-Draft-
2020 Annual Deployment Plan for Observers and Electronic Monitoring in the Groundfish and Halibut Fisheries off Alaska

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Contents

Executive Summary

This draft 2020 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 partial observer coverage category (50 CFR 679.51(a)) in the North Pacific during the calendar year 2020.

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; and 3) the allocation of deployment trips among strata.

- **Selection method:** Trip selection will be the sole method of assigning both observers and EM to at-sea fishing events for vessels in the partial observer coverage category in 2020. Trip selection is facilitated through vessels logging their trips into ODDS and being notified by the system if the trip is selected for coverage.

- **Selection pools:**
  - ***EM trip-selection pool****:*
    - Vessels fishing with non-trawl gear may submit a request to NMFS through ODDS before **November 1, 2019,** to opt into or out of the EM selection pool. Any vessel that does not request to participate by this deadline will not be eligible for the 2020 EM selection pool and will be in the observer trip-selection pool for the duration of the year.
    - Based on available funding for EM, the EM selection pool will be composed of up to 168 fixed gear vessels, which would maintain the size of the EM pool from 2019. If additional funds become available, the number of EM boats could increase by Council's recommendation of 30 additional vessels.
    - If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS will prioritize placement in the EM selection pool as follows:
      - vessels that are already equipped with EM systems;
      - vessels which are wired for EM systems but are not yet fully equipped;
      - vessels 40-57.5 ft LOA where carrying an observer is problematic due to bunk space or life raft limitations; and
      - vessels that are unlikely to introduce data gaps based on 3 years of past fishing history.
    - If a vessel operator has repeat problems with EM system reliability or video quality or has failed to comply with the requirements in their Vessel Monitoring Plan, NMFS may disapprove a Vessel Monitoring Plan for the following calendar year and the vessel may be removed from the EM pool the following calendar year.

  - ***No-selection pool*****:** As in all deployment plans, NMFS recommends the no-selection pool continue to be composed of: 1) fixed-gear vessels less than 40 ft LOA and vessels fishing with jig gear, which includes handline, jig, troll, and dinglebar troll gear; 2) vessels voluntarily participating in EM innovation and research.

  - ***Observer trip-selection pool*****:** NMFS recommends 3 sampling strata for the deployment of observers in 2020:
    - Hook-and-line vessels greater than or equal to 40 ft LOA,
    - Pot vessels greater than or equal to 40 ft LOA, and
    - Trawl vessels

Appendix B provides an evaluation of the tendering strata (tender pot and tender trawl) and shows that the implementation of tender strata did not substantially change the expected rates of coverage. Additionally, optimization weightings for tender strata are lower than optimization weightings for non-tendered strata, which means that combining tendered and non-tendered trips into one stratum is unlikely to result in a decline in the number of observed tendered trips. Furthermore, if the trawl EM EFP project is implemented in 2020, then it is likely to substantially decrease the number of tender trips in the observer trip-selection pool. For all of these reasons, NMFS recommends that the observer trip selection strata in 2020 are defined by gear only (Hook-and-Line, Pot, and Trawl) and do not include tender strata.

- ***Trawl Electronic Monitoring Trip-Selection Pool*:** NMFS has received an Exempted Fishing Permit (EFP) application that proposes to evaluate the efficacy of EM on pollock catcher vessels using pelagic trawl gear in the Bering Sea and Gulf of Alaska. If NMFS approves the EFP application and fishing occurs in 2020, then vessels will carry EM systems in lieu of observers. The goal for EM would be compliance monitoring and the accounting for the vessel's catch and bycatch would be done via eLandings reports and shoreside plant observers. The specific requirements for vessels in the trawl EM trip-selection pool would be determined through the permit approval process. In terms of the ADP, a complicating element to the proposed project is that vessels could decide, on a trip-by-trip basis, whether to fish under the EFP or whether to participate in the observer trip-selection pool.

- **Allocation Strategy:** ***NMFS recommends an observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut PSC, and Chinook PSC.*** This allocation strategy provides a 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:** NMFS uses estimates of anticipated fishing effort and available sea-day budgets to determine selection rates for observer deployment in each stratum. As a preliminary budget for this draft ADP, NMFS estimated total expenditures in 2020 of $4.15M that will result in 2,899 observer days. In order to evaluate the relative performance of alternative stratification schemes and allocation strategies, this draft ADP is based on the assumption that fishing in 2020 will be identical to that in 2018. The final ADP will incorporate an updated estimate of anticipated fishing effort. Other factors that will affect deployment rates will be number of fixed-gear EM vessels and the outcome of the trawl EM EFP application. To address these uncertainties, Appendix C evaluates six scenarios and provides estimated coverage rates that vary between scenarios and under different assumptions. For example, if no additional funding becomes available to increase the number of fixed-gear EM boats, the trawl EFP is approved, and 50% of the trips for vessels in the trawl EM EFP are EFP trips (and 50% are observer trip-selection trips), then the *estimated* coverage rates would be: Hook-and-line – 15.7%; Pot – 15.1%; Trawl – 17.5%. However, if 100% of the trips for vessels in the trawl EM EFP are EFP trips (and 0% are observer trip-selection trips), then the *estimated* coverage rates would be: Hook-and-line – 16.1%; Pot – 15.1%; Trawl – 19.5%. **The coverage rates presented in Appendix C are preliminary estimates and will differ from rates determined in the final ADP.** Once these decisions regarding strata definitions and the final budget is known, an updated estimate of anticipated fishing effort and simulation models (following methods outlined in NMFS 2015) will be used to estimate expected coverage rates in the final 2020 ADP.

- Owners of trawl catcher vessel in the partial observer coverage category may request placement in the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI for the upcoming calendar year. Requests may be submitted in the Observer Declare and Deploy System (ODDS) and must be received by **October 15, 2019,** for the 2020 fishing year.

- NMFS will continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin.

    - If the Trawl Electronic Monitoring Exempted Fishing Permit (EFP) is approved for 2020, then the sampling protocol for Chinook salmon for the vessels participating in the EFP will be determined by the Alaska Fisheries Science Center's Fisheries Monitoring and Analysis Division in concert with the EFP applicants. The EFP application outlines the use of EM on both tender and non-tender trips to enable shoreside observers to conduct offload monitoring at shoreside processing facilities.

    - For vessels that are not participating in the EFP and deliver 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 outside of the trawl EFP and delivered to tender vessels and the 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.

Introduction

Purpose and Authority

This draft 2020 Annual Deployment Plan (ADP) describes how the National Marine Fisheries Service (NMFS) intends to assign at-sea and shoreside fishery observers and electronic monitoring to vessels and processing plants engaged in halibut and groundfish 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). Details on the integration of EM deployment into the ADP process are found in the final rule to integrate electronic monitoring (EM) into the North Pacific Observer Program (82 FR 36991).

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.

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 Council's role in the annual deployment plan process is described in the analysis that was developed to support the restructured observer program (NPFMC 2011) and in the preamble to the proposed rule to implement the restructured observer program (77 FR 23326). The preamble to the proposed rule notes that: "NMFS would consult with the Council each year on the deployment plan for the upcoming year. The Council would select a meeting for the annual report consultation that provides sufficient time for Council review and input to NMFS. The Council would likely need to schedule this review for its October meeting. The Council would not formally approve or disapprove the annual report, including the deployment plan, but NMFS would consult with the Council on the annual report to provide an opportunity for Council input. The final deployment plan would be developed per NMFS' discretion to meet data needs for conservation and management. (77 FR 23344 & 23345)."

The annual analysis and evaluation of the data collected by observers and the ADP development is an ongoing process and this ADP follows the process envisioned by the Council and NMFS when the restructured observer program was developed and implemented. NMFS is committed to working with the Council throughout the annual review and deployment cycle to identify improved analytical methods and ensure Council and public input is considered. The schedule for the 2020 ADP is as follows:

- **June 2019:** NMFS presented the 2018 Annual Report (AFSC and AKRO 2018) to the Council and the public. The Annual Report process informs the Council and the public about how well various aspects of the program are working. The review highlights 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. The 2018 Annual Report provided a comprehensive evaluation of Observer Program performance including costs, sampling levels, issues, and potential changes for the 2020 ADP.

- **September 2019:** Based on information and analyses from the 2018 Annual Report and Council recommendations, NMFS prepared and released this draft 2020 ADP containing recommendations for deployment methods in the partial coverage category.

- **September – October 2019:**

    - *Review of the draft ADP*: The Council and its Scientific and Statistical Committee will review this draft 2020 ADP and any associated Plan Team and Fishery Monitoring 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 2020 ADP. NMFS will review and consider these recommendations; however, extensive analysis and large-scale revisions to the draft 2020 ADP are not feasible. This constraint is due to the short time available to finalize the 2020 ADP prior to the December 2019 Council meeting, and practical limitations on planning for deployment (including modifying a federal contract with the observer provider) and associated processes that need to be in place by January 1, 2020.

  - *Requests to participate in EM selection pool*: Vessels in the partial coverage category using fixed gear may request to be in the 2020 EM selection pool using the Observer Declare and Deploy System (ODDS) by November 1, 2019.

- **December 2019:** NMFS will finalize the 2020 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 2020, NMFS will present the 2019 Annual Report that will form the basis for the 2020 ADP.

Annual Report Summary

As described in the previous section, NMFS releases an annual report in June of each year that evaluates observer and EM deployment relative to the sampling plan described in the ADP. The annual report 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. Ganz et al. 2018). NMFS has released six annual reports starting with the 2013 Annual Report (NMFS 2014), which was presented to the Council in June 2014, and most recently the 2018 Annual Report (AFSC and AKRO 2019), which was presented to the Council in June 2019. This draft 2020 ADP builds on NMFS recommendations in the annual reports and input from the Council (Appendix A).

There were 11 at-sea deployment strata evaluated in 2018, including one full coverage stratum, two zero coverage strata, and eight partial coverage strata: five strata defined by gear and tender designation, one regulated EM stratum (where data were used for inseason management), and two pre-implementation EM strata for pot vessels.

Coverage rates met expected values in the full coverage and five of the eight partial coverage strata. Rates were higher than expected in the tender trawl stratum and NMFS is investigating if this is a result of the inherit process in ODDS. Rates were lower than expected in the hook-and-line stratum. This was the first year in which the coverage rates for trip-selected partial coverage strata were lower than expected rates. The EM hook-and-line stratum had realized coverage rates lower than expected, based on the number of trips where video was reviewed or partially reviewed. However, not all 2018 video was reviewed; at the end of 2018, there were 62 hard drives that had not yet been reviewed and NMFS requested PSMFC prioritize review of 2019 instead of finishing the remaining trips from 2018.

NMFS recommended that the observer trip selection strata based on gear (trawl, hook-and- line, and pot) which were implemented in 2016 remain the same for 2020. However, NMFS recommendation that the draft 2020 ADP include a re-examination of tendering strata (tender pot and tender trawl). In 2018, observers were deployed using a 15% baseline plus optimization based on discarded groundfish, Pacific halibut PSC, and Chinook salmon PSC. NMFS recommended continuing using the same method to allocate observer deployment in 2020. This allocation strategy provides a 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.

The sampling design used for dockside monitoring in 2018 remained unchanged from previous years. All vessels participating in the BSAI Pollock fisheries are in the full coverage category and dedicated plant observers monitor all deliveries to account for salmon bycatch. In the GOA, all Pollock trawl catcher vessels are in the partial coverage category and observers deployed on selected trips monitor the delivery at the shoreside processors to obtain counts of salmon caught as bycatch within the trawl Pollock fishery and to obtain tissue samples to enable stock of origin to be determined using genetic techniques. When an observed trawl vessel in the GOA delivers its Pollock catch to a tender vessel instead of a shoreside processor, the observer is unable to monitor the delivery and collect additional tissue samples. In this situation, the trip would be monitored, but there is no offload monitoring. A total of 2,310 Pollock deliveries to shoreside processors were monitored for salmon in 2018. Of those, 2,030 occurred in ports in the Bering Sea and 280 occurred in ports in the GOA. NMFS supported the EM Committee's priority to test and evaluate longer-term solutions for monitoring salmon bycatch in the trawl fisheries, including using EM on tender vessels to enable shoreside data collection from these deliveries. For vessels not participating in the trawl EM Exempted Fishing Permit in 2020, NMFS recommended maintaining the status quo for dockside monitoring.

2020 Deployment Methods

The Observer Program uses a stratified hierarchical sampling design where trips and vessels represent the primary sampling units. Observers 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

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 will be the sole method of assigning both observers and EM to at-sea fishing events in 2020. 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.

In addition to logging each of their trips, vessels in the EM selection pool will also use ODDS to close each trip following the instructions in their Vessel Monitoring Plan (VMP) (Appendix D).

Selection Pools (Stratification Scheme)

Electronic Monitoring (EM) Selection Pool:

Vessels in the partial coverage category using fixed gear may request to be in the 2020 EM selection pool using ODDS.[1] Any vessel in the EM selection pool in 2019 will remain qualified to be in the EM selection pool unless a request is submitted to not be in the EM selection pool for 2020 or NMFS has disapproved the vessel's 2019 VMP. Appendix E provides a step-by-step guide to the EM annual process. All these requests, to be in or out of the EM selection pool for 2020 must be received by November 1, 2019. Any vessel that does not request to participate by this deadline will not be eligible for placement in the 2020 EM selection pool and will be in the partial coverage trip selection pool for observer coverage. If a vessel operator has repeat problems with EM system reliability or video quality or have failed to comply with the requirements in their 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.

