
640_Partial_CP_HAL	5.00		0.45		0.45
640_TRW	2.00	0.40	0.40	0.39	0.39
649_HAL	105.50		1.00		1.00
649_HAL	109.50	1.00		1.00	
649_Partial_CP_HAL	4.00		0.38		0.38
650_HAL	506.33				1.00
650_HAL	507.33		1.00		
650_HAL	508.33			1.00	
650_HAL	509.33	1.00			
650_Partial_CP_HAL	2.00		0.21		0.21
650_Tender_HAL	1.00			0.20	0.20
659_HAL	268.50			1.00	1.00
659_HAL	270.50	1.00	1.00		
659_Tender_HAL	2.00			0.38	0.38

Table 7 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Bering Sea and Aleutian Islands for each of the four stratification schemes compared with Discard Optimal Allocation. The number of trips in an Area Stratum combination is not in whole numbers since some actual fishing trips span more than one NMFS Area.

BSAI Discard Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
509_POT	120.50			0.99	0.99
509_POT	131.83	1.00	1.00		
509_Tender_POT	11.33			0.54	0.54
509_TRW	129.83	1.00	1.00	1.00	1.00
513_HAL	5.50	0.55	0.54	0.55	0.54
513_TRW	0.50	0.19	0.19	0.20	0.20
514_HAL	9.00	0.70	0.69	0.69	0.69
516_TRW	1.83	0.35	0.35	0.35	0.35
517_HAL	8.92	0.70	0.69	0.69	0.69
517_POT	60.50			0.91	0.91
517_POT	63.83	0.95	0.95		
517_Tender_POT	3.33			0.19	0.19
517_TRW	145.00	1.00	1.00	1.00	1.00
518_HAL	34.92		0.99		0.99
518_HAL	36.25	0.99		0.99	
518_Partial_CP_HAL	1.33		0.18		0.18
518_POT	24.00	0.67	0.67	0.61	0.61
519_HAL	57.17	1.00	1.00	1.00	1.00
519_POT	248.00			1.00	1.00
519_POT	254.00	1.00	1.00		
519_Tender_POT	6.00			0.34	0.34
519_TRW	33.83	1.00	1.00	1.00	1.00
521_HAL	18.92	0.92	0.92	0.92	0.92
523_HAL	7.08	0.60	0.60	0.60	0.60
524_HAL	9.50	0.73	0.73	0.73	0.73
541_HAL	54.17		1.00		1.00
541_HAL	72.33	1.00		1.00	
541_Partial_CP_HAL	18.17		0.99		0.99
541_POT	3.00	0.13	0.13	0.11	0.11
542_HAL	14.83		0.86		0.86
542_HAL	31.50	0.99		0.99	
542_Partial_CP_HAL	16.67		0.98		0.98
543_HAL	1.83		0.23		0.23
543_HAL	4.67	0.48		0.48	
543_Partial_CP_HAL	2.83		0.46		0.46

Table 8 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Gulf of Alaska for each of the four stratification schemes compared with Discard Optimal Allocation. The number of trips in an Area Stratum combination is not in whole numbers since some actual fishing trips span more than one NMFS Area.

GOA Discard Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
610_HAL	211.50	1.00	1.00	1.00	1.00
610_POT	190.00			1.00	1.00
610_POT	264.83	1.00	1.00		
610_Tender_POT	74.83			1.00	1.00
610_Tender_TRW	154.50			1.00	1.00
610_TRW	414.50			1.00	1.00
610_TRW	569.00	1.00	1.00		
620_HAL	171.00				1.00
620_HAL	172.00			1.00	
620_HAL	175.50		1.00		
620_HAL	176.50	1.00			
620_Partial_CP_HAL	1.00		0.18		0.18
620_POT	42.00			0.81	0.81
620_POT	82.00	0.98	0.98		
620_Tender_HAL	4.50			0.88	0.88
620_Tender_POT	40.00			0.95	0.95
620_Tender_TRW	13.50			0.92	0.92
620_TRW	770.00			1.00	1.00
620_TRW	783.50	1.00	1.00		
630_HAL	1048.50				1.00
630_HAL	1051.00		1.00		
630_HAL	1052.50			1.00	
630_HAL	1055.00	1.00			
630_Partial_CP_HAL	4.00		0.56		0.56
630_POT	291.00			1.00	1.00
630_POT	338.50	1.00	1.00		
630_Tender_HAL	2.50			0.66	0.66
630_Tender_POT	47.50			0.98	0.98
630_TRW	872.50	1.00	1.00	1.00	1.00
640_HAL	201.83		1.00		1.00
640_HAL	206.83	1.00		1.00	
640_Partial_CP_HAL	5.00		0.65		0.65
640_TRW	2.00	0.35	0.35	0.35	0.35
649_HAL	105.50		1.00		1.00
649_HAL	109.50	1.00		1.00	
649_Partial_CP_HAL	4.00		0.56		0.56
650_HAL	506.33				1.00
650_HAL	507.33		1.00		
650_HAL	508.33			1.00	
650_HAL	509.33	1.00			
650_Partial_CP_HAL	2.00		0.33		0.33
650_Tender_HAL	1.00			0.30	0.30
659_HAL	268.50			1.00	1.00
659_HAL	270.50	1.00	1.00		
659_Tender_HAL	2.00			0.53	0.53

