Draft 2021 Annual Deployment Plan for Observers and Electronic Monitoring in the Groundfish and Halibut Fisheries off Alaska

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Executive Summary

This draft 2021 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 2021.

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 refers to the method of selecting fishing trips as the sampling unit. Trip selection is facilitated through vessels logging their trips into the Observer Deploy and Declare System (ODDS) and being notified by the system if the trip is selected for coverage.
    - Consistent with revisions to observer deployment due to COVID-19, observers will be deployed on randomly selected trips from specific ports. These ports were identified because travel and lodging conditions allow observers to meet and maintain applicable health mandates for deployment into the commercial fisheries and because there are expected to be enough fishing trips originating and ending in these ports to make it cost effective to place observers in these communities. Currently, these ports include: (1) Akutan, (2) Dutch Harbor/Unalaska, (3) False Pass, (4) Homer, (5) Juneau, (6) Ketchikan, (7) King Cove, (8) Kodiak, (9) Nome, (10) Petersburg, (11) Sand Point, (12) Seward, (13) Sitka, and (14) Yakutat. NMFS may modify the list of ports with available observers in response to transportation availability and/or changes in health mandates.
    - Observers will be deployed according to the port-based trip selection model and EM will be deployed according to trip-selection.
- **Selection pools:**
    - ***Observer trip-selection pool*:**
        - NMFS recommends 3 sampling strata for the deployment of observers in 2021:
            - 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
        - Consistent with revisions to observer deployment due to COVID-19, observers will be deployed on randomly selected trips from specific ports. These ports were identified because travel and lodging conditions allow observers to meet and maintain applicable health mandates for deployment into the commercial fisheries and because of the volume of fishing trips that are expected to originate and end in these locations. Currently, the selected ports include: (1) Akutan, (2) Dutch Harbor/Unalaska, (3) False Pass, (4) Homer, (5) Juneau, (6) Ketchikan, (7) King Cove, (8) Kodiak, (9) Nome, (10) Petersburg, (11) Sand Point, (12) Seward, (13) Sitka, and (14) Yakutat. NMFS may modify the list of ports with available observers in response to transportation availability and/or changes in health mandates.
    - ***EM trip-selection pool*:**

- Vessels in the partial coverage category using fixed gear may request to be in the 2021 EM selection pool using ODDS. Any vessel in the EM selection pool in 2020 will remain eligible to be in the EM selection pool unless a request is submitted to not be in the EM selection pool for 2021 or NMFS has disapproved the vessel's 2020 VMP. All requests to be in or out of the EM selection pool for 2021 must be received by **November 1, 2020**. Any vessel that does not request to participate by this deadline will not be eligible for placement in the 2021 EM selection pool and will be in the partial coverage trip selection pool for observer coverage.
- Based on available funding for EM, the EM selection pool will be composed of up to 169 fixed gear vessels, which would maintain the size of the EM pool from 2020.
- 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 that are cost effective for EM and unlikely to introduce large data gaps; and
    - vessels 40-57.5 ft LOA where carrying an observer is problematic due to bunk space or life raft limitations.
- As part of the VMP approval, NMFS will assess a vessel's adherence to their approved VMP. The quantity and severity of conformance issues that impact the quality and usability of data will be evaluated to determine the standing of a vessel and their eligibility to participate in the fixed gear EM program. NMFS will notify the vessel operator of their status through a cover letter attached to the VMP approval on an annual basis. A vessel with poor standing will be placed into probation status and the vessel owner/operator will be notified of specific issues they need to address in order to bring the vessel into compliance with the VMP. Failure of a vessel operator to address these issues or comply with other conditions of the VMP may result in the vessel not being eligible to participate in the EM pool in the following year.

- ***Trawl Electronic Monitoring Trip-Selection Pool*:** This pool is composed of all vessels fishing under an Exempted Fishing Permit (EFP) to evaluate the efficacy of EM on pollock catcher vessels using pelagic trawl gear in the Bering Sea and Gulf of Alaska. The goals for EM is compliance monitoring of maximized retention. Catch accounting for the vessel's catch and bycatch is done via eLandings reports and shoreside plant observers. Industry received National Fish and Wildlife Foundation (NFWF) funding to support the project with 42 catcher vessels, 8 tender vessels, and 9 shoreside processors participating in the first year of the EFP. Additional funding is being sought for 2021 to expand EFP participation by 27 vessels.

- ***No-selection pool*:** 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.

- **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. NMFS set a preliminary budget for the draft 2021 ADP of $4.47M resulting in estimated coverage rates: Hook-and-line – 15%; Pot – 15%; Trawl – 18.5%; Fixed Gear EM – 30%; and Trawl EM EFP – 100% at-sea EM (plus: 30% shoreside monitoring in GOA and 100% shoreside monitoring in BS). ***These coverage rates are preliminary estimates and will differ from rates determined in the final ADP.*** Once the final budget is known, an updated estimate of anticipated fishing effort and simulation models will be used to estimate expected coverage rates in the final 2021 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 ODDS and must be received by **October 15, 2020,** for the 2021 fishing year.

- To the extent possible, observers will continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. COVID-19 protocols at most shoreside processing plants now prevent vessel observers from entering the processor to complete any further sampling. NMFS has altered data collection procedures to account for this and, when possible, will increase shore-based observer coverage to help fill in data gaps. In many cases, COVID-19 restrictions mean that shore-based observers will complete sampling for pollock trawl vessels regardless if they are observed at-sea or if they are participating in the trawl EM EFP. 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 2021 Annual Deployment Plan (ADP) describes how the National Marine Fisheries Service (NMFS) intends to assign at-sea and shoreside fishery observers and electronic monitoring (EM) 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 (Magnuson-Stevens Act) (16 U.S.C. 1862), 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.

The ADP describes the science-driven method for deployment of observers and EM systems to support statistically reliable data collection. The ADP is a core element in implementation of section 313 of the Magnuson-Stevens Act, which authorizes the North Pacific Fishery Management Council (Council), in consultation with NMFS, to prepare a fishery research plan. NMFS implemented the Council's fisheries research plan through the North Pacific Observer Program (Observer Program). The Observer Program provides the regulatory framework for stationing observers and EM systems to collect data necessary for the conservation, management, and scientific understanding of the commercial groundfish and Pacific halibut fisheries of the BSAI and GOA management areas.

More 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). Further details on the integration of EM deployment into the ADP process are found in the final rule to integrate EM into the Observer Program (82 FR 36991).

Data collection through the Observer Program 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. These data contribute to the best available scientific information used to manage the fisheries in the North Pacific. Observers and EM systems provide fishery-dependent information that is used to estimate total catch and interactions with protected species. Managers use these data to manage groundfish and prohibited species catch within established limits and to document and reduce fishery interactions with protected species. Scientists use fishery-dependent data to assess fish stocks, provide data for fisheries and ecosystem research and fishing fleet behavior, assess marine mammal interactions with fishing gear, and characterize fishing impacts on habitat. 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 2021 ADP is as follows:

- **June 2020:** Normally in June NMFS presents the Annual Report to the Council and the public. The annual 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. Due to the global COVID-19 pandemic, NMFS re-prioritized work and intends to publish the 2019 Annual Report before the end of the 2020. During May 2020, NMFS met with the Council's Fishery Monitoring and Advisory Committee (FMAC) and discussed COVID-19 issues related to observer deployment and data collection in the full and partial coverage fleets. The meeting served as a forum for dialogue among multiple stakeholders and agency staff to address fast-changing conditions and emerging challenges. In June, 2020 the Council provided recommendations on observer deployment for the remainder of 2020 (Appendix A).