The number of vessels in the EM selection pool will be based on the amount of funding. Currently there is expected to be federal funding available for EM selection pool of up to 168 fixed gear vessels. Additional National Fish and Wildlife (NFWF) funds are also being requested by industry and if this request is successful, the number of EM boats could increase to accommodate the Council's recommendation of 30 additional vessels.

If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS will prioritize placement in the EM selection pool as follows:

1) vessels that are already equipped with EM systems;
2) vessels that are wired for EM systems but are not yet fully equipped;
3) vessels 40-57.5 ft LOA where carrying an observer is problematic due to bunk space or life raft limitations;
4) vessels which are unlikely to introduce data gaps based on 3 years of past fishing history.

NMFS will notify vessel owners whether that vessel has been approved or denied for placement in the EM selection pool. Once NMFS notifies a vessel that they are in 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 are required to submit and follow an NMFS-approved Vessel Monitoring Plan (see Appendix D).

EM system installations will be scheduled in the primary ports of Sitka, Homer, Kodiak, and 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 be eligible to participate in the EM selection pool the following year.

Trip-Selection Pools for Observer Deployment:

NMFS recommends that the observer trip-selection strata based on gear (trawl, hook-and- line, and pot), which were implemented in 2016, remain the same for 2020. This follows the Observer Science

[1] 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.

Committee (OSC) and the NPFMC Scientific and Statistical Committee (SSC) recommendation to try to stabilize the sampling design across years.

Appendix B provides an evaluation of the tendering strata (tender pot and tender trawl) and shows that the implementation of tender strata did not substantially change the expected rates of coverage. Additionally, optimization weightings for tender strata are lower than optimization weightings for non-tendered strata, which means that combining tendered and non-tendered trips into one stratum is unlikely to result in a decline in the number of observed tendered trips. Furthermore, if the trawl EM EFP project is implemented in 2020, then it is likely to substantially decrease the number of tender trips in the observer trip-selection pool. For all of these reasons, ***NMFS recommends that the observer trip selection strata in 2020 are defined by gear only (Hook-and-Line, Pot, and Trawl) and do not include tender strata***.

Trawl Electronic Monitoring Trip-Selection Pool:
NMFS has received an Exempted Fishing Permit (EFP) application that proposes to evaluate the efficacy of EM on pollock catcher vessels using pelagic trawl gear in the Bering Sea and Gulf of Alaska[2]. Industry is seeking National Fish and Wildlife (NFWF) funding to support the project that is anticipated to support approximately 49 catcher vessels and 9 tender vessels. If NMFS approves the EFP application and fishing occurs in 2020, then vessels will carry EM systems in lieu of observers. The goal for EM would be compliance monitoring and the accounting for the vessel's catch and bycatch would be done via eLandings reports and shoreside plant observers. The specific requirements for vessels in the trawl EM trip-selection pool would be determined through the permit approval process. In terms of the ADP, a complicating element to the proposed project is that vessels could decide, on a trip-by-trip basis, whether to fish under the EFP or whether to participate in the observer trip-selection pool (see discussion below on estimated deployment rates).

Summary of 2020 Deployment Strata:
NMFS recommends the following deployment strata for vessels in the partial coverage category (50 CFR 679.51(a)) in 2020:

- ***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 2020 fishing season. These vessels are: 1) fixed-gear vessels less than 40 ft LOA[3] and vessels fishing with jig gear, which includes handline, jig, troll, and dinglebar troll gear; 2) vessels voluntarily participating in EM innovation and research.

- ***Electronic monitoring (EM) trip-selection pool:*** Currently there is expected to be federal funding available for EM selection pool of up to 168 fixed gear vessels, which maintains the size of the EM pool from 2019.

- ***Observer Trip-Selection Pool:*** NMFS recommends 3 sampling strata in the trip-selection pool for the deployment of observers:
    - ***Hook-and-line:*** This pool is composed of all vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing hook-and-line gear.
    - ***Pot:*** This pool is composed of all vessels in the partial coverage category that are greater than or equal to 40 ft LOA that are fishing pot gear.

[2] EFP application available at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=eacbd1f7-45b5-4bda-839c-e0dce41c7a4d.pdf&fileName=D1a%20Trawl%20EFP%20Application%20and%20NMFS%20review.pdf

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

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

- ***Trawl EM trip-selection pool:*** If the EFP application is approved and fishing occurs in 2020, this pool would be composed on all vessels fishing under the EFP permit.

Allocation Strategy

Allocation strategy refers to the method of allocating deployment trips among strata. Appendix C provides a comparison of the alternative stratification schemes by evaluating the relative performance of 2 allocation strategies: 1) equal rates afforded, where observer days are allocated equally across all strata; and 2) 15% plus optimization, where observer sea days are first allocated equally up to a threshold coverage rate and the remaining sea-days are allocated using an optimal allocation algorithm that maximizes precision for chosen metrics (such as halibut PSC) for the least cost. The use of equal allocation and threshold base-coverage rate is precautionary with respect to avoiding bias and increasing the chance of getting data across all gear types and areas. The allocation strategy of 15% plus optimization provides a 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.

NMFS continues to recommend an observer deployment allocation strategy of 15% plus optimization based on discarded groundfish, Pacific halibut PSC, and Chinook PSC.

Estimated Deployment Rates

Based on recommendations from the Council, NMFS recommends maintaining 30% selection rate for the EM selection pool for 2020.

NMFS uses estimates of anticipated fishing effort and available sea-day budgets to determine selection rates for observer coverage in each stratum. The final budget for 2020 is not yet certain and as a preliminary budget for this draft ADP, NMFS estimated total expenditures in 2020 of $4.15 M that will result in 2,866 observer days (Appendix C).

In order to evaluate the relative performance of alternative stratification schemes and allocation strategies, the analysis in Appendix C is based on the assumption that fishing in 2020 will be identical to that in 2018. The final ADP will incorporate an updated estimate of anticipated fishing effort. Other factors that will impact deployment rates will be number the of fixed-gear EM vessels and the outcome of the trawl EM EFP application. To address these uncertainties, Appendix C evaluates six scenarios and provides estimated coverage rates that vary between scenarios and under different assumptions. For example, if no additional funding becomes available to increase the number of fixed-gear EM boats, the trawl EM EFP is approved, and 50% of the trips for vessels in the trawl EM EFP are EFP trips (and 50% are observer trip-selection trips), then the *estimated* coverage rates would be: Hook-and-line – 15.7%; Pot – 15.1%; Trawl – 17.5% (Table C- 4). However, if 100% of the trips for vessels in the trawl EM EFP are EFP trips (and 0% are observer trip-selection trips), then the *estimated* coverage rates would be: Hook-and-line – 16.1%; Pot – 15.1%; Trawl – 19.5% (Table C- 4). **The coverage rates presented in Appendix C are preliminary estimates and will differ from rates determined in the final ADP.** Before coverage rates can be estimated in the final ADP, the number of fixed-gear EM participants need to be identified and decisions on the trawl EM EFP need to be completed (e.g. will the permit be approved? How many vessels will participate? What proportion of trips will be in the EFP?).Once these decisions regarding strata definitions and the final budget are known, an updated estimate of anticipated fishing effort and simulation models (following methods outlined in NMFS 2015) will be used to estimate expected coverage rates in the final 2020 ADP.

Chinook Salmon Sampling in the Gulf of Alaska

If the Trawl EM Exempted Fishing Permit (EFP) is approved for 2020, then the sampling protocol for Chinook salmon for the vessels participating in the EFP will be determined by the Alaska Fisheries Science Center's Fisheries Monitoring and Analysis Division in concert with the EFP applicants. The EFP application outlines the use of EM on both tender and non-tender trips to enable shoreside observers to conduct offload monitoring at shoreside processing facilities.

For vessels that do not participate in the EFP and deliver to shoreside processors in the in the GOA pollock fishery, the sampling protocol for Chinook salmon will remain unchanged from previous years. 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 in the GOA pollock fishery (outside of the EFP) 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.

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[4] to NMFS. Eight catcher/processors requested, and NMFS approved, placement in the partial coverage category for the 2020 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[5] prior to October 15, 2019 for the 2020 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://www.fisheries.noaa.gov/resource/document/bsai-trawl-catcher-vessels-cvs-full-coverage.

Observer Declare and Deploy System (ODDS)

For 2020, the user experience in ODDS will not change for a vessel operator unless they are operating in the trawl EM EFP. As in 2019, there will be a selection box to indicate whether the vessel will be delivering to a tender, however the response will not affect selection rates. NMFS will retain the current

[4] The form for small catcher/processors to request to be in partial coverage is available at: https://www.fisheries.noaa.gov/webdam/download/85047638

[5] Instructions for catcher vessels to request to be in full coverage using ODDS are available at: https://www.fisheries.noaa.gov/resource/document/bsai-trawl-catcher-vessel-annual-full-observer-coverage-request

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 randomly selected for a third consecutive observer trip. 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 the ODDS call center (1-855-747-6377). As NMFS has described in the previous three Annual Reports, there are improvements to the programming in ODDS that would allow vessels to change the dates for future observed trips, rather than having the current cancel and inherit process. This modification is a priority for NMFS and the Council, however due to limitations in staff resources, the programming changes to ODDS have not yet been evaluated.

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 and Frequently Asked Questions Observer deployment are available at https://www.fisheries.noaa.gov/alaska/fisheries-observers/north-pacific-observer-vessel-plant-operator-faq
- Frequently asked Questions about EM are available at: https://www.fisheries.noaa.gov/alaska/resources-fishing/frequent-questions-electronic-monitoring-em-small-fixed-gear-vessels
- For technical information and Frequently Asked Questions regarding ODDS go to http://odds.afsc.noaa.gov/ and click the “ODDS FAQ” button.

Observer Program staff are available for outreach meetings upon request by teleconference and/or video conferencing 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 Jennifer Ferdinand at 1-206-526-4076 or Jennifer.Ferdinand@noaa.gov.

References

Alaska Fisheries Science Center (AFSC) and Alaska Regional Office (AKRO). 2019. North Pacific Observer Program 2018 Annual Report. AFSC Processed Rep. 2019-04, 148 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available at: https://www.afsc.noaa.gov/Publications/ProcRpt/PR2019-04.pdf

AFSC and AKRO. 2018. North Pacific Observer Program 2017 Annual Report. AFSC Processed Rep. 2018-02, 136 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available at https://www.afsc.noaa.gov/Publications/ProcRpt/PR2018-02.pdf.

Ganz, P., S. Barbeaux, J. Cahalan, J. Gasper, S. Lowe, R. Webster, and C. Faunce. 2018. Deployment performance review of the 2017 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-379, 77 p. Document available: https://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-379.pdf.

NMFS. 2015. 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. 2014. 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.

NPFMC (North Pacific Fishery Management Council). 2011. Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Proposed Amendment 86 to the Fishery Management Plan for Groundfish of the Bering sea/Aleutian Islands Management Area and Amendment 76 to the Fishery Management Plan for Groundfish of the Gulf of Alaska: Restructuring the Program for Observer Procurement and Deployment in the North Pacific. March 2011. 239 p. plus appendices. Available at http://alaskafisheries.noaa.gov/analyses/observer/amd86_amd76_earirirfa0311.pdf.

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Appendix A. Council motion on the Annual Report and ADP

Council Motion
June 7, 2019
Agenda Item C3: Observer Program Annual Report & FMAC Report

1. The Council supports the NMFS recommendations listed in section 7.1 (pg. 92) of the 2018 Annual Report.

2. Based on input from the Fishery Monitoring Advisory Committee (FMAC), AP, and SSC the Council also recommends the following:

   - If external funds can be leveraged, expand the Electronic Monitoring (EM) selection pool in 2020 by 30 vessels and include testing of alternative EM systems and data service delivery models.
   - In the 2019 Annual Report (to be presented in June, 2020), the Council recommends that NMFS:
     - Continue to refine the cost metrics and funding information presented in Chapter 2 to better characterize costs and allow comparisons between observer and EM costs in the full and partial coverage categories.
     - Continue to include an evaluation of observer effects in pelagic and non-pelagic trawl within the trawl stratum.
     - Incorporate the analysis of observer statement incident rates (presented in Appendix D) in future reports.
   - NMFS work with the FMAC and industry prior to implementing potential future changes to the Observer Declare and Deploy System (ODDS).

3. Regarding the Observer Analytical Tasks, the Council supports the FMAC's recommendations to:

   - Remove the task "Observer Disembark Location" and take no further action on this item.
   - Prioritize the project to assess how biological information currently collected by observers is used in stock assessment.
   - Initiate a discussion paper to scope a shoreside sampling program, in conjunction with some minimal level of at-sea observer coverage, to complement Fixed Gear EM.

Appendix B. Evaluating the Utility of Tender Strata

Introduction

The North Pacific Observer Program (Observer Program) has undergone multiple changes since its restructure in 2013. One aspect of observer deployment that has changed in every year since restructure has been the way in which similar fishing trips are grouped prior to the deployment of observers into the partial coverage fleet (AFSC and AKRO 2019). This grouping of like trips is referred to as stratification, and the purpose of stratification from a management perspective is to give managers the ability to allocate effort sampling effort differently between different groups. There are also mathematical implications of stratification, which include the ability to reduce the variance of measurements. The two perspectives of stratification interact in that managers decide which measurements are most important to reduce variance for. The North Pacific Fisheries Management Council (NPFMC), with input from the Observer Program, currently consider total discards, Chinook salmon (*Oncorhynchus tshawytscha*) prohibited species catch (PSC), and Pacific halibut (*Hippoglossus stenolepis*) PSC to be the measurements of importance when it comes to allocating observer sampling effort (and thereby reducing variance).