Table 9 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Bering Sea and Aleutian Islands for each of the four stratification schemes compared with Retained Optimal Allocation. The number of trips in an Area Stratum combination is not in whole numbers since some actual fishing trips span more than one NMFS Area.

BSAI Retained Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
509_POT	120.50			1.00	1.00
509_POT	131.83	1.00	1.00		
509_Tender_POT	11.33			0.99	0.99
509_TRW	129.83	1.00	1.00	1.00	1.00
513_HAL	5.50	0.19	0.19	0.19	0.19
513_TRW	0.50	0.26	0.26	0.24	0.24
514_HAL	9.00	0.26	0.26	0.27	0.27
516_TRW	1.83	0.45	0.45	0.42	0.42
517_HAL	8.92	0.26	0.26	0.27	0.27
517_POT	60.50			1.00	1.00
517_POT	63.83	1.00	1.00		
517_Tender_POT	3.33			0.68	0.68
517_TRW	145.00	1.00	1.00	1.00	1.00
518_HAL	34.92		0.70		0.70
518_HAL	36.25	0.71		0.71	
518_Partial_CP_HAL	1.33		0.04		0.04
518_POT	24.00	0.99	0.99	0.99	0.99
519_HAL	57.17	0.86	0.86	0.86	0.86
519_POT	248.00			1.00	1.00
519_POT	254.00	1.00	1.00		
519_Tender_POT	6.00			0.90	0.90
519_TRW	33.83	1.00	1.00	1.00	1.00
521_HAL	18.92	0.48	0.48	0.48	0.48
523_HAL	7.08	0.21	0.21	0.21	0.21
524_HAL	9.50	0.29	0.29	0.29	0.29
541_HAL	54.17		0.84		0.85
541_HAL	72.33	0.92		0.92	
541_Partial_CP_HAL	18.17		0.55		0.55
541_POT	3.00	0.47	0.47	0.41	0.41
542_HAL	14.83		0.40		0.40
542_HAL	31.50	0.67		0.67	
542_Partial_CP_HAL	16.67		0.53		0.53
543_HAL	1.83		0.07		0.07
543_HAL	4.67	0.16		0.16	
543_Partial_CP_HAL	2.83		0.11		0.11

Table 10 The number of trips and the associated likelihood of observing at least one trip within each NMFS Area Stratum combination in the Gulf of Alaska for each of the four stratification schemes compared with Retained Optimal Allocation. The number of trips in an Area Stratum combination is not in whole numbers since some actual fishing trips span more than one NMFS Area.

GOA Retained Optimal Allocation					
NMFS Area_Stratum	Trips	Gear (3)	Gear + Partial CP HAL (4)	Gear x Tender (6)	Gear x Tender + Partial CP HAL (7)
610_HAL	211.50	1.00	1.00	1.00	1.00
610_POT	190.00			1.00	1.00
610_POT	264.83	1.00	1.00		
610_Tender_POT	74.83			1.00	1.00
610_Tender_TRW	154.50			1.00	1.00
610_TRW	414.50			1.00	1.00
610_TRW	569.00	1.00	1.00		
620_HAL	171.00				1.00
620_HAL	172.00			1.00	
620_HAL	175.50		1.00		
620_HAL	176.50	1.00			
620_Partial_CP_HAL	1.00		0.04		0.04
620_POT	42.00			1.00	1.00
620_POT	82.00	1.00	1.00		
620_Tender_HAL	4.50			0.73	0.73
620_Tender_POT	40.00			1.00	1.00
620_Tender_TRW	13.50			1.00	1.00
620_TRW	770.00			1.00	1.00
620_TRW	783.50	1.00	1.00		
630_HAL	1048.50				1.00
630_HAL	1051.00		1.00		
630_HAL	1052.50			1.00	
630_HAL	1055.00	1.00			
630_Partial_CP_HAL	4.00		0.14		0.14
630_POT	291.00			1.00	1.00
630_POT	338.50	1.00	1.00		
630_Tender_HAL	2.50			0.49	0.49
630_Tender_POT	47.50			1.00	1.00
630_TRW	872.50	1.00	1.00	1.00	1.00
640_HAL	201.83		1.00		1.00
640_HAL	206.83	1.00		1.00	
640_Partial_CP_HAL	5.00		0.18		0.18
640_TRW	2.00	0.45	0.45	0.42	0.42
649_HAL	105.50		0.97		0.98
649_HAL	109.50	0.98		0.98	
649_Partial_CP_HAL	4.00		0.14		0.14
650_HAL	506.33				1.00
650_HAL	507.33		1.00		
650_HAL	508.33			1.00	
650_HAL	509.33	1.00			
650_Partial_CP_HAL	2.00		0.07		0.07
650_Tender_HAL	1.00			0.20	0.20
659_HAL	268.50			1.00	1.00
659_HAL	270.50	1.00	1.00		
659_Tender_HAL	2.00			0.38	0.38