- **September 2020:** Based on direction from the Council (Appendix A) and experience from observer deployment and health and safety considerations during 2020, NMFS prepared and released this draft 2020 ADP containing recommendations for deployment methods in the partial coverage category.

- **October 2020:**

    - *Review of the draft ADP*: The Council reviews this draft 2021 ADP and any associated Plan Team, Trawl EM Committee, 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 2021 ADP. NMFS will review and consider these recommendations; however, extensive analysis and large-scale revisions to the draft 2021 ADP are not feasible. This constraint is due to the short time available to finalize the 2021 ADP prior to the December 2020 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, 2021.

    - *Requests to participate in EM selection pool*: Vessels in the partial coverage category using fixed gear may request to be in the 2021 EM selection pool using the Observer Declare and Deploy System (ODDS) by November 1, 2019.

- **December 2020:** NMFS will finalize the 2021 ADP and release it to the public prior to the Council meeting.

Summary of 2020 ADP and modifications due to COVID-19

In December, 2019, NMFS released the final 2020 ADP (NMFS 2019) with the following strata and deployment rates:

- No Selection – 0%
- Trawl – 20%
- Hook-and-line – 15%
- Pot – 15%
- Fixed-Gear EM – 30%
- Trawl EM EFP–100% at-sea EM; plus: 30% shoreside monitoring in GOA or 100% shoreside monitoring in BS

Starting in March, 2020, the COVID-19 pandemic created limitations on available air travel and “shelter in place” restrictions, particularly in many remote Alaskan communities. Under the emergency rule signed on March 24, 2020, NMFS temporarily waived the requirement for vessels in the Partial Coverage Category to carry a fishery observer from March 27 through April 19, 2020. On April 18, 2020, NMFS announced a limited extension of the temporary waiver of observer requirements, which narrowed the scope and reinitiated deployment of observers on trips departing from the port of Kodiak, Alaska (the majority of GOA trawl fisheries occurred out of Kodiak during this timeframe). On June 28, 2020, NMFS expanded observer deployment in the partial coverage category to include 13 ports and in addition to Kodiak, which further reduce the scope of waivers issued.

The largest component of the Alaskan groundfish fisheries, vessels and processors in the full coverage category (including catcher processors and participants in limited access privilege programs), were not issued waivers in 2020. Additionally, requirements for deployment of EM was not waived for trawl catcher vessels fishing under the trawl EM exempted fishing permit and only a few trips were released from coverage under the fixed gear EM portion of the partial coverage category for circumstances when an EM service technician was unable to travel.

2021 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 by observers occurs in the pollock fishery to enable complete enumerations of salmon bycatch and conduct biological sampling.

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 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.

Consistent with revisions to observer deployment due to COVID-19, observers will be deployed on randomly selected trips from specific ports. These ports were identified because travel and lodging conditions allow observers to meet and maintain applicable health mandates for deployment into the commercial fisheries and because of the volume of fishing trips that are expected to originate and end in these locations. Currently, these ports include: (1) Akutan, (2) Dutch Harbor/Unalaska, (3) False Pass, (4) Homer, (5) Juneau, (6) Ketchikan, (7) King Cove, (8) Kodiak, (9) Nome, (10) Petersburg, (11) Sand Point, (12) Seward, (13) Sitka, and (14) Yakutat. NMFS may modify the list of ports with available observers in response to transportation availability and/or changes in health mandates.

Observers will be deployed according to the port-based, trip-selection model and EM will be deployed according to trip-selection. 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 C).

Selection Pools (Stratification Scheme)

Trip-Selection Pool for Observer Deployment:
NMFS recommends that the three observer trip-selection strata based on gear (trawl, hook-and- line, and pot), which were implemented in 2016, remain the same for 2021. As described above, observers will be deployed from select ports throughout Alaska. Consistent with existing regulatory authority at 50 CFR 679.51(a)(1), NMFS may release trips from observer coverage on a case-by-case basis for vessels in the Partial Coverage Category. NMFS will use this authority when an observers that meet health mandates is not available for deployment.

EM Selection Pool:
Vessels in the partial coverage category using fixed gear may request to be in the 2021 EM selection pool using ODDS.[1] Any vessel in the EM selection pool in 2020 will remain eligible to be in the EM selection pool unless a request is submitted to not be in the EM selection pool for 2021 or NMFS has disapproved the vessel's 2020 VMP. All requests, to be in or out of the EM selection pool for 2021 must be received by November 1, 2020 (Appendix D). Any vessel that does not request to participate by this deadline will not be eligible for placement in the 2021 EM selection pool and will be in the partial coverage trip selection pool for observer coverage.

New this year, NMFS is adding a step to the Vessel Monitoring Plan (VMP) approval process to increase compliance and address data quality issues. As part of the VMP approval, NMFS will assess a vessel's adherence to their approved VMP. For example, does a vessel operator have recurring issues (such as obstructing the camera view or consistently not addressing camera cleanliness) that have resulted in unusable or very poor quality EM data? The quantity and severity of compliance issues that impact the quality and use of that data will be used to assess the standing of a vessel and their eligibility to participate in the fixed gear EM program. NMFS will notify the vessel operator of their status through a cover letter attached to the VMP approval on an annual basis. A vessel with poor standing will be placed into probation status and the vessel owner/operator will be notified of specific issues they need to address in order to bring the vessel into compliance. Failure of a vessel operator to address these issues or comply with other conditions of the VMP may result in the vessel not being eligible to participate in the EM pool in the following year.

Based on the estimated budget for the draft ADP, the EM selection pool will be composed of up to 169 fixed gear vessels, which would maintain the size of the EM pool from 2020. 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 that are cost effective for EM and unlikely to introduce large data gaps; and
- vessels 40-57.5 ft LOA where carrying an observer is problematic due to bunk space or life raft limitations.

Trawl EM Trip-Selection Pool:
NMFS has issued an Exempted Fishing Permit (EFP) to evaluate the efficacy of EM on pollock catcher vessels using pelagic trawl gear in the Bering Sea and Gulf of Alaska[2]. NMFS approved the EFP in

[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.

[2] More details on the EFP permit are available at: https://www.fisheries.noaa.gov/alaska/resources-fishing/exempted-fishing-permits-alaska

January, 2020 allowing pollock catcher vessels using pelagic trawl gear to use EM systems in lieu of at sea observers. The goals for EM is compliance monitoring of maximized retention. Catch accounting for the vessel's catch and bycatch is done via eLandings reports and shoreside plant observers. The specific requirements for vessels in the trawl EM trip-selection pool was determined through the permit approval process.

Industry received National Fish and Wildlife Foundation (NFWF) funding to support the project with 42 catcher vessels, 8 tender vessels, and 9 shoreside processors participating in the first year of the EFP. Additional funding is being sought for 2021 to expand EFP participation by 27 vessels.