In the 2015 Annual Report, the National Marine Fisheries Service (NMFS) showed that tendered trips differ from non-tender trips when it comes to the six metrics (the number of NMFS areas fished, days fished, vessel length, species landed, proportion of the catch that is comprised of the predominant species, and landed catch) that are also used to test for an observer effect (NMFS 2016a, pg. 45-46). These differences were the basis for the NMFS recommendation (NMFS 2016a, pg. 52, 97-98) that the Draft 2017 Annual Deployment Plan (NMFS 2016b) evaluate a stratification design that separates tendered trips from non-tendered trips. In comparing stratification designs that separated trips by gear type alone, by gear type and tendering status, or by gear type and partial coverage catcher-processor (partial CP) status, the NMFS found that stratifying by gear alone produced the fewest spatial gaps in coverage (NMFS 2016b). That result was unsurprising, given that larger strata will reduce spatial gaps as long as trips are not heavily grouped in one area. However, the NMFS ultimately recommended that the gear and tender stratification design be used. This recommendation was made in an attempt to give managers more agency in deploying observers specifically to tender vessels and in recognition that the gear and tender stratification design outperformed the gear and partial CP stratification design (NMFS 2016b).

Although stratifying by tender status gives managers more of an ability to control their coverage rates in theory, multiple challenges have been encountered since tender strata implementation that raise the question of whether this ability exists in practice (AFSC and AKRO 2019). Additionally, stratification might not be the best tool to address the differences between tendered and non-tendered trips. Post-stratification, which divides fishing activity *after* deployment, is a means of ensuring that observed catch from one type of fishing activity is not applied inappropriately to unobserved catch of a different type of fishing activity. The purpose of this analysis is to evaluate 1) whether tendered catch differs from non-tendered catch in ways that are best addressed with stratification and 2) whether the agency has been able to observe tendered trips at intended rates before and after tender strata were implemented.

Methods

The equations used to optimize observer coverage above the 15% minimum baseline come from Cochran (1977) and can be found in Appendix C of this report. These equations place more observer coverage in strata that have more variable discards, Chinook, and halibut PSC or are less expensive to observe. As an example, a stratum with an optimization weighting of 0.1 would receive 10% of the sampling budget that remains after accounting for the cost of meeting any minimum baseline.

The 2015 Annual Report used a permutation test in order to identify differences between tendered and non-tendered trips (NMFS 2016a). This test takes two groups (such as tendered and non-tendered trips) and tests for differences between them by taking an existing metric of interest (such as landed catch), recording the difference between the average values of this metric for each group, randomizing the group label associated with each measurement of this metric, recording how different the original difference is when compared to the randomized difference, and then repeating this process many times in order to determine just how rare the original observed difference would be if the groups were truly the same (random group labels). This test has been used in several annual reports in order to determine whether observer effects are present in the fishery (NMFS 2015, NMFS 2016a, AFSC and AKRO 2017, AFSC and AKRO 2018, AFSC and AKRO 2019) and to test for differences between tendered and non-tendered trips (NMFS 2015, NMFS 2016a, AFSC and AKRO 2017).

In order to evaluate whether or not observers were deployed onto tender trips at the expected rate, we use either the hypergeometric or the binomial distribution. Which distribution is used for a given test depends on whether or not trips were stratified by tender status in that year. In 2015 and 2016, prior to tender strata being implemented, we use the hypergeometric distribution to test whether tender trips within the broader strata were observed at the expected rate. This is the purpose of the hypergeometric distribution, to determine the probability of drawing (observing) a number of units (trips) with a certain characteristic (delivered to a tender) given a known number of trips, a known number of tendered trips, and a known sample size. The hypergeometric distribution was replaced with the binomial distribution for the years 2017 and 2018 when observers were deployed within tender-specific strata. The binomial distribution evaluates the probability of "success" in situations where there are only two potential outcomes, such as observing a trip or not.

Results

Does tendered catch differ from non-tendered catch in ways that are best addressed with stratification?

As mentioned above, tendered trips differ from non-tendered trips in the metrics that are also used to test for observer effects (NMFS 2016a, pg. 45-46). Permutation tests showed that tendered trips in the POT stratum were 37.7% longer in duration, occurred on vessels 9.5% shorter in length, caught 22.8% more species, and landed 43.9% more catch per trip than non-tendered trips in the same stratum (NMFS 2016a, Table 3-10). Tendered trips in the TRW stratum occurred in 9.2% fewer NMFS Areas, were 52.6% longer in duration, occurred on vessels 30% shorter in length, landed 12.9% fewer species, and had catch that was comprised 5.1% more of the predominant species (NMFS 2016a, Table 3-10).

However, the six metrics used in the permutation tests differ from the metrics by which observer sampling effort is optimized beyond any minimum baseline. Optimization metrics have changed more than once since restructure, but in recent years have focused on discards and certain PSC species (Table B- 1). Optimization metrics are broken down in Table 2 by the elements that affect their influence on weighting: variance and trip duration, the latter of which is a proxy for cost. The trip duration used in optimization is the average for the entire stratum and therefore doesn't change between optimization metrics (Table B- 2). The largest relative differences in variance (σ^2) between non-tendered strata (POT, TRW) and their tender equivalent (TenP, TenTR) are for pot groundfish discards (σ^2_{POT} = 1.00, σ^2_{TenP} = 14.20), trawl Chinook PSC (σ^2_{TRW} = 196.40, σ^2_{TenTR} = 1582.40), and trawl groundfish discards (σ^2_{TRW} = 71.07, σ^2_{TenTR} = 27.09; Table 2). In calculating optimization weights, the high variances in tendered pot TenP groundfish discards and TenTR Chinook PSC are counteracted by the longer tender trip durations (higher cost) and the fact that the tender variances for the other two metrics are either lower than or approximately equal to the non-tender variances within each gear type (Table B- 2). These competing forces within the blended optimization design result in weightings for tender strata that are consistently lower than weightings for non-tendered strata (Table B- 1).

Has the agency been able to observe tendered trips at intended rates before and after tender strata were implemented?

During the four years between 2015 and 2018, tender strata were implemented only in the latter two years. Tender trips that occurred in 2015 and 2016 therefore occurred within the vessel length-based (2015) or gear-based (2016) strata. In the past four years, one of eight stratum/year combinations that contained tendered trips had tendered trips observed at a rate lower than expected given the deployment rate (Table B- 3). This occurred in 2015 for the trip-selection (*T*) stratum of vessels that included 1) all catcher vessels fishing trawl gear, 2) catcher vessels fishing hook-and-line or pot gear that are also greater than or equal to 57.5 ft. LOA, and 3) catcher-processor vessels exempted from full coverage requirements (NMFS 2014). In all other stratum/year combinations, the number of observer tendered trips was either equal to or above the minimum number expected (Table B- 3).

Although these results suggest that the NMFS has not had difficulty observing tendered trips at expected rates both before and after implementing tender strata, there is considerable evidence that the NMFS has difficulty deploying to tender strata as expected. Since the implementation of tender strata in 2017, incorrect tender status has been the ODDS issue most reported to the Office of Law Enforcement (AFSC and AKRO 2019, Appendix Figure D-7). This suggests that there are instances when a vessel logs a tender trip but delivers shoreside or vice-versa. If this is the case, it would mean that there are tender strata in theory but not in practice.

Discussion

The fact that optimization weightings for tender strata are lower than optimization weightings for non-tendered strata suggest that combining tendered and non-tendered trips into one stratum would not result in a decline in the number of observed tendered trips. Given the few number of tendered trips in comparison to non-tendered trips, combining the two strata together is also unlikely to substantially impact the selection rates for non-tendered trawl trips. Furthermore, results suggests that the implementation of tender strata did not substantially impact the ability of the NMFS to observe tendered trips at or above minimum expected rates.

It is important to note that grouping tendered and non-tendered trips as one stratum does not require tendered catch to be applied to non-tendered catch or vice-versa. The process of post-stratification separates catch from different fishing activities that occur within strata (Cahalan et al. 2014). The post-stratification process is already employed to separate catch in pelagic trawl fisheries from catch in non-pelagic trawl fisheries and can also be used to separate tendered catch from non-tendered catch. Additionally, coverage of tendered trips can be evaluated in Annual Reports regardless of whether they are strata or post-strata. Such an evaluation of subgroups has already been done for pelagic and non-pelagic trawl (AFSC and AKRO 2019).

It is for the reasons above that the NMFS decided that the best stratification design to evaluate for the 2020 ADP was one that did not include separate strata for tendered trips. Evaluating only one stratification design allowed for more focus to be given to the EM scenarios being proposed. The decision over whether to post-stratify by tender status can be made separate from the ADP since it does not involve the same logistical considerations that deployment does.

References

AFSC (Alaska Fisheries Science Center) and AKRO (Alaska Regional Office). 2019. North Pacific Observer Program 2018 Annual Report. AFSC Processed Rep. 2019-04, 148 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available online at: https://www.fisheries.noaa.gov/resource/document/north-pacific-observer-program-2018-annual-report.

AFSC and AKRO. 2018. North Pacific Observer Program 2017 Annual Report. AFSC Processed Rep. 2018-02, 136 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available online at: https://www.fisheries.noaa.gov/resource/document/north-pacific-observer-program-2017-annual-report.

AFSC and AKRO. 2017. North Pacific Observer Program 2016 Annual Report. AFSC Processed Rep. 2017-07, 143 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available online at: https://www.fisheries.noaa.gov/resource/document/north-pacific-observer-program-2016-annual-report.

Cahalan, J., J. Mondragon, and J. Gasper. 2014. Catch Sampling and Estimation in the Federal Groundfish Fisheries off Alaska: 2015 Edition. NOAA Tech. Memo. NMFS-AFSC-286, 46 p. Available online at: http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM- AFSC-286.pdf.

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

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

NMFS. 2016b. Draft 2017 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 online at: https://www.fisheries.noaa.gov/resource/document/draft-2017-annual-deployment-plan-observers-groundfish-and-halibut-fisheries.

NMFS. 2015. North Pacific Groundfish and Halibut Observer Program 2014 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at: https://www.fisheries.noaa.gov/resource/document/north-pacific-groundfish-and-halibut-observer-program-2014-annual-report.

NMFS. 2014. Draft 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 online at: https://www.fisheries.noaa.gov/resource/document/draft-2015-annual-deployment-plan-observers-groundfish-and-halibut-fisheries.

Table B- 1. Optimization rates and resulting deployment rates for pot and trawl tender strata between 2017 and 2019. Hook-and-line strata are excluded because the tendered and non-tendered hook-and-line strata were recombined in 2019.

Strata	**Weight**	**Rate**
2017: Fully optimized on groundfish discards		
POT	0.04	3.88
TenP	0.01	3.92
TRW	0.55	17.57
TenTR	0.03	14.29
2018: 15% + optimized on groundfish discards, Chinook PSC, and halibut PSC		
POT	0.02	16.21
TenP	0.00	17.29
TRW	0.78	20.18
TenTR	0.01	16.67
2019: 15% + optimized on groundfish discards, Chinook PSC, and halibut PSC		
POT	0.01	15.43
TenP	0.00	16.11
TRW	0.70	23.70
TenTR	0.01	27.12

Table B- 2. The variance of optimization metrics and average trip length of strata within the pot and trawl gear types. Average trip length is a proxy for the cost of observing a trip. Equations from Cochran (1977) optimize based on variance and cost.

Strata	Variance	Average trip length (days)
Discard		
TRW	71.07	3
TenTR	27.09	5
POT	1.00	4
TenP	14.20	8
Chinook PSC		
TRW	196.40	3
TenTR	1582.40	5
POT	0.00	4
TenP	0.00	8
Halibut PSC		
TRW	3.36	3
TenTR	2.38	5
POT	0.02	4
TenP	0.03	8

Table B- 3. The number of trips (N), observed trips (n), tender trips (N_{Tender}), observed tender trips (n_{Tender}), and resulting coverage levels for tender trips before and after the implementation of tender strata in 2017.

Strata	N	n	N_{Tender}	n_{Tender}	Selection rate	Observed tender trips: lower 95% confidence limit	Observed tender trips: upper 95% confidence limit	Coverage above the minimum level expected?
2015								
T	3501	832	306	44	24.00	62	85	No
t	178	31	59	15	12.00	4	10	Yes
2016								
POT	1261	185	132	14	15.24	14	27	Yes
TRW	2738	767	272	122	28.31	65	89	Yes
2017: Tender strata implemented								
TenP	75	4	75	4	3.92	1	6	Yes
TenTR	69	13	69	13	14.29	5	15	Yes
2018: Tender strata implemented								
TenP	31	9	31	9	17.39	2	9	Yes
TenTR	40	14	40	14	16.67	3	11	Yes

Appendix C. Comparison of alternative sampling designs for 2020

Introduction

The North Pacific Observer Program uses a hierarchical sampling design with randomization at all levels toward the goal of achieving 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 deployment and improve the sampling design. In the Draft 2019 ADP, NMFS presented three alternative deployment designs for observers (NMFS 2018a). The adopted design in the Final 2019 ADP allocates observed trips among five strata defined by gear and tendering activity according to an optimized allocation resulting from the interactions of stratum size and variance from a combination of discarded groundfish, Pacific halibut Prohibited Species Catch (PSC), and Chinook salmon PSC (NMFS 2018b). The coverage rate for the fixed-gear electronic monitoring (EM) stratum was kept equal to the coverage rate for this stratum in previous years and was determined separately from the optimization routine used on the five observer strata (NMFS 2018b).