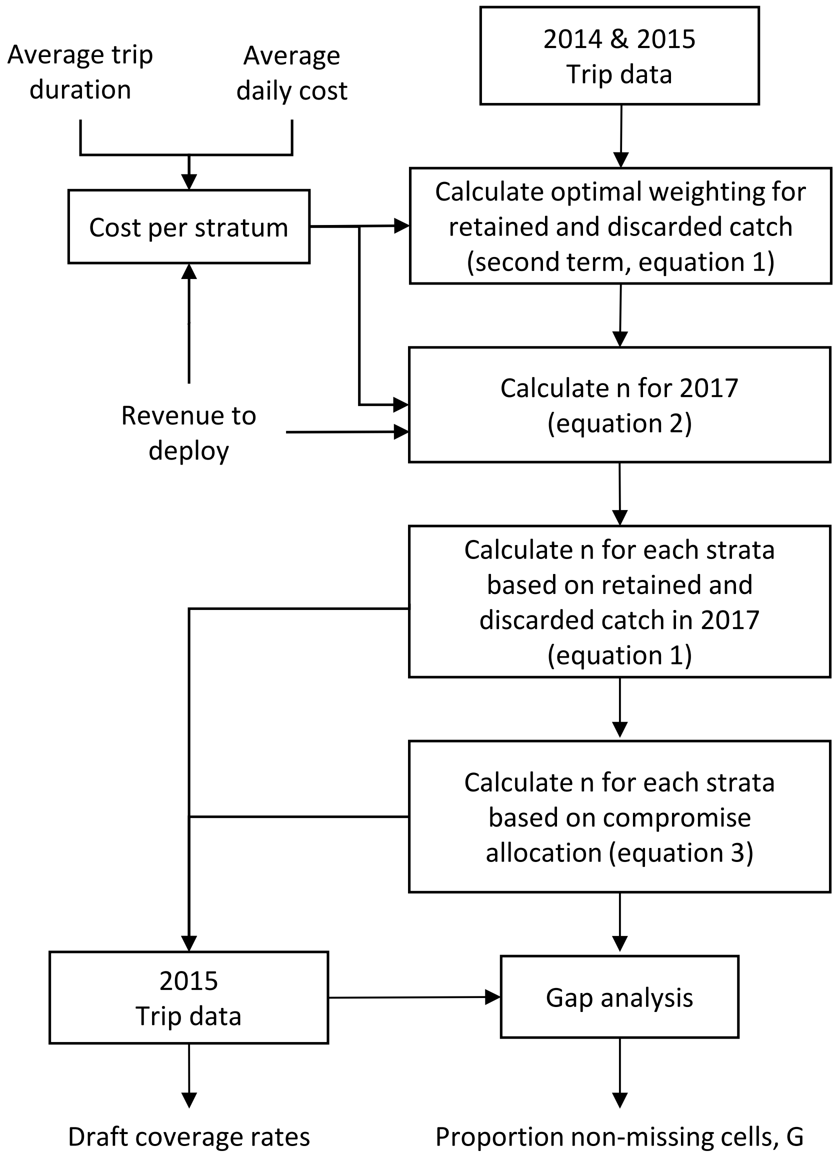

Figure 1 Flow chart depicting methods used in this analysis for each stratification scheme under consideration for the 2017 ADP.