Summary of 2021 Deployment Strata:
NMFS recommends the following deployment strata for vessels in the partial coverage category (50 CFR 679.51(a)) in 2021:

- ***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 2021 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.
- ***Observer Trip-Selection Pool:*** Observers will be deployed from select ports throughout Alaska. NMFS recommends 3 sampling strata in the observer trip-selection pool:
    - ***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.
    - ***Trawl***: This pool is composed of all vessels in the partial coverage category fishing trawl gear.
- ***EM selection pool:*** Based on the estimated budget for the draft ADP, the EM selection pool will be composed of up to 169 fixed gear vessels, which would maintain the size of the EM pool from 2020.
- ***Trawl EM trip-selection pool:*** This pool is composed of all vessels fishing under the EFP permit.

Allocation Strategy

Allocation strategy refers to the method of allocating deployment trips among strata. Appendix B 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.

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

Waivers

NMFS continues to respond to the changing landscape caused by COVID-19. Deployment plans for observers strive to keep all operators, communities, and observers safe. This 2021 Draft ADP is consistent with the Council's recommendation for "port fidelity," with observers adhering to State of Alaska health mandates applicable to commercial fisheries. NMFS maintains the ability to release vessels on a case by case basis in all ports (including our listed ports) when conditions warrant. In other words, this deployment plan is flexible to respond to changing conditions and NMFS can release selected trips if observers cannot meet specific protective plans.

Vessel operators in the partial coverage sector will continue to log all trips in ODDS, regardless of the port of departure or landing. AIS will work with NMFS to release trips from ports in which we are not currently deploying observers. For selected trips from observed ports, AIS will continue to work with each vessel operator to communicate their COVID-19 protocols. AIS will work with NMFS to release trips when they are unable to provide an observer who is compliant with all applicable protective plans.

Estimated Deployment Rates

Based on recommendations from the Council, NMFS recommends maintaining a 30% selection rate for the Fixed-gear EM selection pool for 2021. NMFS uses estimates of anticipated fishing effort and available sea-day budgets to determine selection rates for observer deployment in each stratum.

NMFS set a preliminary budget for the draft 2021 ADP of $4.47M resulting in estimated coverage rates: Hook-and-line – 15%; Pot – 15%; Trawl – 18.5%; Fixed Gear EM – 30%; and Trawl EM EFP – 100% at-sea EM (plus: 30% shoreside monitoring in GOA and 100% shoreside monitoring in BS). ***These coverage rates are preliminary estimates and will differ from rates determined in the final ADP.*** Once 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 2021 ADP.

Chinook Salmon Sampling in the Gulf of Alaska

To the extent possible, observers will continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. COVID-19 protocols at most shoreside processing plants now prevent vessel observers from entering the processor to complete any further sampling. NMFS has altered data collection procedures to account for this and, when possible, will increase shore-based observer coverage to help fill in data gaps. In many cases, COVID-19 restrictions mean that shore-based observers will complete sampling for pollock trawl vessels regardless if they are observed at-sea or if they are participating in the trawl EM EFP.

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.

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 2021 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, 2020 for the 2021 fishing year. NMFS will publish the list of catcher vessels that have been approved to be in the full coverage category on the NMFS website.

Observer Declare and Deploy System (ODDS)
For 2021, the user experience in ODDS will not change for a vessel operator. NMFS will retain the current business operating procedure of allowing vessels to log up to three trips in advance and programming that prevents a 40 – 57.5' fixed gear vessel from being randomly selected for a third consecutive observer 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 Annual Reports, ODDS programming allows vessel operators to change the dates for future observed trips

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 login" 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.

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[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

References

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Appendix A. Council motion on the ADP

Council Motion
D1 Observer Update
June 10, 2020

2020 Annual Deployment Plan
The Council appreciates and supports NMFS's response thus far to COVID-19 relative to the observer program. Full coverage fisheries have been maintained, a majority of the pelagic trawl fleet is covered under trawl electronic monitoring (EM), and all partial coverage catcher vessels operating out of Kodiak are subject to observer coverage under the existing annual deployment plan. In considering resuming partial coverage for the remaining fleets in 2020, which are primarily fixed gear, the Council recommends NMFS strongly consider tradeoffs of the concerns outlined in the May 2020 FMAC report against the utility of limited data that may be collected. If NMFS proceeds, the Council recommends the following:

- Reintroduce partial coverage using trip selection out of a select number of key ports (e.g., in addition to Kodiak)
- Maintain the current coverage/selection rates for vessels carrying EM
- Given the limited opportunities for outreach, focus on communicating proposed changes to affected fleets

2021 Annual Deployment Plan
The Council recommends a high priority is placed on developing a 2021 Annual Deployment Plan (ADP) that provides necessary data while being responsive to continued COVID-19 challenges and Council priorities. The Council reiterates the January 2020 Council priorities relative to the 2021 ADP, including: 1) continuation of the trawl EM EFP; 2) integration of electronic monitoring into the overall monitoring of fixed gear; and 3) evaluation of different criteria to define the 'zero selection' pool to meet data needs and improve cost efficiency.

Appendix B: Comparison of alternative sampling designs for 2021

Introduction

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

The ADP provides an annual process for NMFS and the Council to evaluate deployment and improve the sampling design. The adopted design in the Final 2020 ADP allocated observed trips among three strata defined by gear according to a 15% + optimized allocation. The optimized allocation resulted from the interactions of stratum size and variance from a combination of discarded groundfish and Pacific halibut Prohibited Species Catch (PSC), and Chinook salmon PSC (NMFS 2019a).

In March 2020 the NMFS issued waivers from observer coverage as a result of the COVID-19 pandemic. Vessels participating in the fixed gear (Hook and Line - HAL, and Pot Gear - POT) Electronic Monitoring (EM) pool were not affected. The guidance provided to analysts was that observers would be required to complete a 14 day quarantine upon arrival to a new port. By June 2020 partial observer coverage had been reinstated in Alaska by switching from a trip-based deployment method to a port-based trip deployment method. Basically these two methods are identical, using the trip as the primary sampling unit. However, the port-based trip deployment method excludes fishing activities from observation if they do not depart from and land within a port that is within the NMFS list of observable ports. The NMFS observable ports are 1) feasible to deploy observers from given current health mandates and 2) receptive of enough fishing effort to make the deployment of observers worthwhile. In statistical terms, prior to COVID-19, all ports were within the sampling frame, whereas only some ports remain in the sampling frame in response to COVID-19. The NMFS designated 14 ports that fit the two criteria above, from which they would deploy observers for partial coverage: (1) Akutan, (2) Dutch Harbor/Unalaska, (3) False Pass, (4) Homer, (5) Juneau, (6) Ketchikan, (7) King Cove, (8) Kodiak, (9) Nome, (10) Petersburg, (11) Sand Point, (12) Seward, (13) Sitka, and (14) Yakutat.

In June 2020 the Council recommended that the NMFS place a high priority on developing a 2021 ADP that provides necessary data and is also responsive to continued COVID-19 challenges and Council priorities, particularly improving cost efficiencies in the partial coverage category.