The most recent Annual Report (AFSC and AKRO 2019) and subsequent Council motion (June 7, 2019) recommended that the Draft 2020 ADP 1) continue to stratify by gear type, 2) reexamine whether to continue to stratify by tender, 3) maintain a single trawl stratum (as opposed to placing non-pelagic trawl and pelagic trawl into separate strata), 4) continue to allocate observer deployment using a 15% minimum baseline with additional days optimized on discarded groundfish, Pacific halibut PSC, and Chinook halibut PSC, and 5) expand the fixed-gear EM trip-selection pool by 30 vessels if external funds can be leveraged. In response to these requests, the Draft 2020 ADP 1) continues to stratify by gear type, 2) evaluates the utility of tender strata (Appendix B), 3) maintains a single trawl stratum, 4) includes the 15% plus optimization design in the comparison of alternative sampling designs (Appendix C), and 5) evaluates scenarios in which the fixed-gear EM trip-selection pool is expanded by 30 vessels (Appendix C).

Methods

Data Preparation: Defining the partial coverage fleet

The partial coverage fleet in general consists of the catcher vessel fleet and some catcher processors 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 2020 that will continue to be excluded from observer coverage include 1) catcher vessels while fishing in state-managed fisheries, 2) catcher vessels fishing with jig gear, and 3) 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 2019 will continue to do so in 2020.

A database containing 2016, 2017, and 2018 species-specific catch amounts, dates, locations,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 2020, and finally re-labelled according to the alternative deployment designs (if any) described below.

Uncertainty due to Electronic Monitoring

In 2019 there were 168 vessels included in the EM trip-selection stratum. The Council recommended adding 30 fixed-gear vessels to the EM trip-selection pool if there was sufficient funding (see Appendix A). However, it is unknown which vessels might apply and be accepted into the EM pool. Therefore, 30 vessels were randomly sampled from a list of all fixed-gear vessels that fished within the observer trip-selection pool in 2018 (excluding voluntary partial coverage CPs). This sampling was repeated for a total of 100 iterations. The analysis therefore allows comparisons between scenarios where the number vessels listed within the EM pool remains as-is or is increased by 30 (Table C- 1).

Uncertainty due to Pollock Trawl EFP

NMFS has received an Exempted Fishing Permit (EFP) application for pollock catcher vessels using pelagic trawl gear in the Bering Sea and Gulf of Alaska to evaluate the use of EM in lieu of observers. This EFP would effectively move a considerable number of pelagic trawl trips targeting pollock from the partial coverage observer trip-selection pool and the analysis presented here considers the impacts of the proposed pollock trawl EFP. The EFP would create a new EM trawl stratum within which discards will be monitored by EM systems for compliance and catch accounting (including salmon) will be performed shoreside. Since the proposed EFP would be funding by outside grant sources, it would reduce the total number of trips/days fished within the observer pool and higher deployment rates for the remaining trips may be afforded.

A preliminary list of vessels that are planned to participate within the pollock trawl EFP was used to predict how fishing effort may change. However, the pollock trawl EFP includes a provision where a vessel may opt out of the EFP on a trip-by-trip basis e.g. cases where EM systems stop performing or when non-pelagic gear is planned to be deployed[6]. In order to account for this variability, two sub-scenarios were employed: 1) all trips by vessels listed in the EFP targeting pollock with pelagic gear were assumed to be within the EFP (EM Trawl stratum), and 2) all trips by vessels listed in the EFP targeting pollock with pelagic gear in NMFS Area 610 were assumed to be within the EFP, but trips in NMFS areas 620, 630, and 640 were randomly sampled as in/out of the EFP with a 50% probability. This trip-level sampling was repeated for a total of 100 iterations. The analysis therefore allows comparisons between three scenarios: 1) without a pollock trawl EFP, 2) with the pollock trawl EFP using a 50% trip-selection rate for trips in all NMFS areas excluding 610, and 3) with the pollock trawl EFP using a 100% trip-selection rate (Table C- 1).

Budget Forecasting

This draft ADP sets an annual budget at levels that support a minimum level of coverage (15%) across all strata under the current sampling design. Cost per observer day was estimated as a function of the partial coverage observer contract's costs for guaranteed days and optional days, in addition to the size of the observer budget and cost efficiencies modeled from prior ratios of travel to day costs.

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

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[6] EFP application available at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=eacbd1f7-45b5-4bda-839c-e0dce41c7a4d.pdf&fileName=D1a%20Trawl%20EFP%20Application%20and%20NMFS%20review.pdf

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: 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. In this study only one stratification scheme was considered.

- Gear (3 strata): This stratification divides the partial coverage trips into 3 strata based on gear type only (and not tender status – see Appendix B):
    - Hook and Line ≥ 40' LOA (HAL)
    - Pot ≥ 40' LOA (POT)
    - Trawl (TRW).

Sample Allocation

Sample allocation refers to the allotment of trips afforded to a stratum. Two types of sample allocations were compared for 2019 observer deployment (the full workflow for the methods used in these designs is found in Figure C- 1). These types are:

1. Equal Allocation

This allocation design estimates the equal coverage rate (trips sampled/total trips) across strata that can be afforded with available funding. 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

$$r_h = \frac{F_{2020}}{\sum_{h=1}^{H} c_h N_h}, \qquad (1)$$

where F_{2020} is the estimated funds from the budget forecasting.

2. 15% + Optimized

Unlike equal rates afforded, this sample allocation adopts a "baseline" approach to optimization. First, observer sea days are allocated equally up to a 15% coverage rate (the base-rate, or baseline). Once 15% has been met, an optimal allocation algorithm (described below) is used to allocate remaining resources 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 2017a, NMFS 2015b p. 98), and was adopted by NMFS in the

2018 ADP (NMFS 2017b). This allocation first estimates the number of trips left over in each stratum after 15% coverage has been met using

$$N_{h+} = N_h - (0.15 \times N_h) \qquad (2)$$

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

$$F_{2020+} = \sum_{h=1}^{H} c_h N_{h+}. \qquad (3)$$

The F_{2019}+ and N_h+ is then allocated following the optimized design. Optimal allocation beyond the 15% minimum baseline maximizes precision for the chosen metrics for the least cost. If n_+ is the number of optimized observed trips afforded among all partial coverage fishing trips above 15% minimum coverage in each strata (N_{h+}), and the optimization metric has variance S^2, 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}),

$$n_{h+} \times W_{hopt}, \quad \text{where} \quad W_{hopt} = \frac{\frac{N_{h+}S_h}{\sqrt{c_h}}}{\sum_{h=1}^{H}\left(\frac{N_{h+}S_h}{\sqrt{c_h}}\right)} \quad \textit{Cochran (1977).} \qquad (4)$$

While equation 4 gives the allocation of observed trips among strata, it does not give the total sample size of optimized trips. To obtain this we can rearrange equation 4 as

$$n_+ = \frac{F_{2020+} \sum_{h=1}^{H}\left(\frac{n_{h+}s_h}{\sqrt{c_h}}\right)}{\sum_{h=1}^{H}(N)} \quad \textit{Cochran (1977).} \qquad (5)$$

Cochran (1977) shows that the blended optimal allocation (m_{h+}) is derived from the average number of optimal sample sizes measured across L metrics,

$$m_{h+} = n_+ \times \bar{n}_{h+}, \quad \text{where} \quad \bar{n}_{h+} = \frac{\sum_{l=1}^{L} n_{l,h+}}{L}. \qquad (6)$$

It is worth noting that unless nh+ among all metrics are positively correlated, the resulting compromise allocations may be substantially different from nh+ for any individual target metric. Optimized sample allocations were generated using the variance of discarded groundfish catch, Pacific halibut PSC, and Chinook salmon PSC.

The two types of deployment designs that are presented include:

1. Equal rates afforded (allocations are distributed by fishing effort - all strata get the same coverage rate)
2. 15% + Optimized based on groundfish discards, halibut PSC, and Chinook salmon PSC.

Data from 2016, 2017, and 2018 were combined and treated as a single meta-year for the calculation of optimal allocation weightings (W_{hopt}) in each strata, including trip duration, discarded catch, halibut PSC, and Chinook PSC.

Evaluation of Alternative Designs

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 an analysis different from previous evaluations of observer program deployments (NMFS 2015a, NMFS 2016, NMFS 2017a, NMFS 2018a) that defines domains at finer resolution (i.e. strata, tender status, target, and FMP area) and roughly mimics the Catch Accounting System's (CAS) routines to determine the spatiotemporal resolution of discard estimates for unobserved trips that are provided by pooled observer data. 'Data gaps' are therefore defined as unobserved trips, and the quality of each gap is categorized by the extent of time and space that is required to pool data from observed trips in order to generate a discard estimate. By evaluating the quantity and quality of data gaps, the performance of both allocation designs under the considered scenarios can be compared.

The new analysis has several other notable differences to the previous analysis. CAS uses observer data to generate discard estimates for trips within the no-selection pool as well, so the discard estimation gap analysis described above simultaneously evaluates gap resolution for unobserved trips within the observer pool and no-selection pools. Secondly, the fixed gear EM expansion scenario may affect discard estimation for the EM pool by adding trips. CAS generates discard estimates for fixed gear EM vessels from the data provided by trips selected for monitoring, so the same gap analysis methods that were described for the observer and no-selection pool were applied to the EM pool so that the resolution of estimates in the FN and FY scenarios can be compared (note that this gap analysis is independent of the pollock trawl EFP and the observer pool allocation scheme). Finally, the scenarios and allocation schemes may have an effect on how representative the average weight estimates provided by observed trips are for fixed gear EM vessels. Fixed gear EM systems rely on these average weight estimates in order to calculate catch and discard estimates. One concern of adding additional vessels into the EM pool is that fewer vessels remain in the observer pool to provide average weight estimates and that the remaining observer pool fishing effort may not be as representative (i.e. in time and space) as the fishing effort within the EM pool. Although average weight estimates are not generated in the same way that CAS generates discard estimates, the gap analysis methods described previously can be used evaluate the availability and representativeness of data of observed trips to the fishing effort within the EM pool. Table C- 2 summarizes the three separate gap analyses.

Within each prediction of fishing effort for each scenario, 1000 iterations of ODDS trip selection were simulated for observed trips using the deployment rates provided by both allocation schemes and for fixed gear EM pool trips at the predetermined 30% rate. Within each iteration, all three gap analyses were performed to evaluate the resolution of data that was provided by the selected trips. The methods for evaluating data resolution are described below.

Within each ODDS simulation iteration, fishing effort was split into domains based on strata/gear, tender status, trip target, and FMP area. For example, no-selection pool trips that fished with hook-and-line gear and targeted sablefish within the GOA were grouped in the same domain as observer pool trips with the same gear, target, and FMP area. Note that trips employing jig gear were excluded from the analyses and that although strata within the observer pool were defined by gear type and not tender status, tender status was included in as post-stratum. Additionally, any domains with fewer than 5 trips were excluded from the analyses. Trips selected for monitoring (i.e. by observers or EM systems) were identified as being at the 'COVER' data level, i.e. discard estimates were generated from observer data collected on those trips. A check was then performed within each domain on all unobserved trips to determine if they fished within 15 days of at least one monitored trip that also fished within the same NMFS area – if so, the unmonitored trips were identified as AREA-level gaps (i.e. discard estimates could be generated from borrowing at the smallest spatiotemporal scale possible). Unmonitored trips that could not generate estimates at the AREA-level then went through a second check to determine if they fished within 45 days of at least one monitored trip within the FMP (i.e. domain-wide) – if so, these trips were identified as FMP-level gaps. Any remaining trips that could not generate estimates at the FMP-level were identified at the YTD-level, which implies that estimates were generated using data aggregated at a year-to-date temporal scale. In summary, data gaps, or unobserved trips, were qualified as able to have estimates generated from small (AREA), medium (FMP), or large (YTD) scales of time and space.

Following the gap check routine, the frequency of these categorizations within each domain was used to compute the proportions of trips within each data level. These proportions were then used to calculate an index, hereby called a ‘GAP index’, which represents the overall data resolution of estimates within a domain for each ODDS iteration. The GAP index was calculated with the equation below:

$$GAP_D = (P_{CD} \times 1) + (P_{AD} \times 0.75) + (P_{FD} \times 0.25) + (P_{YD} \times 0) \qquad (7)$$

where GAP_D is the *GAP* index for a domain and P_{CD}, P_{AD}, P_{FD} and P_{YD} are the proportions of trips at each data resolution within the domain. Note that the weightings in the formula above were picked arbitrarily, but were specified in order to give higher values when the monitoring within domains can largely provide AREA-level estimates and penalize indices when FMP or YTD-level estimates have high proportions. GAP indices closer to 1 indicate more trips within the domain were selected for monitoring and/or unmonitored trips were able to have estimates generated at smaller scales of time of space, and also imply that the monitored trips were highly representative of the effort within the domain. GAP indices closer to 0 indicate fewer trips within the domain were selected for monitoring and/or many trips required aggregating data from large scales of time and space. Lower indices may also imply that estimates have higher variability (lower confidence) and that the monitored trips may not be representative of fishing effort within the domain.