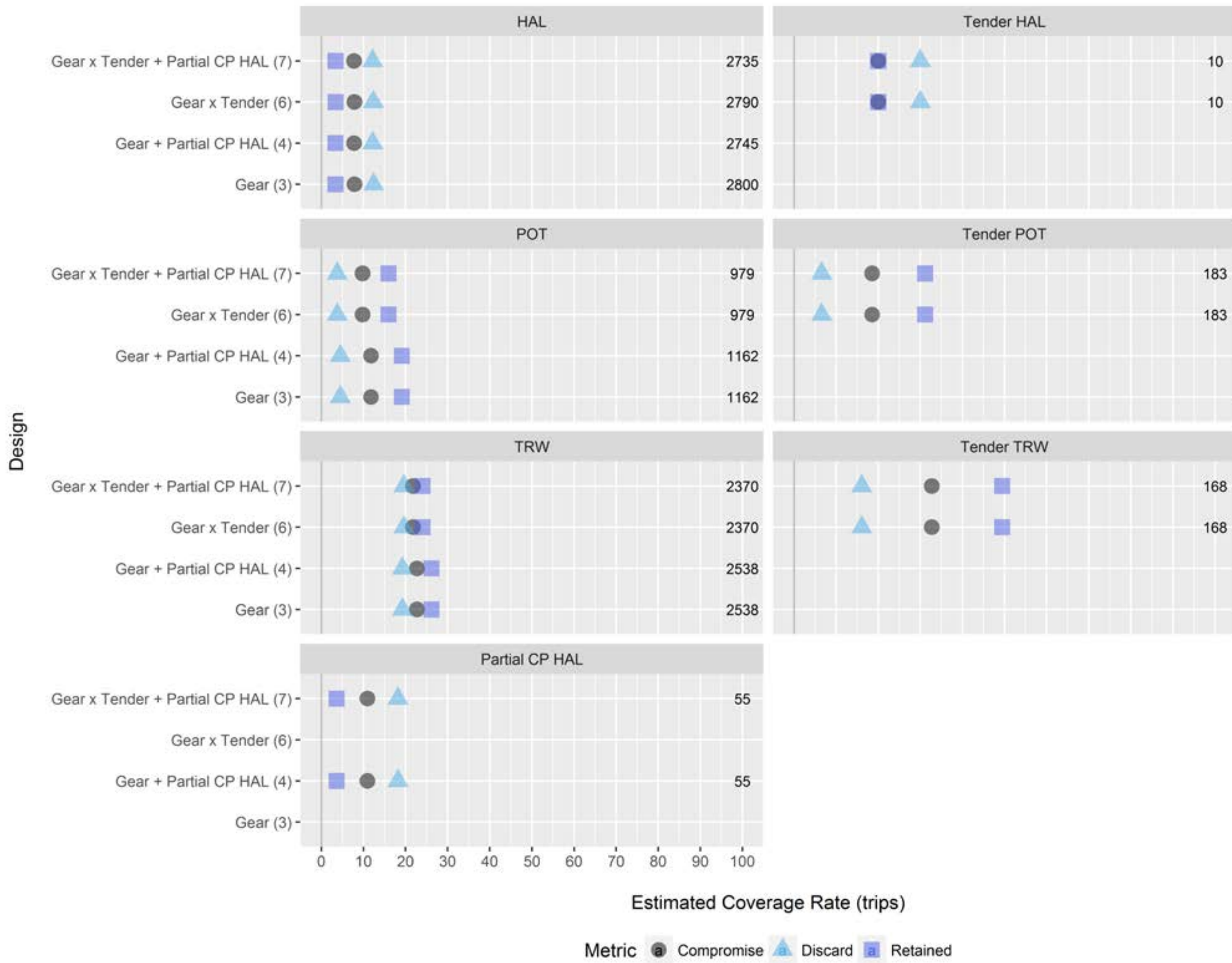

Figure 2 Comparison of preliminary draft coverage rates resulting from four stratification schemes and discarded, retained, and compromise optimal sample allocations. Vertical bars denote zero and 100 percent values. Values at the far right of each panel depict the number of trips in a stratum.