This analysis is an attempt to present alternative Scenarios (the term used to define a possible Final ADP) to facilitate meaningful movement towards the goal of one fully-integrated fishery monitoring program, where each monitoring tool is maximized towards efficiency and effectiveness. Towards this goal, this analysis contains three Scenarios that loosely represent the past, present and experimental near future of the partial coverage fishery monitoring program in Alaska.

Methods

Here we have built upon the lessons learned in the Draft and Final versions of the ADP and combined all of these variables into one analysis. This version presents alternative Scenarios for evaluation (aspects of the prior Draft ADPs) and also forecasts future fishing effort (the focus of prior Final ADPs)

Data Preparation: Defining the partial coverage fleet

The partial coverage fleet consists of catcher vessels 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 2021 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, 3) vessels that volunteer for EM and are either placed into research EM, or are placed by NMFS into fixed gear EM, and 4) fishing trips that are conducted under a trawl gear EM EFP. The trawl gear EM EFP is an Exempted Fishing Permit (EFP) issued by NMFS for trawl catcher vessels using pelagic trawl gear. This EFP creates a new EM trawl stratum within which discards will be monitored by EM systems for compliance and catch accounting (including salmon) will be performed by dockside observers. The EFP uses funding by outside grant sources and reduces the total number of trips/days fished within the observer pool.

This analysis attempts to predict future fishing effort and future expenditures towards fishery monitoring in the North Pacific. The uncertainties inherent in this activity include determining which vessels will participate in which monitoring pool, how fishing activity will change from the past to 2021, and how coverage rates need to be set in order to keep the fishery monitoring program fiscally solvent. An additional requirement this year is to account for uncertainty in the deployment model due to the unforeseen impacts of the COVID-19 pandemic.

A database containing 2017 - 2020 species-specific catch amounts, dates, locations, and observation status was first created from data maintained by the Alaska Regional Office and the Fisheries Monitoring and Analysis (FMA) Division of the Alaska Fisheries Science Center (AFSC). The data were then parsed to reflect the partial coverage fleet subject to observer coverage in 2021, and finally re-labelled according to the alternative deployment designs as described below.

Uncertainty due to participation in fishery monitoring pools

The composition of the partial coverage pool for 2021 was created by assuming that the same AFA-endorsed trawl catcher vessels that volunteered to carry full observer coverage when fishing in the Bering Sea and Aleutian Islands in 2020 will continue to do so in 2021, and that the list of fixed gear EM vessels in 2020 would also be the same for 2021. The list of Trawl EM EFP vessels for 2021 was provided by the EFP applicants prior to this analysis.

Uncertainty due to Electronic Monitoring

In the past there has been interest in examining Scenarios in which the EM pool is expanded by a number of vessels. However, it is unknown which vessels might apply and be accepted into the EM pool. To address this in the past, a random draw of possible additional vessels would be used to simulate this expansion. Unfortunately, the results of this exercise were deficient. First, because it is a random draw, on average the results of adding new vessels always show unbiased outcomes. However, the act of adding new vessels to the EM pool is not the result of random draws. Instead it is the result of a volunteer process that is then vetted by the NMFS according to policy and data needs. Prior approaches to simulate potential impacts of increasing the EM pool were discontinued since it is unknown which vessels will volunteer from one year to the next, and the EM vessel selection process is not random.

Uncertainty due to Pollock Trawl EFP

The pollock trawl EFP includes a provision where a vessel fishing in the Gulf of Alaska (GOA) may opt out of the EFP (and thus into random selection for at-sea observer coverage) on a trip-by-trip basis. For

EFP vessels in partial coverage, simulated future fishing trips were given an 83.61% probability of being under the EFP by random draw based on past participation in the EFP on a trip by trip basis. While informed, this method of simulating participation in the EFP is still deficient since it is modeled with a random draw. Improvements to this simulation are planned for future ADPs.

Uncertainty due to COVID-19

The list of 14 fishing ports 'in the frame' during 2020 and the inability to deploy observers from Akutan was assumed to be the case for partial coverage fishery monitoring in 2021. However, the fishing data used in simulations only had the offload port specified, and not the embark port. These analyses therefore assumed for all trips that the embark port was the same as the disembark port and do not account for waivers that will be issued for trips that embark from ports outside of the sample frame or trips with differing embark and offload ports.

Predicting future fishing effort

Fishing effort for the upcoming year follow those detailed in Ganz and Faunce (2019) and employed in the 2020 Final ADP (NMFS, 2019a) with some exceptions. Briefly, trends in cumulative effort from 2017-2020 inclusive were examined by stratum, Fishery Management Plan (FMP) area (GOA or BSAI), and target species (Halibut, Pacific cod, Pollock, Sablefish, or "Other"). Although 2020 fishing effort is used to predict effort for 2021, when this analysis is conducted only a partial year is available. In order to project 2020 fishing effort to the end of the year, we used the ratio of total effort to effort to date from previous years, and projections were made for each gear type, FMP, and target species combination for 2020. This estimate for the end of the year trips in 2020 was used as the base fishing effort (in terms of trips) for 2021.

Uncertainty in Trip Selection

The relationship between past fishing effort and future fishing effort have been disrupted by the COVID-19 pandemic and its effects on fishery markets. To incorporate some uncertainty in the estimate of 2021 fishing effort, the number of estimated trips for 2021 in each Gear + Target + FMP combination was altered by up to 25% in either direction. The result was an increase and decrease in fishing trip estimates by 50% overall. The process of generating a forecast for numbers of future fishing trips and selecting trips from the past to generate a population was repeated at least 500 times for each Scenario.

One problem that arises in simulating future fishery monitoring is the need to account for variation in trip duration and which trips are selected for monitoring. If only short trips are accounted for, more trips may be afforded by the same amount of money (and hence a higher selection rate) than if longer trips were selected. For each population, each trip was assigned a random number between 0 and 1 and ODDS selection processes were simulated. This random number assignment and ODDS simulation was repeated 100 times for each population.

Budget Forecasting

Observer deployment is paid for according to a negotiated contract between NMFS and its observer provider. Under this contract there are guaranteed days that carry a high 'front-load' cost that includes much of the risk / reward incurred by the contractor. Above and beyond this number of guaranteed days there are option days. Option days are less expensive on a per unit basis. In this way, when measured in terms of total costs per day, economic efficiency is correlated with budget size. The larger the budget, the less deployment costs per unit. This draft ADP uses negotiated contract day costs for observer coverage and a ratio estimator of actual travel to contract day costs to generate models of total costs for a given number of contracted days for the coming year and future years. Using inputs of the available budget, past expenditures, and estimated revenue from fee proceeds, an initial budget can be set so that an identical sized observer program in terms of days can be sustained for a predetermined period of time.

In this analysis a budget was set so that a fiscally sustainable observer program could be maintained until 2024 while also sustaining a $1M EM fishery monitoring program every year.

Alternative Scenarios for the 2021 ADP

Three alternative 2021 ADPs, termed *Scenarios* were created for comparison for one another. In their entirety, they represent a progression from a partial coverage fishery monitoring program that uses at-sea observers as its only monitoring method to an increasingly novel and experimental program that attempts to optimize at-sea observers with EM for both cost efficiency and data quality.