By compiling all of the GAP indices on all ODDS iterations for each allocation scheme, scenario, and domain, distributions were built to represent the variability in gap resolution that results from the randomness of ODDS and the scenarios. Two metrics were calculated to summarize these distributions: the median GAP index, hereby called ‘MED’, and the proportion of iterations with GAP indices less than or equal to 0.25, hereby called ‘P25’. MED is a measure of central tendency and represents the midpoint GAP index where half of all ODDS iterations had lesser indices and the remaining half of ODDS iterations had greater GAP indices. This metric can be used to determine if the overall resolution of gaps differs between allocation schemes scenarios. P25 employed the cutoff of 0.25 in order to match the weighting that the FMP-level gaps have in the GAP score equation so that P25 may be interpreted as the likelihood that gap resolution within a domain will on average require FMP-level or YTD-level estimates.

Together, MED and P25 were used to compare the performance of the different allocation schemes under the various scenarios. The MED and P25 metrics of the status quo scenario in which trawl EM is not approved and fixed gear EM is not expanded (TNFN; Table C-1) were compared against all other scenarios to determine whether these metrics improved. Improvements are defined as an *increase* in MED (a measure of data resolution) or a *decrease* in P25 (proportion of trips with low spatiotemporal data resolution).. The magnitude of the differences in metrics relative to the status quo had to be at least 0.01 points different to be considered improved/worsened, and were otherwise labeled as not different. If at least one metric improved without the other worsening, the allocation scheme/scenario/domain was assigned a score of +1. If neither index changed, a score of 0 was given, and if one or both metrics worsened (regardless of whether the other metric improved), a score of -1 was given. The scores for each scenario were summed across allocation schemes so that the total number of domains that improved/worsened could be compared, providing a summary of the allocation schemes/scenarios in which gaps are minimized.

However, for the purpose of assessing the allocation schemes against one another, MED and P25 scores were compared against one status quo: the currently used “15% + optimization” allocation scheme and the “TNFN” scenario. That is, the metrics for the domains within each allocation scheme and scenario combination were all assessed relative to the allocation scheme and fishing scenarios used for deployment in 2019.

Results and Discussion

The total number of observer days available for deployment in the Observer Program is dependent upon the available budget, the anticipated fishing effort and the average cost of an observed day. This analysis uses a total amount of observer days that approximates a minimum coverage level of 15%. The expected partial coverage observer program of this size is expected to be approximately 2,866 days. Using the cost per day translations in the fee analysis, this translated into a calendar budget of approximately $4.15 M. This represents a 7.8% reduction in days observed from the final 2019 ADP (3,109 days; NMFS 2018b).

The ‘equal rates’ allocation apportions afforded samples according to the relative size of the stratum. In comparison, the ‘minimum + optimized’ allocation applies the equal rates allocation for 15% coverage requirements, and then puts additional afforded samples where 1) strata are larger, 2) variance of a chosen metric is larger, and 3) costs are lower (Cochran 1977). The methods used herein cannot only be used to accommodate differential trip duration but also differential costs between observation types (for example observers vs. EM) in future ADPs. Moreover, the comparison of coverage rates using equal allocation and 15% plus optimization elucidates the tradeoff between minimizing gaps in coverage reducing variance in measurements of groundfish discards and PSC.

A focus on resulting coverage rates in the Draft ADP is not as productive as focusing on how those observer days are allocated and the potential for gaps in coverage. This is because estimates of fishing effort and budgets are preliminary during the Draft ADP. Instead of focusing on deployment rates, a focus on observer day allocations and potential gaps ensures that the correct design is chosen for the Final ADP based on the merits of the design and not the expected deployment rates. Nonetheless, due to their continued interest, these values have been provided for equal rates and minimum + optimization allocations in Table C- 3 and Table C- 4 respectively. The greatest rates are obtained in the TYFY / minimum + optimization design and the lowest rates are obtained in the TNFN scenario regardless of sample allocation used.

Greater differences in the coverage rates between strata within a design and between designs would be realized if greater amounts of optimized days were afforded than presented here. One way to imagine how additional days would be optimized in the minimum + optimization allocation designs is to refer to the column W_h in Table C- 4. For each additional trip afforded, those trips would be allocated among stratum by this column. A simplified version of the data in this column would be that in general for each additional optimized dollar, 70-75 cents are allocated to the TRW stratum, 24-29 cents are allocated to the HAL stratum, and a very small proportion is allocated to the POT stratum.

There are several domains that degrade among designs considered here that are worth mentioning (Table C- 5). First, in virtually all designs where either the trawl EFP is approved, fixed gear EM fleet is expanded, or both of these occur, available data from observers to estimate discard rates for tendered trawl trips that target pollock degrade and the risk of having no data for the year increase. Second, designs where the trawl EFP is not approved, but fixed gear EM fleet is expanded degrades discard estimates for hook and line Sablefish trips in the Bering Sea and Aleutian Islands, but these estimates are improved for other scenarios. Third, estimates of discard rates for the tendered pot trips targeting Pacific cod degrade for designs where fixed gear EM fleet is expanded regardless of the status of the trawl EFP.

In addition, the average weight estimates from observers become less representative for use within the EM_POT stratum for designs where the fixed gear fleet is expanded (Table C-6). The distributions of the underlying gap scores that contribute to these results are visualized in Figures C-2 through C-5.

For these reasons**, the authors recommend that the final 2020 ADP not include designs where fixed gear EM fleet is expanded**. No further recommendation regarding the trawl EFP or allocation strategy is forwarded since the choice between equal rates afforded and minimum + optimization is a minor one due to funding availability and the fact that the 15% baseline effectively mitigates any potential egregious gap formations caused by full optimization. However, it is noted that for designs that approve the trawl EFP, equal allocation strategy is the clear winner in terms of gaps (Figure C- 6 and Figure C- 7).

This analysis relies on several key assumptions. First, we assume 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. In addition, current methods do not use cost as a constraint to set coverage rates for EM, although the methods in this analysis fully support doing so. Finally, accurate predictions of which boats will participate in EM next year are made difficult by the fact that the vessel list for this stratum is not known at the time this document is prepared.

Again, it is important that the reader understand that the resulting coverage rates for observer deployment depend upon the amount of fishing effort and the available number of observer days which is dependent upon budget and trip duration. Since this analysis is focused on the *relative* performance of alternative deployment designs, it uses a simplified assumption of future fishing effort-namely that fishing in 2020 will be identical to that in 2018. This assumption is made in anticipation that for the Final 2020 ADP, when a deployment design is selected, a more careful estimate of anticipated fishing effort will be made for 2020, and resulting rates will be adjusted to reflect this new prediction. This effort will build on lessons learned from this exercise last year (Ganz and Faunce, 2019). Finally budget values are always expected to change from draft to final versions of the ADP. Consequently, **the resulting coverage rates presented in this study should only be considered preliminary estimates and <u>will differ</u> from rates determined in the Final ADP.** Once a stratification design for the Final ADP is established in the draft, updated values for expected fishing effort will be generated, and a similar simulated sampling procedure using updated budget values will be used to estimate expected coverage rates following the methods described in previous ADPs (NMFS 2017b, NMFS 2018b).

References

AFSC (Alaska Fisheries Science Center) and AKRO (Alaska Regional Office). 2019. North Pacific Observer Program 2018 Annual Report. AFSC Processed Rep. 2019-04, 148 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115. Available online at: https://www.fisheries.noaa.gov/resource/document/north-pacific-observer-program-2018-annual-report.

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. NMFSAFSC-286, 46 p.

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

Faunce, C., J. Sullivan, S. Barbeaux, J. Cahalan, J. Gasper, S. Lowe, and R. Webster. 2017. Deployment performance review of the 2016 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-358, 75 p. Available online at: https://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-358.pdf.

Ganz, P. and C. Faunce. 2019. An evaluation of methods used to predict commercial fishing effort in Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-395, 19 p. Available online at: https://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-395.pdf.

NMFS (National Marine Fisheries Service). 2018a. *Draft* 2019 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 online at: https://www.fisheries.noaa.gov/resource/document/draft-2019-annual-deployment-plan-observers-groundfish-and-halibut-fisheries.

NMFS. 2018b. 2019 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 online at: https://www.fisheries.noaa.gov/resource/document/2019-annual-deployment-plan-observers-groundfish-and-halibut-fisheries-alaska.

NMFS. 2017a. Draft 2018 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 online at: https://alaskafisheries.noaa.gov/sites/default/files/draft_2018_adp.pdf.

NMFS. 2017b. 2018 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 online at: https://alaskafisheries.noaa.gov/sites/default/files/final_2018_adp.pdf.

NMFS. 2016. Draft 2017 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 online at: https://alaskafisheries.noaa.gov/sites/default/files/draft_2017adp.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. 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 C- 1. Scenarios considered, the number of effort predictions sampled for each scenario, and the number of times each effort prediction went through ODDS trip-selection within the combined observer and zero-selection pools.

Scenario Name	Pollock trawl EFP	Fixed Gear Expansion	EFP Trip Probability	Effort Iterations	ODDS Iterations	Total Iterations
TNFN-0 (status quo)	No	No	0.0	1	1,000	1,000
TNFY-0	No	Yes	0.0	100	1,000	100,000
TYFN-0.5	Yes	No	0.5	100	1,000	100,000
TYFN-1	Yes	No	1.0	1	1,000	1,000
TYFY-0.5	Yes	Yes	0.5	100	1,000	100,000
TYFY-1	Yes	Yes	1.0	100	1,000	100,000
	Total			402		402,000

Table C- 2. Three separate gap analyses were performed using the results of the ODDS trip selection results from the combined observer/no-selection pool trips and the EM pool trips.

Gap Analysis	Description
OBNO discard estimation	The data resolution of discard estimates generated for unobserved observer pool and no-selection pool trips was evaluated using data from trips selected for observer coverage.
EM discard estimation	The data resolution of discard estimates generated for unobserved EM pool trips was evaluated using data from trips selected for EM monitoring.
Average weight estimates	The data resolution of average weight estimates generated for all EM pool trips was evaluated using data from trips selected for observer coverage.

Table C- 3. Comparison of the number of trips in a stratum (N_h), the optimal sample weighting (W_h), preliminary predicted observed trips (n_h), days (d_h), and coverage rates (r_h) resulting from equal allocation. This comparison includes all four electronic monitoring (EM) scenarios. Within scenarios that assume the approval of the trawl exempted fishing permit (EFP), results are shown for sub-scenarios in which the probability of an EFP vessel taking a trip with EM (as opposed to an observer) is either 0.5 or 1 (EFP Probability). Weights are left blank since no optimization is performed within equal allocation.

Stratum (h)	EFP Probability	N_h	W_h	n_h	d_h	r_h (%)
TNFN						
HAL	0.0	1,819		307	1,474	14.94
POT	0.0	629		100	449	14.94
TRW	0.0	1,903		301	950	14.94
TNFY						
HAL	0.0	1,680		298	1,430	15.66
POT	0.0	581		97	428	15.66
TRW	0.0	1,903		316	1,009	15.66
TYFN						
HAL	0.5	1,819		332	1,586	16.10
POT	0.5	629		108	481	16.10
TRW	0.5	1,481		256	799	16.10
HAL	1.0	1,819		346	1,663	16.76
POT	1.0	629		113	490	16.76
TRW	1.0	1,270		229	714	16.76
TYFY						
HAL	0.5	1,680		324	1,557	17.02
POT	0.5	581		105	462	17.02
TRW	0.5	1,481		270	845	17.02
HAL	1.0	1,680		338	1,624	17.79
POT	1.0	581		110	486	17.79
TRW	1.0	1,270		244	757	17.79

Table C- 4. Comparison of the number of trips in a stratum (N_h), the optimal sample weighting (W_h), preliminary predicted observed trips (n_h), days (d_h), and coverage rates (r_h) resulting from optimization above 15%. This comparison includes all four electronic monitoring (EM) scenarios. Within scenarios that assume the approval of the trawl exempted fishing permit (EFP), results are shown for sub-scenarios in which the probability of an EFP vessel taking a trip with EM (as opposed to an observer) is either 0.5 or 1 (EFP Probability). Discarded groundfish catch with Pacific halibut and Chinook prohibited species catch was the metric used for optimization.

Stratum (h)	EFP Probability	N_h	W_h	n_h	d_h	r_h (%)
TNFN						
HAL	0.0	1,819	0.25	306	1,471	14.87
POT	0.0	629	0.01	99	439	14.87
TRW	0.0	1,903	0.73	299	952	14.87
TNFY						
HAL	0.0	1,680	0.24	293	1,406	15.39
POT	0.0	581	0.01	93	411	15.06
TRW	0.0	1,903	0.75	328	1,051	16.27
TYFN						
HAL	0.5	1,819	0.27	323	1,547	15.67
POT	0.5	629	0.01	101	445	15.10
TRW	0.5	1,481	0.71	278	872	17.49
HAL	1.0	1,819	0.29	332	1,594	16.12
POT	1.0	629	0.02	102	454	15.17
TRW	1.0	1,270	0.70	267	819	19.46
TYFY						
HAL	0.5	1,680	0.26	309	1,486	16.26
POT	0.5	581	0.01	94	415	15.20
TRW	0.5	1,481	0.73	309	965	19.50
HAL	1.0	1,680	0.27	319	1,523	16.73
POT	1.0	581	0.01	94	417	15.27
TRW	1.0	1,270	0.71	297	930	21.67

Table C- 5. Gap indices for discard estimates within the observer and zero−selection pools. MED = Median scores from distributions; P25 = Proportion of scores below 0.25.