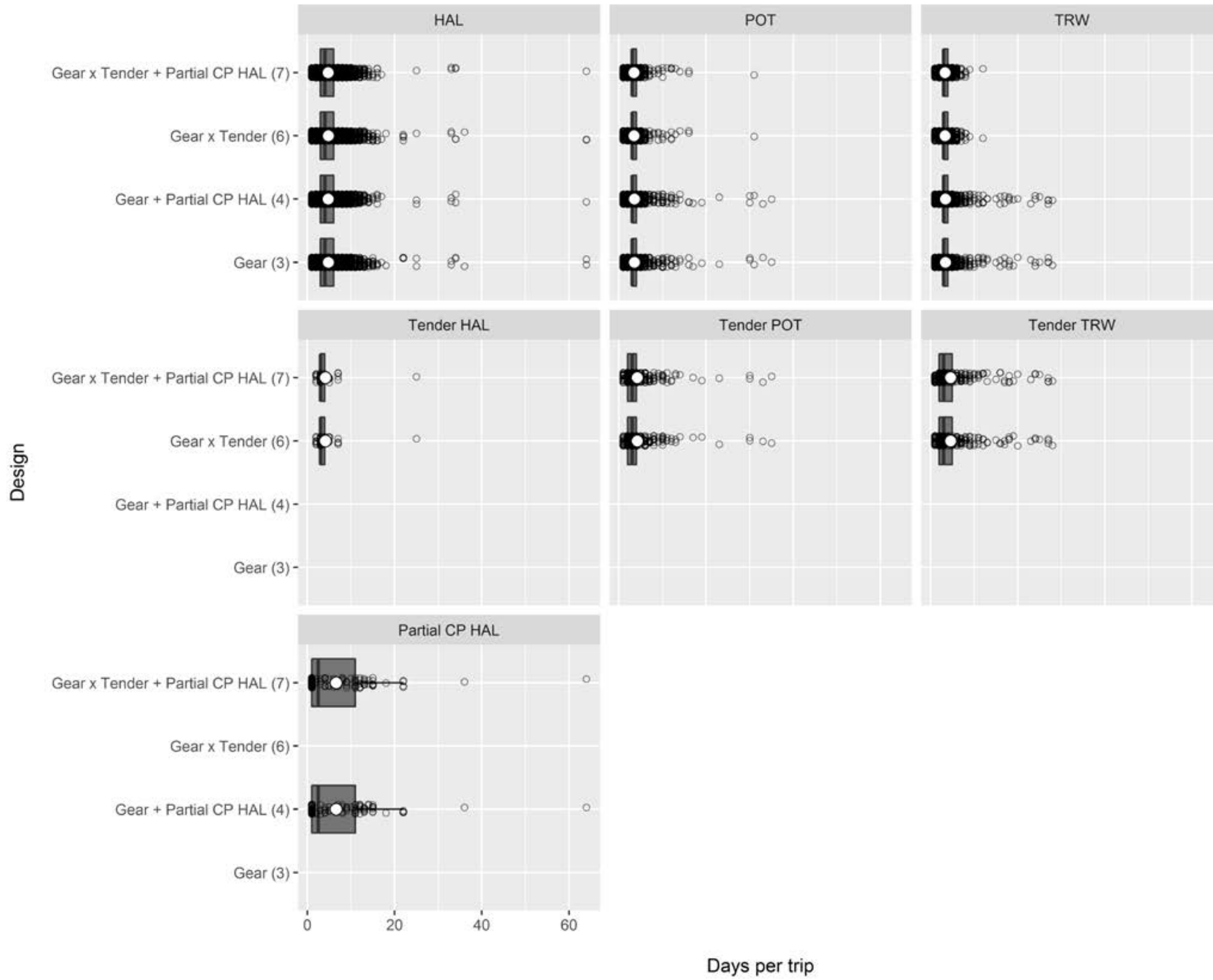

Figure 3 Distribution of trip duration in days for each stratum in four stratification schemes. Mean trip durations are denoted by white circles while shaded boxes denote the 25th, 50th, and 75th percentiles. Individual trip durations are denoted as open circles.