Focusing on the objectives to design a cost-effective and efficient fishery monitoring program that utilizes both EM and observers, the following three Scenarios were evaluated:

1. Scenario 1: This Scenario is the *control*. In this Scenario observers are the only fishery monitoring tool employed and they are deployed according to the original trip-based deployment model. This Scenario allows us to measure how changes to the partial coverage fishery monitoring program since 2013 have impacted the data quality and economic efficiency. In this Scenario, there is no Trawl EFP, no Fixed Gear EM, and no Port-Based Deployment.

2. Scenario 2: This Scenario is essentially *status quo*, or present state. It assumes a port-based trip selection deployment model, the trawl EFP and fixed gear EM based on the vessel participation in 2020.

3. Scenario 3: This Scenario is *future experimental*. It assumes a port-based trip selection deployment model, the trawl EFP and the entire partial coverage fleet monitoring is optimized for cost efficiency and utility. In this Scenario, fixed gear EM participation is based on cost-efficiency and minimizing potential gaps (so-called 'optimized' EM). For comparison with Scenario 2, its maximum membership is held at the size in effort (days) to Scenario 2.

The entire process of building future fishing populations and assigning Scenarios is depicted in Figure B-1.

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*).

Each Scenario employed the same sampling design, and core methods have not changed since prior versions of the Draft ADP (NMFS 2019b).

<u>Stratification</u>

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 or target species is not.

There are numerous reasons for creating strata. These include: when a separate estimate for a subpopulation 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:

- 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 2021 observer deployment. 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 terms of trips *N*) in a stratum (*H*). 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

$$r_h = \frac{F_{2021}}{\sum_{h=1}^{H} c_h N_h}, \qquad (1)$$

where F_{2021} is the estimated funds from the budget forecasting.

2. 15% + Optimized

Unlike equal rates afforded, this sample allocation adopts a “hurdle” approach to optimization. First, observer sea days are allocated equally up to a 15% coverage rate (the base-rate, or hurdle). Then, 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%, equal rates allocation is employed instead. The minimum 15% coverage rate was recommended by the Fisheries Monitoring Science Committee because it has been shown to eliminate or minimize severe gaps in observer data (Faunce et al. 2017, NMFS 2017a, Gasper et al. 2019), and was adopted by NMFS since 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

$$F_{2021+} = \sum_{h=1}^{H} c_h \, N_{h+}. \qquad (3)$$

The F_{2021+} and N_{h+} is then allocated following the optimized design. Optimal allocation beyond the 15% minimum hurdle 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+}), 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

$$n_{+} = \frac{F_{2021+}\sum_{h=1}^{H}\left(\frac{n_{h+}s_h}{\sqrt{c_h}}\right)}{\sum_{h=1}^{H}(N)} \quad \textit{Cochran (1977).} \qquad (5)$$

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

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

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

<u>New - Monitoring Rates vs. Programmed Rates</u>

Fishery monitoring selection rates for observer deployment were based on the number of trips anticipated to be observed divided by those expected to be fished. Strata can have different selection rates, but a trip can belong to one and only one stratum. Prior to mid-2020, all fishing trips in partial coverage were accessible to monitoring – that is, they were all in the sampling frame. This meant that if a 15% selection rate was applied to 100 trips, then we would expect 15 trips to be observed.

A problem arises when not all fishing trips are accessible to fishery monitoring. To achieve the same 15 monitored trips, an inflation in the selection rate on the trips remaining in the sampling frame is necessary to achieve the same number of observed trips.

The new port-based trip selection method presented in Scenarios 2 and 3 necessitated by COVID-19 requires calculation and presentation of two selection rates. The first is termed the *monitoring rate*, and this is the selection rate that would occur if all trips in the stratum were accessible to observation. The second is the *programmed rate*, named because this is the inflated selection rate that would be programmed into ODDS to achieve the monitored rate across the entire stratum. In this analysis both rates for each stratum, each allocation, each Scenario are presented with the relative proportion of fishing trips that are accessible to fishery observers.

Evaluation of Alternative Designs

Data from 2017, 2018, and 2019 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 salmon PSC[6].

Gap Indices are now termed Similarity Indices

The methods used in this analysis are similar to the gap indices or gap analyses employed in Appendix C of the 2020 Draft ADP (NMFS 2019b). They are rebranded similarity indices here. What follows is a description of this method with changes made since it was first performed.

Potential 2021 partial coverage fishing events from multiple populations were used as the basis for performing a simplified version of the Catch Account System's (CAS) post-stratification process. This was done to quantify the degree to which data from monitored trips are available within specified spatiotemporal distances to unmonitored fishing trips. In general, the larger the distance, the greater the potential for problematic gaps (sparse or no data collected) and poorly representative samples within a given spatiotemporal bin (e.g., post-strata in CAS or data groupings used within stock assessments).

This analysis included four distinct types of monitoring coverage that are used within and between partial coverage selection pools: 1) Monitored observer pool trips relative to unmonitored observer pool trips (OB-OB), 2) Monitored observer pool trips relative to all zero-selection pool trips (OB-ZE), 3) Monitored EM pool trips relative to unmonitored EM pool trips (EM-EM), and 4) Monitored observer pool trips relative to all EM pool trips (OB-EM, observer data available to support EM monitoring). The OB-EM analyses were of particular focus of this analysis because they most closely describe whether observed trips from which biological data derive and from which average weight information from fishery catch is available to support EM catch estimation are representative of all trips within deployment strata.

Post-strata were generally defined by gear type, FMP, and the dominant species landed (trip target) to broadly mimic the post-strata CAS employs to generate discard estimates for the observer, zero-selection, and EM pools (i.e., OB-OB, OB-ZE, and EM-EM).

Within the post-strata of a given stratum, distance categories were defined for each trip as a function of whether the trip was monitored or its proximity to a monitored trip: 1) trip is monitored (or "covered", CD), 2) nearest monitored trip occurs 15 days before or after the unmonitored trip in the same NMFS area (AD), 3) nearest monitored trip occurs within 45 days before or after the unmonitored trip in the same FMP (FD), or 4) the nearest monitored trip meets none of the other categories and the nearest monitored trip occurs within the same year within either FMP (YD) (Table B-1). After assigning distance categories to all trips within a given post-stratum, a single 'similarity index' was calculated as a weighted proportion of trips within each of the four distance categories:

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

where S_D is the index for a given post-stratum D and P_{CD}, P_{AD}, P_{FD}, and P_{YD} are the proportions of trips in each distance category. The similarity index represents an overall measure of the spatiotemporal availability of monitoring data within a given post-stratum.The weights for the distance categories were specified to provide separation between the AD distance category to the FD and YD categories and provide an index from zero to one.

[6] The Council did not choose to include crab PSC in their October 5th 2019 Motion, 2019.

New: Stock Assessment Data Needs

To date, nearly all ADP analyses have been focused on the ability of fisheries monitoring to collect representative data for catch estimation and the needs of the stock assessment authors were not specifically considered. Here a new evaluation of the ability of the fishery monitoring program to obtain tissues to support stock assessments in Alaska is presented. Such an evaluation is necessary because biological collections by observers represent one of two major data constraints to expanding Electronic Monitoring tool use[7].