		HAL BSAI			HAL GOA			POT BSAI		POT GOA		TenP BSAI	TenP GOA	TenTR GOA		TRW BSAI	TRW GOA			
	Scenario \ Trip Target	Halibut	Pacific Cod	Sablefish	Halibut	Pacific Cod	Sablefish	Pacific Cod	Sablefish	Pacific Cod	Sablefish	Pacific Cod	Pacific Cod	Pacific Cod	Pollock	Pacific Cod	Arrowtooth Fl.	Pacific Cod	Pollock	S.W. Flatfish
Discards Min + Opt MED	TYFY−1	0.448	0.505	0.368	0.741	0.639	0.765	0.737	0.581	0.738	0.650	0.615	0.643	0.812	0.000	0.791	0.788	0.750	0.801	0.589
	TYFY−0.5	0.445	0.500	0.355	0.739	0.636	0.763	0.736	0.578	0.737	0.649	0.614	0.643	0.792	0.000	0.783	0.779	0.735	0.797	0.562
	TYFN−1	0.458	0.500	0.368	0.743	0.639	0.765	0.739	0.587	0.745	0.660	0.615	0.643	0.792	0.000	0.783	0.780	0.735	0.796	0.562
	TYFN−0.5	0.453	0.495	0.355	0.741	0.636	0.764	0.739	0.587	0.745	0.656	0.615	0.643	0.792	0.000	0.775	0.770	0.706	0.791	0.536
	TNFY	0.439	0.490	0.342	0.735	0.628	0.760	0.736	0.576	0.737	0.648	0.610	0.643	0.792	0.643	0.771	0.765	0.699	0.789	0.518
	TNFN	0.443	0.488	0.336	0.738	0.629	0.760	0.737	0.570	0.740	0.651	0.615	0.643	0.792	0.571	0.764	0.757	0.684	0.785	0.500
Discards Min + Opt P25	TYFY−1	0.000	0.013	0.286	0.000	0.001	0.000	0.000	0.021	0.000	0.000	0.064	0.343	0.052	0.615	0.000	0.000	0.003	0.000	0.022
	TYFY−0.5	0.000	0.015	0.301	0.000	0.001	0.000	0.000	0.022	0.000	0.000	0.064	0.346	0.073	0.646	0.000	0.000	0.006	0.000	0.035
	TYFN−1	0.000	0.014	0.264	0.000	0.001	0.000	0.000	0.011	0.000	0.000	0.067	0.318	0.071	0.649	0.000	0.000	0.003	0.000	0.035
	TYFN−0.5	0.000	0.017	0.282	0.000	0.001	0.000	0.000	0.015	0.000	0.000	0.053	0.315	0.101	0.679	0.000	0.000	0.010	0.000	0.056
	TNFY	0.000	0.020	0.320	0.000	0.001	0.000	0.000	0.022	0.000	0.000	0.068	0.350	0.118	0.035	0.000	0.000	0.015	0.000	0.072
	TNFN	0.000	0.027	0.318	0.000	0.001	0.000	0.000	0.024	0.000	0.000	0.046	0.342	0.146	0.048	0.000	0.000	0.028	0.000	0.103
Discards Equal Rates MED	TYFY−1	0.455	0.515	0.382	0.745	0.648	0.769	0.754	0.616	0.755	0.677	0.635	0.643	0.792	0.000	0.776	0.772	0.713	0.791	0.545
	TYFY−0.5	0.450	0.510	0.368	0.742	0.642	0.766	0.749	0.606	0.750	0.669	0.625	0.643	0.792	0.000	0.773	0.768	0.706	0.790	0.527
	TYFN−1	0.462	0.510	0.368	0.745	0.646	0.768	0.751	0.610	0.755	0.674	0.625	0.643	0.792	0.000	0.772	0.767	0.699	0.788	0.527
	TYFN−0.5	0.456	0.500	0.368	0.743	0.641	0.765	0.746	0.599	0.750	0.668	0.625	0.643	0.792	0.000	0.770	0.764	0.699	0.788	0.518
	TNFY	0.441	0.495	0.342	0.737	0.630	0.761	0.740	0.587	0.741	0.654	0.615	0.643	0.792	0.598	0.768	0.762	0.691	0.788	0.509
	TNFN	0.447	0.480	0.355	0.738	0.631	0.761	0.739	0.581	0.743	0.656	0.625	0.643	0.792	0.580	0.764	0.758	0.691	0.786	0.491
Discards Equal Rates P25	TYFY−1	0.000	0.010	0.261	0.000	0.001	0.000	0.000	0.010	0.000	0.000	0.039	0.283	0.095	0.674	0.000	0.000	0.009	0.000	0.052
	TYFY−0.5	0.000	0.012	0.279	0.000	0.001	0.000	0.000	0.012	0.000	0.000	0.045	0.301	0.107	0.690	0.000	0.000	0.012	0.000	0.063
	TYFN−1	0.000	0.008	0.263	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.032	0.288	0.122	0.674	0.000	0.000	0.014	0.000	0.070
	TYFN−0.5	0.000	0.015	0.273	0.000	0.001	0.000	0.000	0.009	0.000	0.000	0.041	0.290	0.119	0.705	0.000	0.000	0.016	0.000	0.075
	TNFY	0.000	0.019	0.315	0.000	0.001	0.000	0.000	0.018	0.000	0.000	0.058	0.332	0.129	0.038	0.000	0.000	0.017	0.000	0.081
	TNFN	0.000	0.018	0.304	0.000	0.001	0.000	0.000	0.008	0.000	0.000	0.050	0.332	0.136	0.046	0.000	0.000	0.021	0.000	0.103

Trip Target

Difference: Worse | No Change | Better

Table C- 6. Gap indices for discard and available average weight estimates within the electronic monitoring selection pool. MED = Median scores from distributions; P25 = Proportion of scores below 0.25.

		EM_HAL BSAI	EM_HAL GOA			EM_POT BSAI	EM_POT GOA	
	Scenario	Halibut	Halibut	Pacific Cod	Sablefish	Pacific Cod	Pacific Cod	Sablefish
Avg Wgt Min + Opt MED	TYFY−1	0.521	0.729	0.593	0.729	0.680	0.539	0.506
Avg Wgt Min + Opt MED	TYFY−0.5	0.517	0.727	0.592	0.729	0.679	0.539	0.504
Avg Wgt Min + Opt MED	TYFN−1	0.512	0.732	0.598	0.730	0.694	0.537	0.522
Avg Wgt Min + Opt MED	TYFN−0.5	0.512	0.731	0.593	0.730	0.694	0.537	0.513
Avg Wgt Min + Opt MED	TNFY	0.511	0.725	0.587	0.727	0.679	0.538	0.504
Avg Wgt Min + Opt MED	TNFN	0.500	0.729	0.593	0.728	0.694	0.537	0.504
Avg Wgt Min + Opt P25	TYFY−1	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Min + Opt P25	TYFY−0.5	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Min + Opt P25	TYFN−1	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Min + Opt P25	TYFN−0.5	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Min + Opt P25	TNFY	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Avg Wgt Min + Opt P25	TNFN	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates MED	TYFY−1	0.528	0.731	0.598	0.731	0.688	0.548	0.529
Avg Wgt Equal Rates MED	TYFY−0.5	0.523	0.729	0.593	0.730	0.686	0.548	0.522
Avg Wgt Equal Rates MED	TYFN−1	0.512	0.733	0.601	0.731	0.704	0.542	0.531
Avg Wgt Equal Rates MED	TYFN−0.5	0.512	0.731	0.598	0.730	0.694	0.542	0.522
Avg Wgt Equal Rates MED	TNFY	0.513	0.726	0.587	0.728	0.681	0.542	0.510
Avg Wgt Equal Rates MED	TNFN	0.500	0.729	0.593	0.728	0.694	0.537	0.513
Avg Wgt Equal Rates P25	TYFY−1	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates P25	TYFY−0.5	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates P25	TYFN−1	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates P25	TYFN−0.5	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates P25	TNFY	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Avg Wgt Equal Rates P25	TNFN	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Discards EM MED	FY	0.637	0.810	0.792	0.808	0.795	0.790	0.754
Discards EM MED	FN	0.607	0.806	0.795	0.805	0.796	0.784	0.750
Discards EM P25	FY	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Discards EM P25	FN	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Trip Target

Difference: Worse, No Change, Better

Figure C- 1. Process diagram for the analyses contained in this appendix.

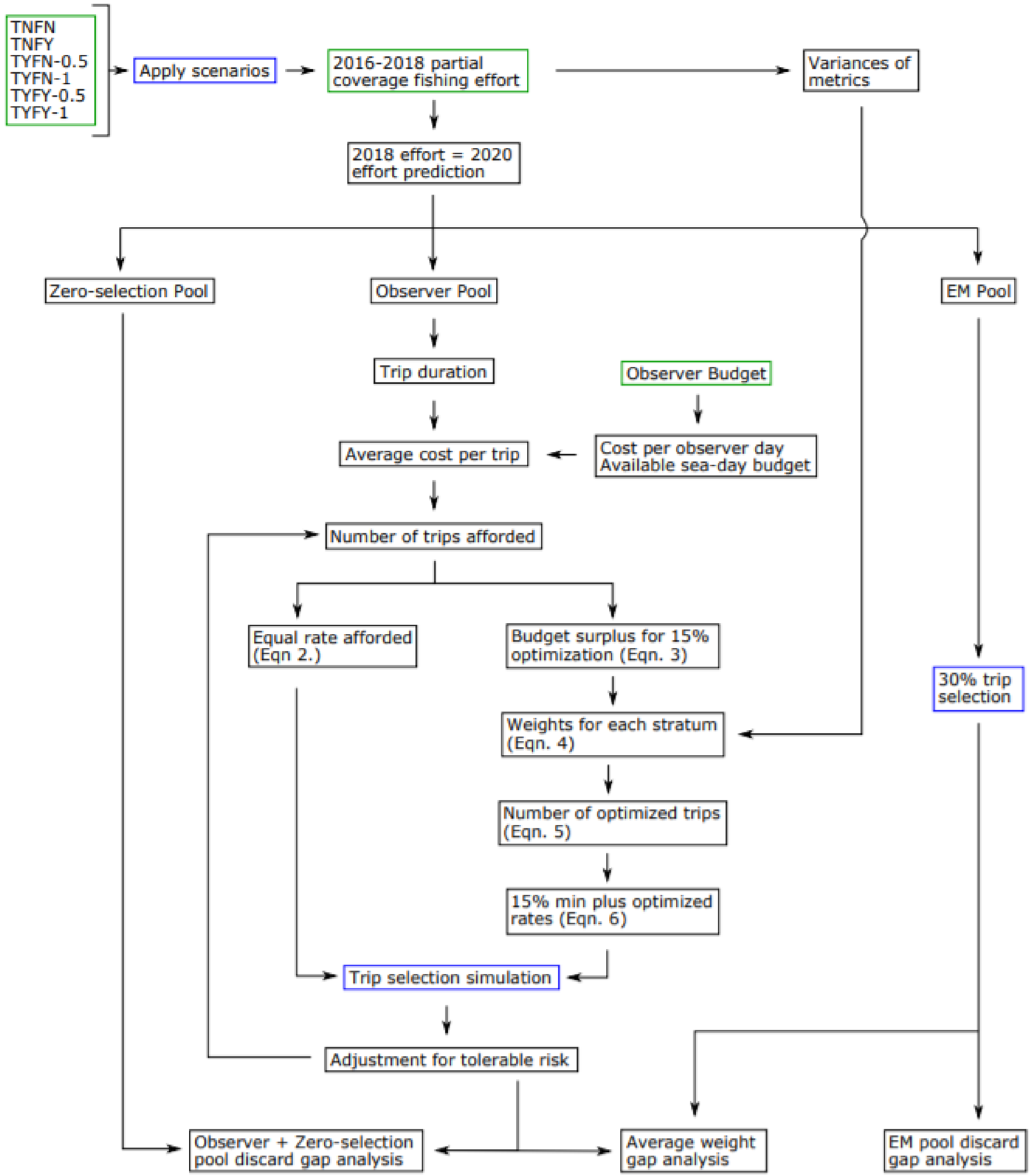


Figure C- 2. Distributions of gap scores by scenario and domain for the HAL (Hook and Line gear) stratum. The status quo design (TNFN) for each allocation scheme is depicted as negative values in grey for comparison with alternative designs.