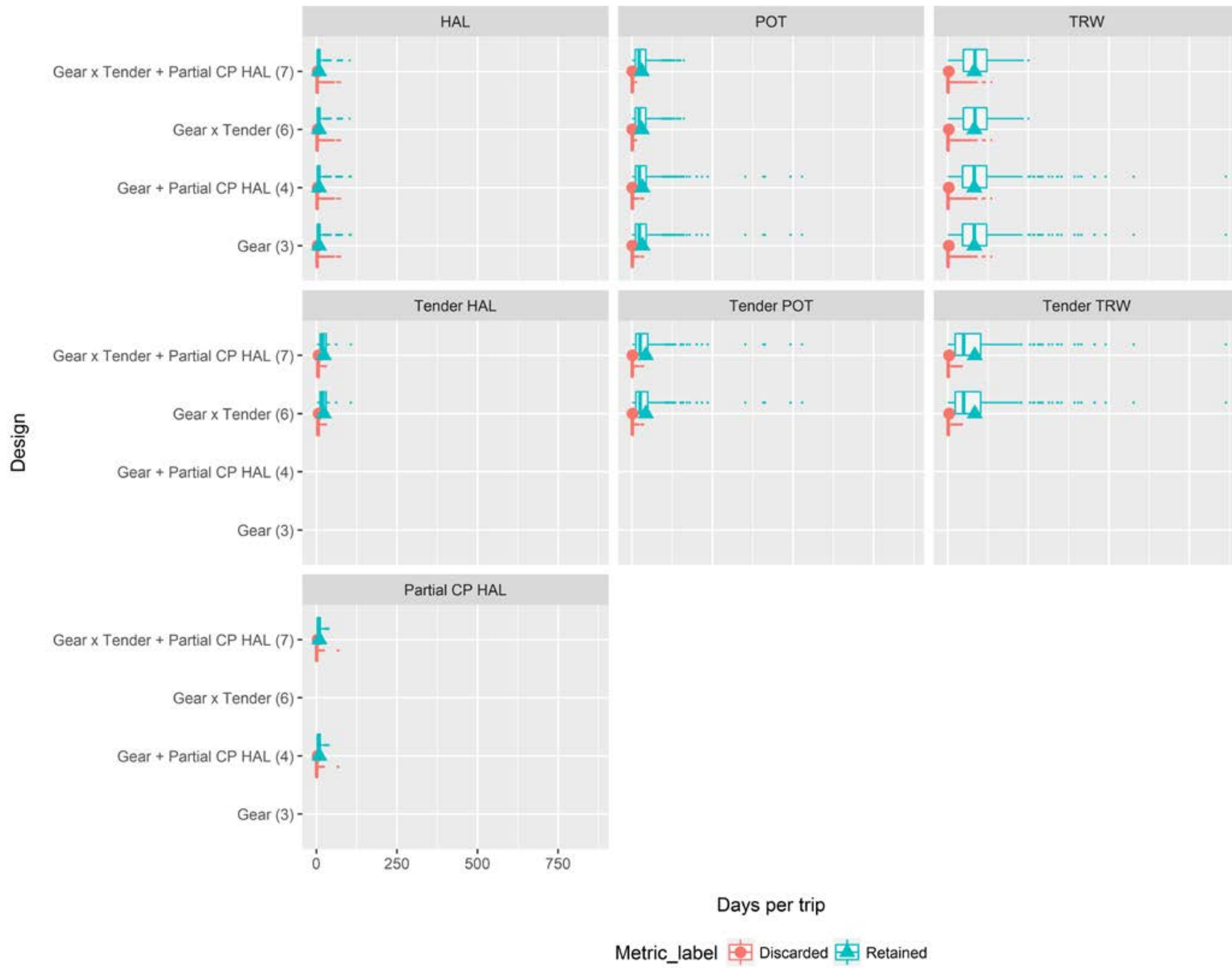

Figure 4 Distribution of catches of total discarded and total retained groundfish for each stratum in four stratification schemes. Mean trip catches are denoted by filled circles or triangles while boxes denote the 25th, 50th, and 75th percentiles. Trip catches outside of the 25th and 75th percentiles are shown as small dots.