During Summer of 2019, scientists at the AFSC Seattle and Auke Bay Laboratories were asked by members of the Fishery Monitoring Science Committee to provide information as to how they were dividing (time, space, gear, etc.) fishery data in their Stock Assessment. These divisions, or *domains* in time and space for each assessment were used to define domains for evaluation.

For each ODDS iteration for each population in each Scenario, this new analysis evaluates whether or not one pair of otoliths would have been collected in the stock assessment domain. This was accomplished by querying existing data tables maintained by the AFSC / FMA Division to obtain the number of otolith pairs collected by Gear + Target + FMP per observed trip and these values were used to derive a rate of otolith collection per day per observed trip. This rate was then multiplied by the duration of each observed trip within each domain in simulations to derive a total number of otoliths collected in each domain in each simulation. For each domain, success was defined as the proportion of iterations where at least one otolith pair was collected. This is different from the similarity indices that produce a score based on how often different levels of data are achieved in aggregate among all trips. This criterion for success was used as it represents a minimum benchmark that can be applied to all stock assessments. Future development of this analysis may consider more specific success criteria such as target otolith collections specified by stock assessment authors or targets defined by otolith collections made in prior years. While this analysis has the ability to be performed on all stock assessments, here only results for the Gulf of Alaska Pollock stock and the Alaska Sablefish Stock are presented.

A complete summary of the metrics used to evaluate alternative deployment designs is provided in Table B-2. The entirety of the rate calculation and evaluation methods can be seen graphically in Figure B-2.

Comparison of stock assessment probability of successes for a domain across all three Scenarios was accomplished by dividing each by the largest value among Scenarios. In this way the relative difference from the best performing Scenario could be easily determined.

'Optimizing' EM

Scenario 3 is an attempt at 'optimizing' EM. Towards this end, EM boats were added to the EM pool that were cost effective and did not result in large changes in data availability, while also giving priority to pre-existing EM boats for inclusion. These individual elements are now described.

Cost-effectiveness for each vessel in Scenario 3 partial coverage was evaluated against a break-even price. This break-even price was determined from using the most recent published information on fixed gear EM and observers. For observers, the yearly cost of an observer is a function of the number of days fished multiplied by the cost per day and the selection rate. Assuming a minimum partial coverage program of 2000 days (the most expensive rate) a cost of $1629.03 per day was obtained from the Final 2020 ADP (NMFS, 2019a). Selection rates of 15% were used in calculations for observer break-even

[7]The other is that EM requires average weight information to convert catch rates to total catch in weight for the CAS.

costs. For EM, the yearly cost of a vessel was determined to be the result of two values added together. The first value is the equipment costs divided by its longevity. The second value is then the same as calculated for observers – the cost per day multiplied by the number of days fished multiplied by the selection rate (this is the EM review cost). Table 2-6 of the 2018 Annual Report (NMFS 2019c) yields estimates of $593,109 / 1005 = $590.16 per review day. An equipment cost of $10,000, a lifespan of 5 years, and an EM review rate of 30% were used in calculations. Setting observer annual costs equal to EM annual costs and solving for the number of days fished parameter yielded 29.71 days. From this, a vessel must fish for at least 30 days to be cost-efficient for EM. Following this, all vessels were evaluated for their cost effectiveness based on their expectations to fish in 2021. From this exercise three categories were created: cost-effective vessels that were prior EM vessels (having fished with EM at least once during 2017-2019), cost-effective vessels that were not prior EM vessels, and cost-ineffective vessels.

Next, a similarity analysis was performed on the 2017-2019 dataset without any EM vessels. This provided base values to compare to for the next step. The baseline was then compared to the similarity scores obtained from adding each cost-effective and previously wired EM vessel into the EM pool. The difference from the scores with the single EM vessel and with no EM vessels divided by the number of EM trips was saved as a *vessel difference score*. A vessel difference score was calculated for every pre-wired cost-effective vessel, and used to rank each vessel from smallest to largest. The vessel with the best score was added to the 'optimized' EM list, and any vessel that caused any Gear + Target + FMP OB-EM similarity score to drop below 0.5 was removed from consideration for EM in Scenario 3. The similarity analyses were repeated with all remaining pre-wired cost-effective candidates for EM so that the cumulative effects of a growing EM vessel fleet was considered with each new vessel.

After all pre-wired EM vessels were considered, cost-effective vessels with no history within the fixed-gear EM program were evaluated, continuing where the prior similarity analysis concluded. That is, cost-effective pre-wired EM vessels received priority over cost-effective vessels that have not been wired for EM systems. This process was continued until all of the vessels in this list were added, or the total number of fished days in the Scenario 3 EM pool was equal to or was greater than the number of fished days in the Scenario 2 EM pool. If all of the cost-effective past EM vessels were vetted according to the above and the Scenario 3 EM pool fished days was still lower than the Scenario 2 EM pool days, the process of adding potential EM vessels (and calculating cumulative difference scores) was continued for the cost-effective vessels that were not prior EM vessels in rank order of their vessel difference score. Cost-ineffective vessels were not considered for inclusion in the EM pool for Scenario 3. The result is a vector of cost-effective EM vessels ordered by their impacts to similarity scores relative to their fishing effort after giving priority to past EM participants.

A visual depiction of the process of assigning observer and EM fishery tools to each stratum and evaluation of each scenario is depicted in Figure B-2.

Results and Discussion

Fishing Effort Forecast

This analysis uses a total amount of observer days that facilitates stable and fiscally solvent fishery monitoring in the partial coverage fleet until 2024 while also supporting a $1M EM fishery monitoring component. The partial coverage fishery in Alaska has been in steady decline in terms of total trips fished from 2017-2019 (Figure B-3). This analysis estimates that this decline will be exacerbated in 2020. Estimates of partial coverage fishing effort in 2020 is 5,299 trips, which represents a 24% decline from 2019 (6,992 trips). Expectations of fishing effort (including EM and zero-coverage) in 2021 range between 3,975 and 6,624 trips.

Budget Forecasts

Budget forecasts estimated that between $4.47 and 4.97 M would sustain observer and EM fishery monitoring for 2021 and beyond (Table B-3). Simulated sampling among Scenarios and allocations showed good agreement among all populations which means that the analysis is working as designed and selection rates were set to the same budget constraints (Figure B-4). Figure B-4 illustrates the extreme costs that could occur in 2021 to help aid in future planning.

'Optimizing' EM

This analysis identified 237 cost-effective fixed gear vessels that fished at least 30 days per year within either the observer or EM pools. Of the 178 vessels that had a history of EM participation since 2017, 74 of these were cost-effective. Of these 74, 58 were considered to be good EM candidates without severely impacting similarity scores. To these 58, an additional 31 new cost-effective vessels that met the same criteria were added. The final list of 89 vessels is less than the current 169 in Scenario 2, but were predicted to fish the same effort. Assuming hardware purchases for 80% of the fleet, this smaller pool in theory should result in the same recurring costs (like maintenance and review) but ultimately save $10,000 / 5 years × 0.8 × (169 vessels – 89 vessels) = $128,000 per year. For context, this savings translates to at least 74 additional observed days per year ($128,000/year) / ($1734.42/day, see Table B-3)). Given the values for total fishery monitoring budgets in Scenario 3, this equates to nearly 3% in potential savings.