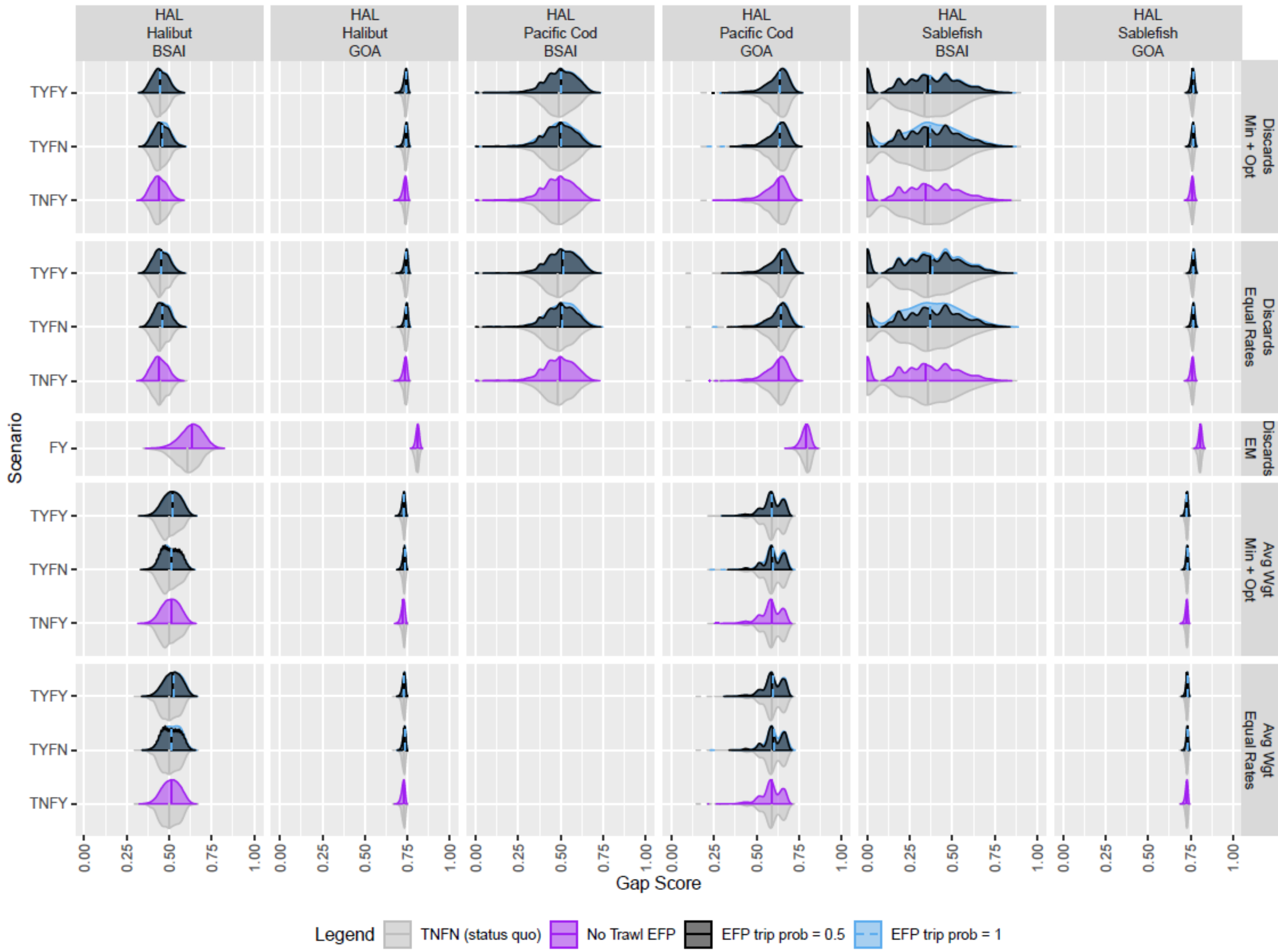


Figure C- 3. Distributions of gap scores by scenario and domain for the POT (Pot gear) stratum. The status quo design (TNFN) for each allocation scheme is depicted as negative values in grey for comparison with alternative designs.

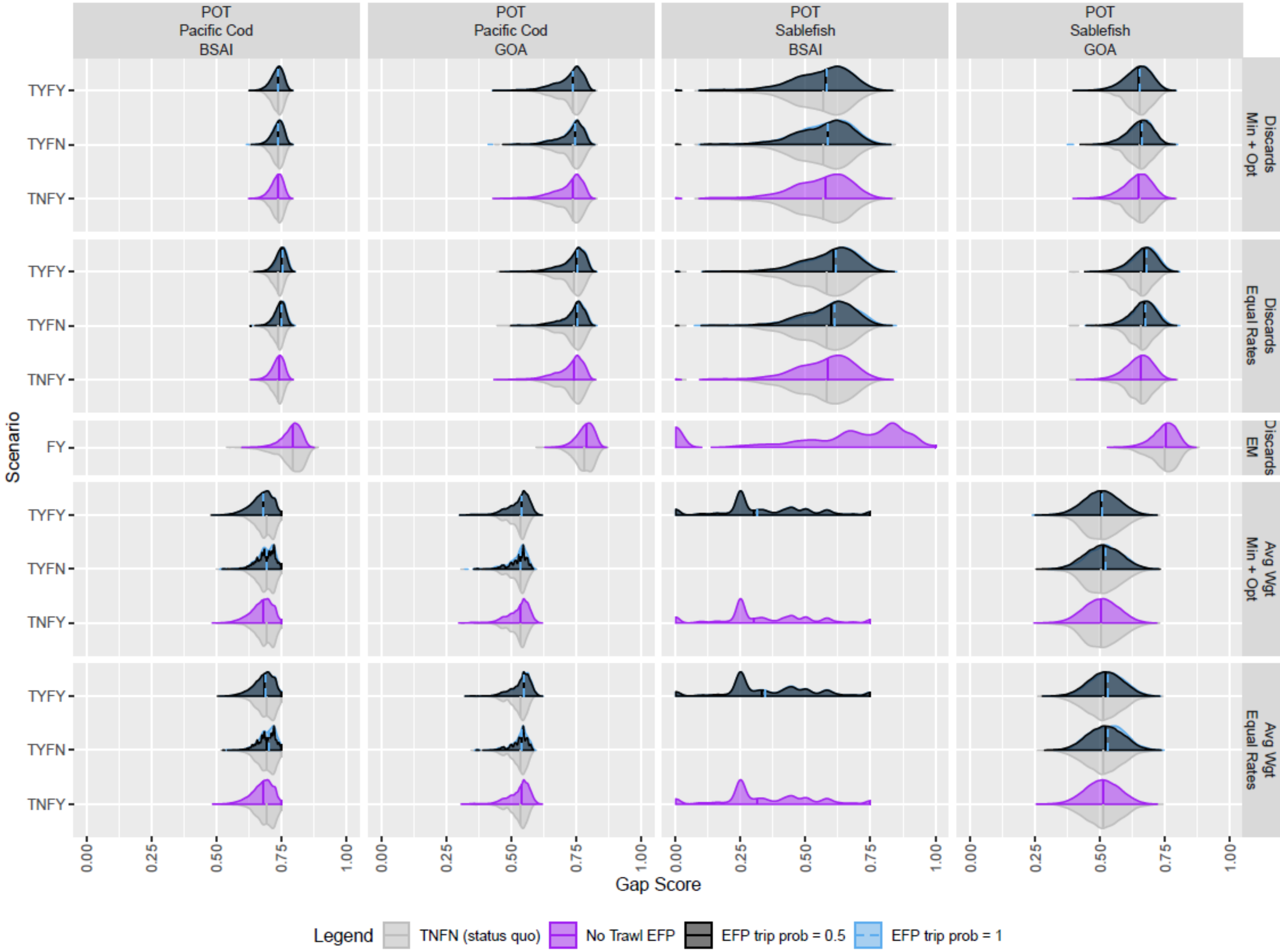


Figure C- 4. Distributions of gap scores by scenario and domain for the TRW (Trawl gear) stratum. The status quo design (TNFN) for each allocation scheme is depicted as negative values in grey for comparison with alternative designs.

Figure C- 5. Distributions of gap scores by scenario and domain for the tendering post-strata. The status quo design (TNFN) for each allocation scheme is depicted as negative values in grey for comparison with alternative designs.

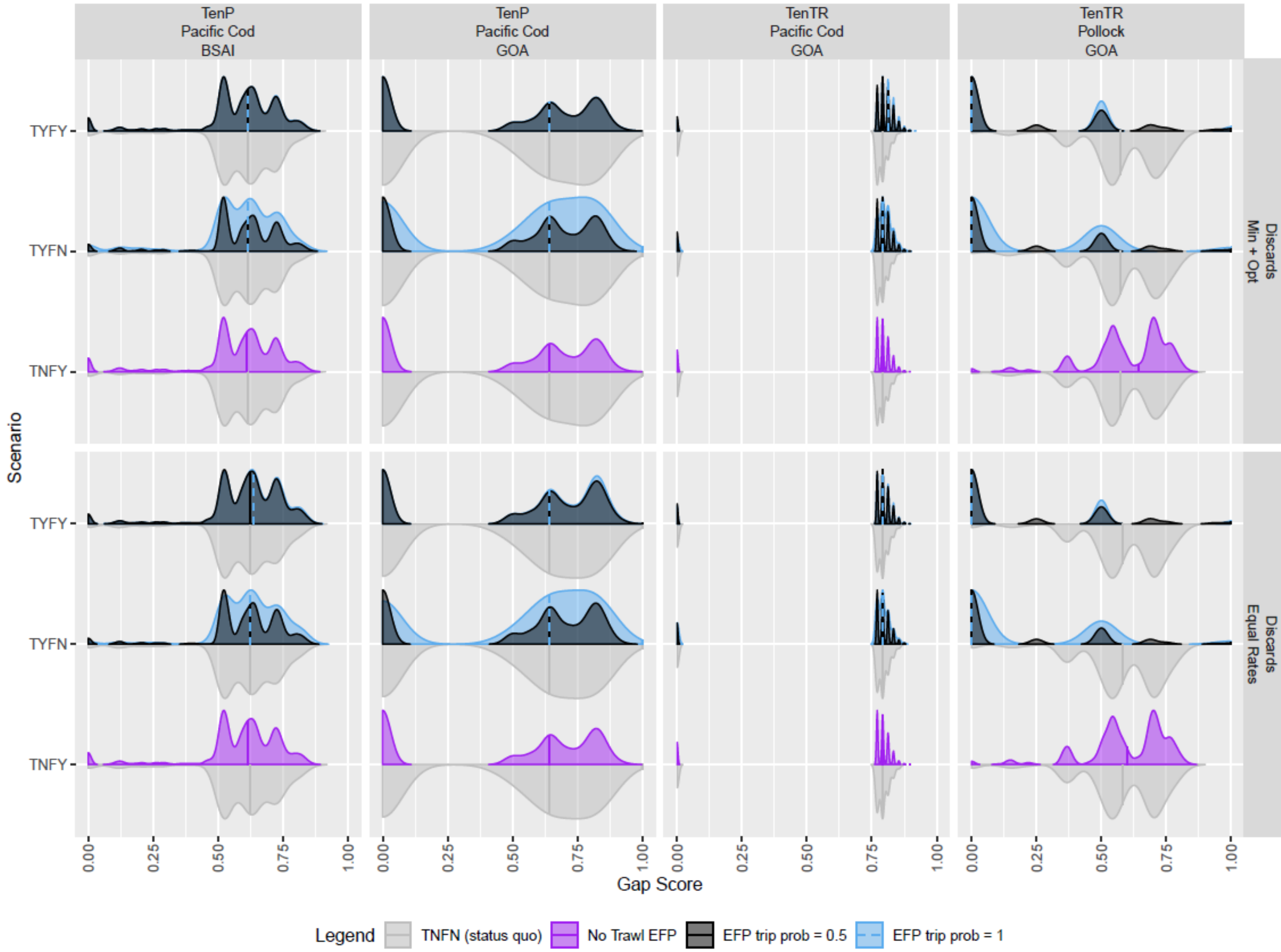


Figure C- 6. Comparison of allocation and stratification combinations for each stratum and tendering post-stratum (see Figure C-4 for descriptions) in reference to the *status quo* Min + Opt allocation / TNFN stratification. Labels on the vertical axis are in the format of: Allocation method / Stratification_Proportion of trips in EFP. Values to the right are improvements whereas values to the left are declines. Colors depict whether the gap score for a domain increased or decreased in median (MED), proportion less than 0.25 (P25) or both (MED + P25).