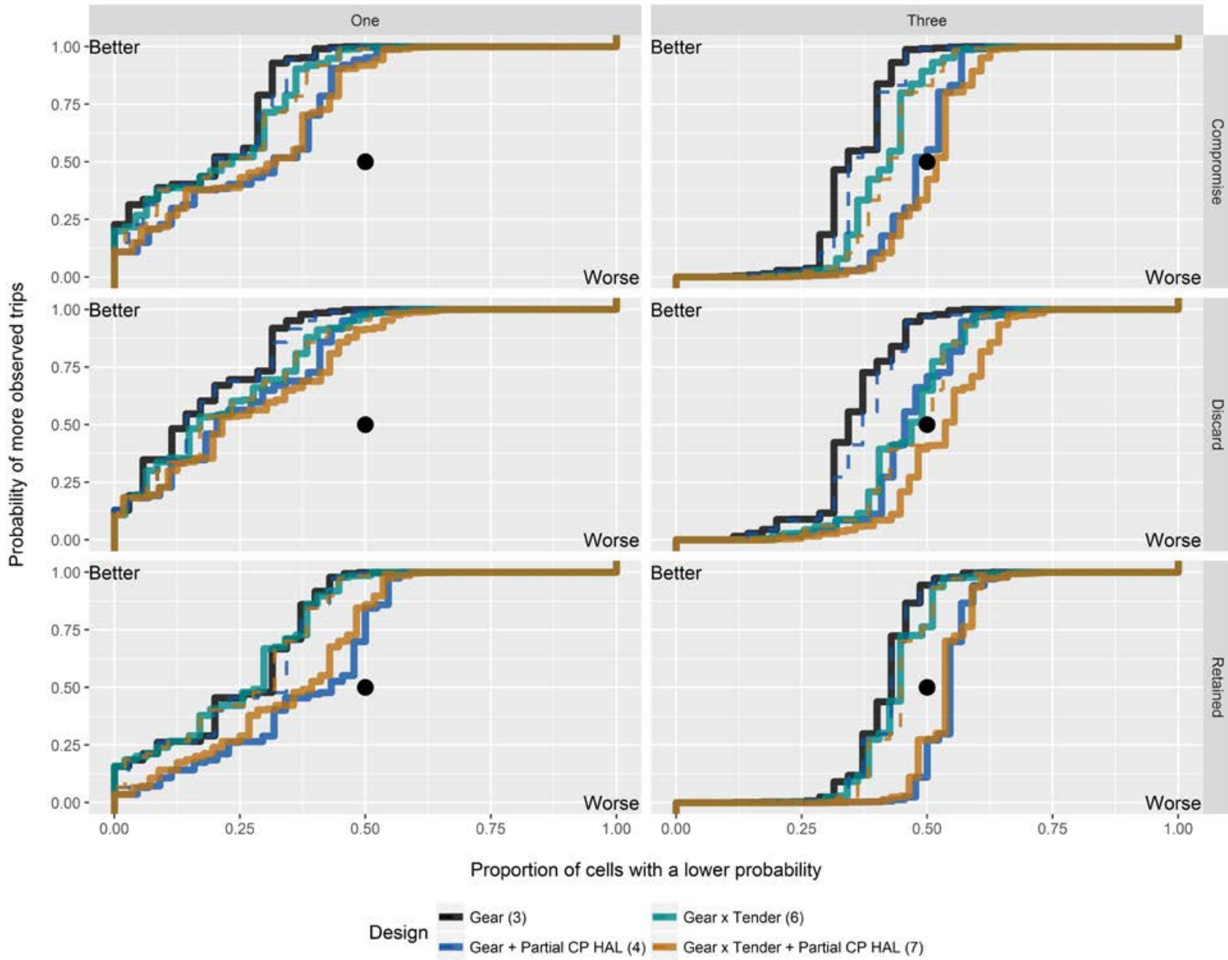

Figure 5 Empirical cumulative distribution curves for the probability of obtaining at least one (left column) and three (right column) trips in a domain defined by NMFS Area and stratum from four stratification schemes and allocations based on retained, discarded, and both of these metrics (=compromise, depicted as rows). Better performing stratification schemes are those that reach a value of 1 furthest to the left of the plot. Relatively poor performance is caused by the Partial CP HAL stratum- dashed lines denote when this stratum's fishing is removed.