Evaluation of Alternatives

Support of a $1M fixed gear EM fishery management component appears to nearly remove the ability of the partial coverage fishery monitoring program to afford option days and optimized days (Table B-3). The number of option days available is 906 days in Scenario 1 but only 4 days in Scenarios 2 and 3 when EM programs are in place. In this way the fixed gear EM program makes the observer program less cost efficient (see last column Table B-3). While it is true that Scenarios 2 and 3 also include a trawl EM component, it does not have any financial obligations attached to it, and therefore does not negatively impact the funding for observer coverage the way that the fixed gear EM component does.

It appears that current and forecasted partial coverage fishery monitoring in Alaska cannot guarantee coverage rates above 15% in any Scenario. This is because a factor of ± 25% was added to each simulation of fishing effect. When these estimates of fishing effort were on the upper end, the budgets were not sufficient to monitor 15% (Table B-4 & Figure B-5).

Monitoring rates were largely similar among Scenarios (Table B-4). Optimization weightings were very similar among Scenarios, with roughly 70 out of 100 cents per 'extra' dollar going towards observing the TRW stratum. 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. However, the Scenarios presented here use forecasted budgets that include revenues from an increased fee percentage expected in 2022. Increase in revenue from the fleet cannot be reasonably expected - increases in Federal funds or in cost-efficiency are required if optimized days are desired from the observer component of the partial coverage fishery monitoring program in Alaska.

The effect of restricting observer access to 13 ports is reflected in the metrics 'percent in the sampling frame' and differences between the monitored rate and the programmed rate presented in Table B-4 & Figure B-5. Port-based trip deployment disproportionately removes POT stratum fishing events from potential observation, with only 61 to 62% of events in the sampling frame compared to 82 to 92% in the other strata. Consequently, even though the 15% + Opt allocation puts the majority of optimization days into the TRW stratum, its effects are diminished compared to the inflation in the selection rate required to achieve the monitored rate for the POT stratum.

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, especially so as a result of COVID-19 disruptions to the fishery time series. 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.

The Scenarios presented here represent two steps from initial trip-based deployment with observers to a fully integrated cost-effective fishery monitoring program. Each step - from Scenario 1 to Scenario 2, and from Scenario 2 to Scenario 3 - represents a chance to see how various aspects of the fishery monitoring program alter its ability to achieve the goals of supporting stock assessments and obtaining representative data for reliable catch estimation.

<u>The effects of adding the Trawl EFP + Fixed Gear EM + Port-based deployment (Scenario 1 to 2).</u>

The GOA pollock stock assessment stratifies otolith-based age data by half-year and NMFS Area. All NMFS Areas and half-year domains for this assessment are well represented as far as obtaining tissues from observers for this stock except one. In Scenario 1, otoliths were collected in Area 610 in the first half of the year 75-80% of the time, but only 28-32% of the time in Scenarios 2 and 3. However, these estimates did not include biological samples collected by shoreside observers under the trawl EFP. Although the number of biological samples collected by shoreside observers under the trawl EFP have fallen significantly short of expected numbers, the number of samples collected has not been zero. Therefore, the results presented in Figure B-6 are overly pessimistic of the amount of tissues overall, even if they are likely reflective of tissues expected to be obtained at sea.

The effect of the trawl EFP is that about half of the GOA pollock trawl trips become unavailable to the observer program (Figure B-10). Despite this, similarity scores between observed and unobserved GOA pollock trips is unaffected (Figure B-10). Thus this EFP does not appear to hinder the ability for at-sea observers to collect representative data within this fishery to support catch accounting. The trawl EFP carries the potential benefit of reducing the partial coverage fishing effort that is necessary to be monitored at-sea for catch estimation and stock assessment purposes.

The sablefish stock assessment is Alaska wide, and does not contain any subdivisions in time and space. However, it was determined here that without entire FMP Areas, erroneous conclusions about the size and age structure of the catch could result. The likelihood of obtaining at least one pair of otoliths from the GOA and Bering Sea was quite high and did not differ between Scenarios (Figure B-7). However, obtaining at least one pair of otoliths from the Aleutian Islands differed by Scenario. In Scenario 1, otoliths were collected in the AI 92-93% of the time, compared to 74-78% of the time in Scenarios 2 and 3. This drop in success rate is likely due to the inability of observers to monitor the port town of Akutan due to the town's local mandates and unwillingness to house observers for quarantine.

Migration from Scenario 1 to Scenario 2 has different effects on each gear-based stratum. This migration degraded the similarity scores for monitored trips in the observer pool in all HAL stratum fisheries examined (Figure B-8). This means that observed trips would not be as representative as unobserved trips and this could have negative effects on the NMFS to generate reliable estimates of catch. The effects of this Scenario migration on the POT stratum was less than that of the HAL stratum. Similarity scores worsened for BSAI Pacific Cod, were improved for Sablefish in the BSAI, and relatively unchanged for other fisheries (Figure B-9). Scenario 2 similarity scores were also relatively unchanged for most TRW fisheries, with the exception of the observed BSAI Pacific Cod fishery (Figure B-10). Taken together, the cumulative effects of Scenario 2 have mostly negatively affected the fishery monitoring data from HAL fisheries.

Effects of 'optimizing EM' (Scenario 2 to 3).

There is no effect on the ability of the observer program to obtain tissues to support stock assessments by optimizing the fixed gear EM fleet (Figures B-6 & B-7). Optimizing EM did have tradeoffs in terms of how similar monitored trips are to unmonitored trips in fixed gear fisheries. For example, in the HAL stratum, observed trips were less representative than unobserved trips in the BSAI Halibut fishery in all comparisons with EM optimizations (Figure B-8). This degradation was offset by improved support for EM catch estimation for the HAL Pacific Cod fishery in the BSAI (OB-EM comparison in Figure B-8). Improved support for EM catch estimation for the POT Pacific Cod fishery in the BSAI was also evident, but at the cost of degraded similarity between observed trips and the zero coverage trips in the GOA POT sablefish fishery (OB-ZE comparison in Figure B-9).

Similarity between the monitored EM trips and unmonitored EM trips was also affected by EM optimization. EM optimization improved the similarity of EM selected trips in the HAL Halibut fishery in the BSAI, but reduced the same metric in the HAL Pacific Cod BSAI fishery (Figure B-11). In this last case however, the fishery constituted fewer than 10 trips.

Summary

In aggregate, the effects on the stock assessment support and similarity scores of allocation strategy were minimal compared to that of the Scenarios. For example, the patterns in the relative similarity scores in the allocation columns of Figure B-12 & Figure B-13 are nearly identical. This is because in Scenarios 2 and 3 there were only 23-34 days allocated towards optimization on average (Table B-3). In other words, the budgets specified for observer coverage in Scenarios 2 and 3 are generally sufficient to afford the minimum-sized program of guaranteed days, but these days cannot guarantee a 15% coverage rate and provide only limited latitude to afford optimized days. The result is a 15% + Optimization allocation that closely resembles that of equal allocation.