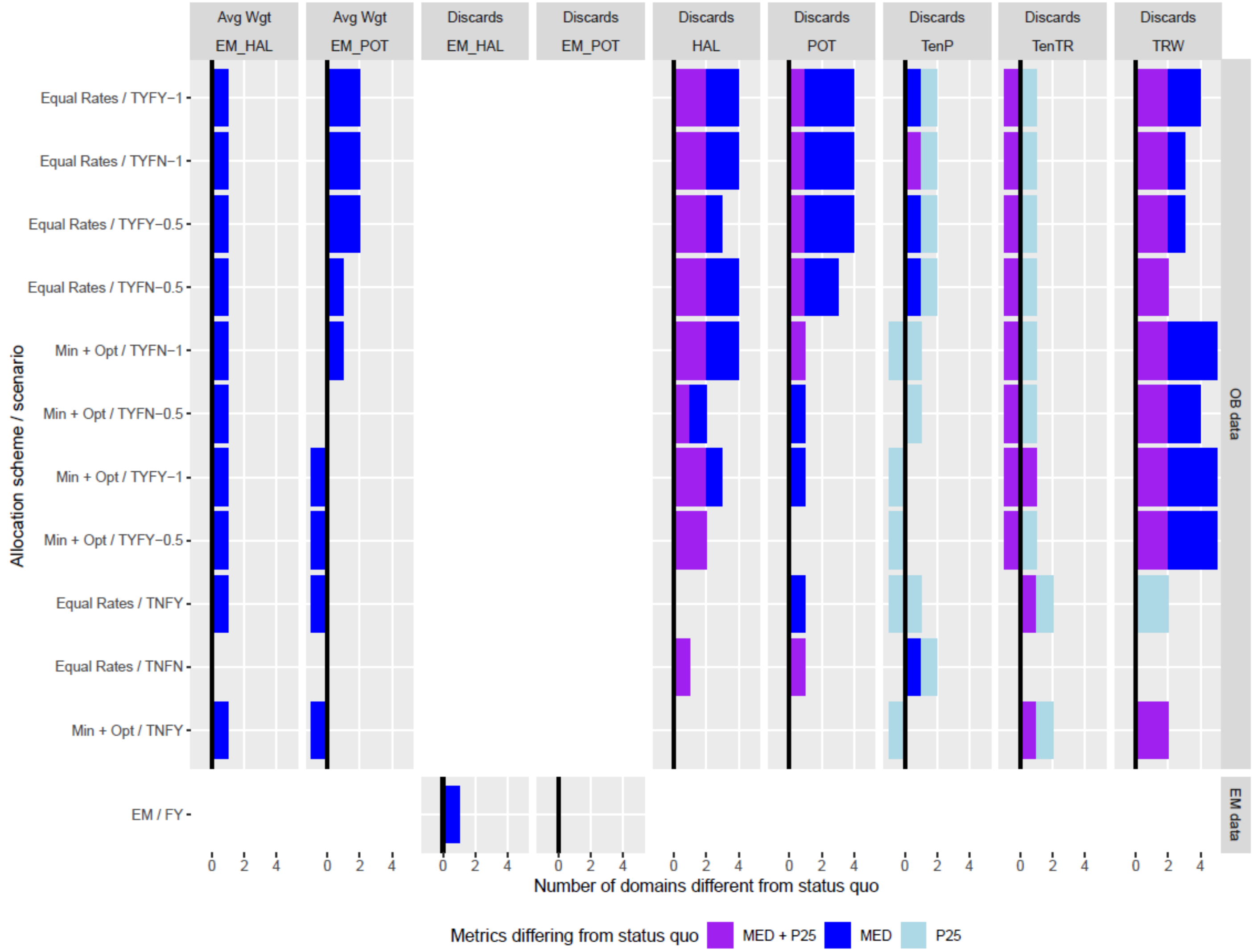
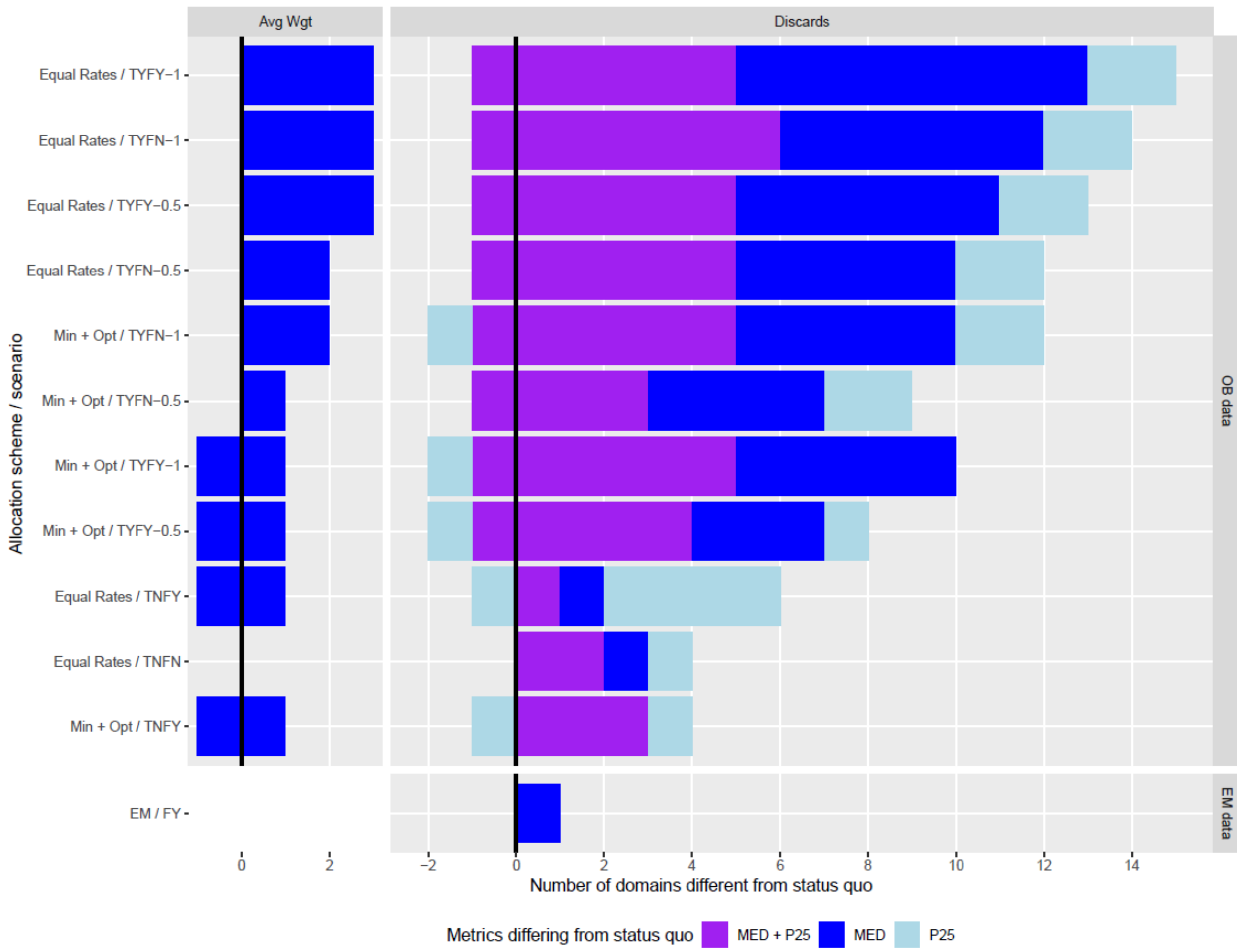


Figure C- 7. Comparison of allocation and stratification combinations for each stratum and tendering post-stratum in reference to the *status quo* Min + Opt allocation / TNFN stratification. Labels on the vertical axis are in the format of: Allocation method / Stratification-Proportion of trips in EFP. Values to the right are improvements whereas values to the left are declines. Colors depict whether the gap score for a domain increased or decreased in median (MED), proportion less than 0.25 (P25) or both (MED + P25).



Appendix D. 2020 EM Vessel Monitoring Plan Description

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://www.fisheries.noaa.gov/alaska/resources-fishing/electronic-monitoring-north-pacific.

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 have failed 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

When selected for coverage, you must comply with operator responsibilities listed below and in Appendix B – Guide for Vessel Operators.

Prior to Trip

- ✓ **Complete Function Test:** Prior to leaving port, you must turn the system on and conduct a system function test following the instructions provided in *Appendix B – Guide for Vessel Operators*. If the function test identifies a malfunction, you must follow the guidance in the malfunction matrix and the troubleshooting guidelines listed in *Appendix B – Guide for Vessel Operators.*

- ✓ **Confirm Hard Drive Storage Space:** Ensure that the system has enough storage to record the entire trip.

Each Trip

- ✓ **Power:** Maintain uninterrupted power to the EM unit while the vessel is underway.

- ✓ **Maintain Equipment:** Make certain that 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:
  - o If you are required to complete a NMFS or IPHC logbook then you can use that logbook ***and add in the comments section:***
    - the ODDS trip number
    - whether the vessel fished at night during the trip
    - any EM malfunctions encountered during the trip
    - each set that marine mammals were observed feeding on the catch as it was brought aboard.
  - o If you ***are not*** required to complete a NMFS or IPHC logbook then you must complete the EM Effort Logbook found in either *Appendix E – 2020 Longline EM Effort Logbook* or *Appendix F – 2020 Pot EM Effort Logbook.*

Prior to each haul or set

- ✓ **Verify System Is Running Correctly**
  - o Verify that all cameras are recording and all sensors and other required EM system components are functioning as instructed in *Appendix B – Guide for Vessel Operators.*
  - o Check the monitor and verify that the camera views are consistent with the images provided in *Appendix A - Vessel Installation Details*.
- ✓ **Clear Camera Views**: Clean cameras to maintain video quality and make sure camera views are not blocked.

Catch Handling Requirements for LONGLINERS:

- ✓ All catch must be handled within view of the cameras as defined in the camera descriptions and deck diagram in *Appendix A - Vessel Installation Details*.
- ✓ All catch processing from the previous set must be complete prior to hauling the next set.
- ✓ **Seabirds**: Hold seabirds up to the camera for 3 seconds and show certain key parts of the animal, such as the beak, to the hauler view camera. When showing a seabird to the camera:
  - o Grasp by the outermost bend in wing, with wings out-stretched and show the bird to the hauler camera showing the front and back 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 logbook each set where marine mammals were feeding on the catch.

Catch Handling for POT Gear:

✓ All catch must be handled within view of the cameras as defined in the camera descriptions and deck diagram in *Appendix A - Vessel Installation Details*.

✓ On retrieval of a pot, ALL catch must be emptied from the pot onto the sorting table. Any catch left in the pot or that land on the deck must be placed on the sorting table.

✓ 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.

✓ 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 cannot be 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.

Owners of pot vessels may propose alternatives to these procedures by submitting plans to NMFS for approval. This alternative may not be used until approved by NMFS.

Trip End

✓ **Mail hard drive and logbook**

- Mail hard drives and a copy of the trip's **logbook** (IPHC or NMFS logbook or EM effort logbook, as appropriate) and the ODDS trip number **within 2 business days** after the EM selected trip to the contact provided in *Appendix C – EM Program Contacts*.
- **EM selected trips ending in ports with limited postal service**: notify NMFS using the contacts on first page of the VMP to inform of the expected delay.

- ✓ **Close fishing trip in ODDS:** 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.

- ✓ **EM selected trips ending at a tender:**
  - o You must manually turn on the EM system and trigger recording during the offload to allow the EM reviewer to verify the end of the trip
  - o Record the location of the offload in your logbook.
  - o Mail hard drives and a copy of the trip's **logbook** (IPHC or NMFS logbook or EM effort logbook, as appropriate) and the ODDS trip number **within 2 business days** after the tender's arrival in a port with regular postal service.

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

You must still meet 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, such as VMS, to make sure the vessel's location information is available for the entire trip in *Appendix A - Vessel Installation Details*.
- ✓ If an EM system malfunction identified as "high" priority in the malfunction matrix occurs during a fishing trip, ***you must cease fishing immediately***; follow the troubleshooting guidelines listed in *Appendix B – Guide for Vessel Operators*, and contact NOAA OLE immediately.
  - o If a "high" priority malfunction occurs, every effort should be made to contact OLE while at sea, but if you are unable to contact OLE while at sea, you are not required to abandon fishing gear. You should also contact the EM service provider to facilitate the repair.
  - o You may contact OLE using a cell phone or satellite phone, or you may contact the U.S. Coast Guard via VHF or single side band radio to request the Coast Guard contact OLE.
  - o You **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.
- ✓ You may purchase additional equipment, such as cameras or control centers, at you own expense to reduce lost fishing time. This additional equipment and its purpose must be described in *Appendix A - Vessel Installation Details*.

Equipment Malfunctions

Equipment Malfunction Discovered During Pre-Departure EM System Function Test

If the function test identifies a malfunction, follow the troubleshooting guidelines listed in *Appendix B – Guide for Vessel Operators*.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Monitor	***High***	Connect a different monitor	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip is selected for EM coverage. Repair must occur prior to departing on the next trip.
GPS	***High***	Restart system	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip for EM coverage. Repair must occur prior to departing on the next trip.
Insufficient Storage	***High***	Replace with spare data drive[7]	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip is selected for EM coverage. Repair must occur prior to departing on the next trip.
Control Center	***High***	Restart system	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip is selected for EM coverage. Repair must occur prior to departing on the next trip.
Insufficient Lighting	***High***	Replace lights	May fish but cannot retrieve gear at night.
Hauling Camera(s)	***High***	Restart system; replace with spare camera[7]	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip 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[7]	Must remain in port up to 72 hours to allow for repairs. After 72 hours, may depart on trip and the next trip 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[7]	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[7]	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.

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

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Hydraulic Sensor	Low	Restart system	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[7]	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.

Equipment Malfunction at Sea

- If the system passed the function test, and remains continuously powered during the trip, you are NOT required to return to port in the event of a breakdown. Follow the instructions provided in *Appendix B – Guide for Vessel Operators*.

- If the malfunction cannot be resolved following the troubleshooting guide and/or with remote support, continue to run the system with all functional parts, and 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	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	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	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	May fish but cannot retrieve gear at night.
Hauling Camera(s)	***High***	Restart system; replace with spare camera[7]**Error! Bookmark not defined.**	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.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[7]	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[7]	May continue 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[7]	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[7]	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	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.

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 *Appendix B – Guide for Vessel Operators*, 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	Cease fishing and contact OLE or you 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[7]	Cease fishing and contact OLE or you may not embark on trip using exemption.
GPS	***High***	Restart system	Cease fishing and contact OLE or you may not embark on trip using exemption unless vessel has operating VMS and hauling and discard cameras are functioning.
Insufficient Storage	***High***	Replace with spare data drive	If vessel does not have a spare data drive, cease fishing and contact OLE or you may not embark on trip using exemption.
Control Center	***High***	Restart system	Cease fishing and contact OLE or you may not embark on trip using exemption.

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Insufficient Lighting	***High***	Replace lights	May fish but cannot retrieve gear at night
Hauling Camera(s)	***High***	Restart system; replace with spare camera[7]	Cease fishing and contact OLE or you may not embark on trip using exemption.
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[7]	Cease fishing and contact OLE or you may not embark on trip using exemption.
Streamer line Camera	Low	Restart system; replace with spare camera[7]	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[7]	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[7]	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[7]	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.

Appendix E. EM Annual Process and Step-by-step Guide