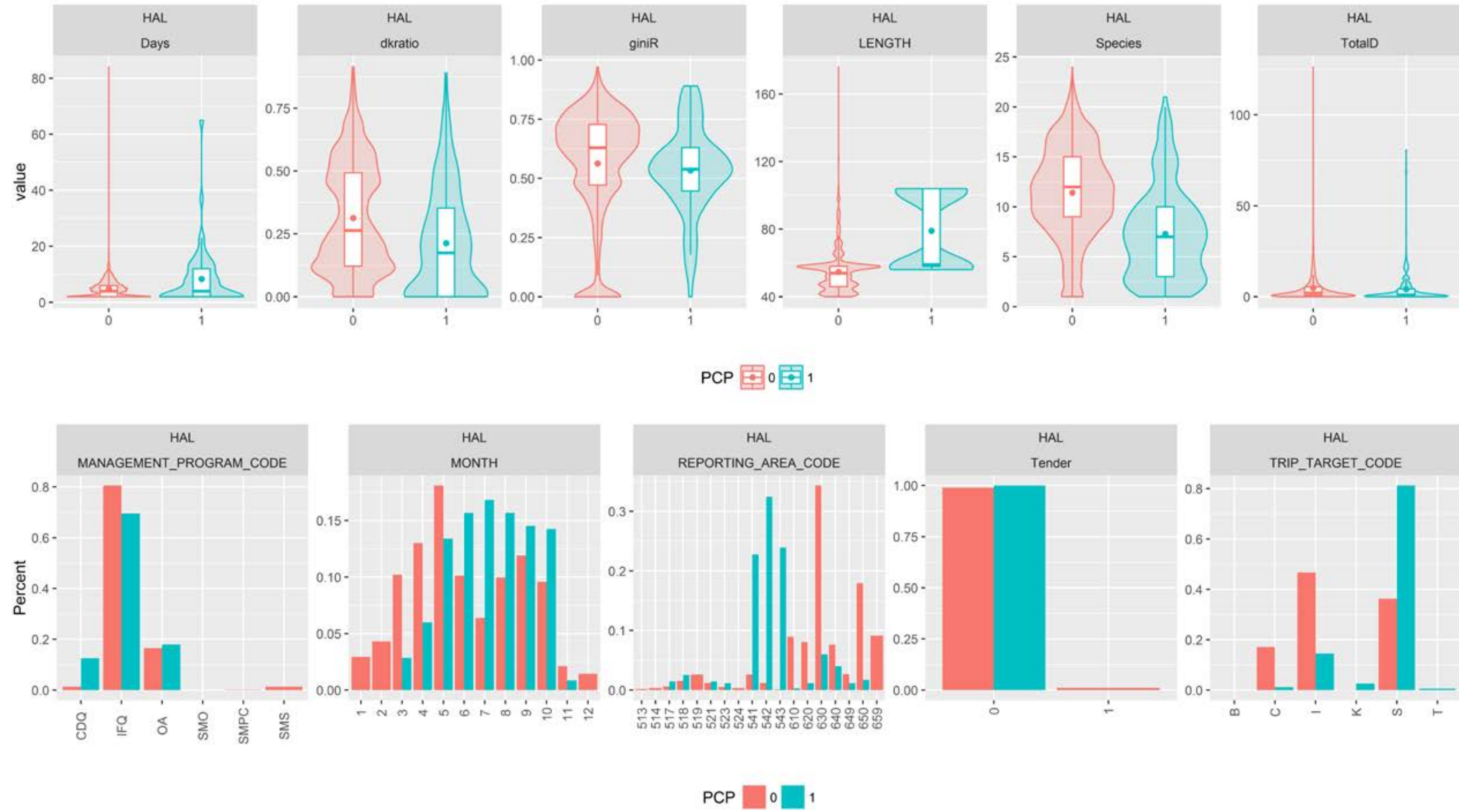

Figure 6 Comparisons between the trip catch metrics (top panels) and the fishing factors (bottom panels) of partial CP HAL vessels (PCP = 1) and non-partial CP vessels that fished with hook and line (note: 2 CP vessels also fished with pot gear, so their data is considered confidential and not included in this analysis). HAL = hook and line; Days = Days fished in a trip; dkratio = ratio between discarded weight and total weight; giniR = Gini index on retained catch measured over retained species (a value of 1 is perfect equality while a value of zero is perfect inequality); LENGTH = vessel length overall; Species = number of species in the total catch; TotalD = Total weight of discarded catch; Management Program Codes: CDQ = Community Development Quota, IFQ = Individual Fishing Quota, OA = Open Access, SMO = State Managed Other, SMPC = State Managed Pacific Cod, SMS = State Managed Sablefish; Month = calendar month where 1 = January; Tender = did the trip tender (= 1) or not (=0); Trip Target Codes: C = Pacific cod, I = Halibut, K = Rockfish, S = Sablefish, T = Turbot.

Appendix C – Summary of Electronic Monitoring (EM) Pool for 2017

The North Pacific Fishery Management Council (Council) has established an intention to integrate electronic monitoring (EM) tools into the Observer Program for the fixed gear groundfish and halibut fisheries. The Council's intent is to develop EM to collect data to be used in catch estimation for this fleet. As part of this process, an EM pre-implementation plan is being developed and refined through a Council committee, the fixed gear EM Workgroup (EMWG). The EMWG provides a forum for all stakeholders, including the commercial fishing industry, agencies, and EM service providers, to cooperatively and collaboratively design, test, and develop EM systems, consistent with the Council goal to integrate EM into the Observer Program.

The EMWG has developed a draft 2017 EM pre-implementation plan, which the Council is scheduled to review the at its October meeting when this draft ADP is presented. This appendix summarizes some elements of the draft EM pre-implementation plan that affect the draft ADP.

More information on the EMWG and the draft EM pre-implementation plan is available on the Council's website: http://www.npfmc.org/observer-program/ .

EM Selection Pool

The EM selection pool in 2017 will include vessels that meet the Council's criteria for EM, and who opt into the EM pool. Not all vessels in the EM selection pool will carry cameras for all of their fishing activity. Vessels that opted into the EM selection pool in 2016 need to "opt-in" again.

Qualifying Criteria & Process

Criteria: The 2017 EM selection pool is open to vessels greater than 40' LOA using hook and line and pot gear. First priority will be given to vessels 40-57.5 feet length overall where carrying a human observer is problematic, due to bunk space or life raft limitations.

Process: In May 2016, NMFS sent letters to all hook and line vessels and pot vessels, regardless of vessel length, requesting them to opt-in to the EM selection pool if they were interesting in carrying EM systems in 2017[3]. NMFS requested that vessels indicate their interest by September 20, 2016. After the October 2016 Council meeting, which will include discussion of the EM Pre-implementation Plan, a second letter specifying the rules governing EM deployment for 2017 will be sent to vessels that have expressed interest. After receiving this second letter and reviewing the requirements for volunteering, vessels may choose to contact NMFS and "opt out" of the EM program, in which case they will be returned to the human observer pool. Vessels agreeing to the EM program rules, and accepted by NMFS, will be placed in the EM selection pool for the duration of the 2017season, with no probability of carrying an observer on any trips for the 2017fishing season.

[3] http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/2017%20EM%20Selection%20Pool%20Opt%20In%20Letter%20final%20sent%20May%2027.pdf

Additions to the EM pool from vessels not meeting the September 20, 2016, deadline may be considered on a case-by-case basis relative to the qualifying criteria and available funding.

EM Pool Size

Hook and Line Vessels: Up to 90 vessels, >40 feet, will be allowed to participate in the longline EM selection pool. First priority in the pool would continue to be given to small longline vessels (40 to 57.5 ft LOA) and vessels that have life raft or bunk space limitations with carrying a human observer, followed by vessels that were registered for the 2016 EM selection pool. Vessels selected for the longline gear EM program will be moved into the zero selection pool for human observers.

Pot Gear Vessels: Up to 30 vessels, >40 feet, will be allowed to participate in the EM pot selection pool, if funding permits. First priority will be given to vessels that have life raft or bunk limitations with carrying a human observer. Vessels selected for the pot gear EM program will be moved into the zero selection pool for human observers.