Movement from Scenario 1 to Scenario 2 have not resulted in improvements to the similarity of observed trips to unobserved trips or stock assessment support. For example, Scenario 1 had the greatest likelihood of success for providing tissues to support these stock assessments (Figures B-6 & B-7), and for most fisheries examined, Scenario 1 also had the greatest similarity between monitored observed trips and unmonitored trips to support catch estimation (OB-OB & OB-ZE, Figure B-12). Movement from Scenario 1 to Scenario 2 has greatly reduced the similarity between observed trips and unobserved trips in the HAL Pacific Cod fishery in the BSAI (Figure B-12). The effects of the presence of a large fixed gear EM fishery monitoring component in Scenario 2 is also that sea-days are not available to deploy observers according to the 15% + Optimization strategy. The effect of the trawl EM EFP and port-based observer deployment in Scenario 2 mean that tissue collections for stock assessments are likely to be diminished. However, the effect of the trawl EFP on similarity scores is minimal and exclusion of the GOA pollock fishery from observation reduces the size of the population that needs to be monitored and likely aids in boosting observer coverage rates.

Movement from Scenario 2 (the present) to Scenario 3 has tradeoffs between the loss of similarity between monitored and unmonitored trips among some fisheries and the gain in this metric among others

(Figure B-12 & Figure B-13). Optimizing EM in Scenario 3 also has gains in terms of economic efficiency - efficiency that translates into potential money for optimized observer days[8].

One of the greatest aspects of the ADP process is that the NMFS, the Council, and Industry can adjust fishery monitoring tools to meet their desires. However, caution is warranted if these desires are based on beliefs that conflict with these realities:

1. The data quality and accessibility problems that face the current partial coverage fishery monitoring program are possible to cure.
2. These data quality and accessibility problems exist primarily in the Aleutian Islands and Bering Sea and not the Gulf of Alaska.
3. Expansion of the fixed gear EM fleet diminishes the money available to deploy observers, makes the observer fishery monitoring program less cost-efficient, and compromises the ability to fund a minimum-sized observer program.
4. Current partial coverage fishery monitoring budgets and fishing effort do not guarantee optimization of observer coverage with a $1M fixed gear EM fleet.

Caveats

With any analysis, there are caveats - no analysis is perfect. 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 is 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. Past performance is no guarantee of future returns, and in no time series is this more obvious than when the effects of COVID-19 are considered on partial coverage fishing effort in Alaska. However, here analysts have done their best to incorporate multiple sources of variation - including their own uncertainty- in an honest attempt to provide a suite of possible outcomes and not 'precise but wrong' inference. Accurate predictions of the future are always difficult, but some factors make it more so, one of which is that there is no knowledge which boats will participate in EM next year at the time this document is prepared.

ADP Analyst Team Recommendations and future direction.

The 2020 partial coverage fleet fisheries (and the entities that monitor them) are undergoing pressures that have never been experienced before. Since the present is unlike anything experienced in the past, caution must be borne when making decisions about the design of the partial coverage fishery monitoring program in Alaska. **The ADP Analyst Team recommend the final 2021 ADP employ gear-based stratification with 15% + Optimization allocation and the port-based trip selection deployment method as presented in Scenario 2 (the status quo program in place as of June 2020)**, with some hope that progress will be made towards developing a cost-efficient fishery monitoring program such as that presented in Scenario 3.

[8] Recall that potential savings from EM optimizations were not added back into Scenario 3 observer budgets.

The ADP Analyst Team recommend scrutiny of the $1M funding policy for the fixed gear EM component of the partial coverage fishery monitoring program. Funding allocations for EM and Observers should not be set by fixed dollar amounts because their relative contribution will change over time as the size of the overall program changes. A more attractive approach would be to use the same proportion of supporting funds to allocate among monitoring tools between years, or better yet, use those tools in proportion to their cost effectiveness and utility (i.e., use them where it makes the most sense). It is recognized here that the criteria used to optimize EM in Scenario 3 may not match that of the reader. It represents a first and honest attempt to build a partial coverage fishery monitoring program that uses tools where they are cost efficient and minimizes loss in data quality.

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. In addition, 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 sampling design for the Final ADP is established, 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, 2019a).

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Table B-1. Description of the scores used in similarity index calculations.

Category	Resolution	Condition	Score
C	Fine	All trips monitored ("Covered")	1.00
A		Within 15 days of monitored trip in same NMFS Area	0.75
F		Within 45 days of monitored trip in same FMP	0.25
Y	Coarse	Year-to-Date', i.e. > 45 days and/or FMP	0.00

Table B-2. Metrics for evaluating Scenarios and allocations in the Draft 2021 ADP.

Analyses	**Selected using:**	**Metric**
Spatial Representation of Otolith Collections	Equal rates/ 15% + Opt	Proportion of times >= 1 otoliths on observed trips in areas used in the assessment (or one step finer)
Observer/Observer pool (OB-OB)	Equal rates/ 15% + Opt	Relative similarity score within domain across Scenarios
Observer/Zero pool (OB-ZE)	Equal rates/ 15% + Opt	Relative similarity score within domain across Scenarios
EM/EM pool (EM-EM)	30%	Relative similarity score within domain across Scenarios
Observer/EM pool (OB-EM)	Equal rates/ 15% + Opt	Relative similarity score within domain across Scenarios

Table B-3. Scenarios considered and their budget split between observer and EM fishery monitoring tools.

Scenario	Total 2021 Budget	2021 EM Budget	2021 Observer Budget	Observer Sea Days 2021-2024	Observer Option Days 2021-2024	2021 Mean Optimized days afforded	2021 Observer Cost Per Day
1	$4.497 M	$0 M	4.497 M	2,906	906	121	$1547.69
2	$4.473 M	$1 M	3.473 M	2,004	4	23	$1733.23
3	$4.473 M	$1 M	3.473 M	2,004	4	34	$1733.23

Table B-4. Scenarios considered, allocations considered, strata, optimization weights, and resulting selection rates.

Scenario	Nickname	Allocation Scheme	Strata	Optimization Weights	Monitoring Rate (%)	Percent in Sampling Frame	Programmed Rate (%)
1	TNFNPN	Equal Rates	HAL	NA	15.94	100.00	15.94
			POT	NA	15.94	100.00	15.94
			TRW	NA	15.94	100.00	15.94
		15% + Opt	HAL	0.266	15.17	100.00	15.17
			POT	0.038	14.71	100.00	14.71
			TRW	0.696	19.00	100.00	19.00
2	TYFCPY	Equal Rates	HAL	NA	15.46	84.62	18.27
			POT	NA	15.46	62.62	24.71
			TRW	NA	15.46	91.75	16.85
		15% + Opt	HAL	0.257	14.84	84.62	17.53
			POT	0.041	14.48	62.62	23.14
			TRW	0.702	18.48	91.75	20.14
3	TYFOPY	Equal Rates	HAL	NA	15.55	82.89	18.76
			POT	NA	15.55	61.04	25.49
			TRW	NA	15.55	91.76	16.95
		15% + Opt	HAL	0.277	14.94	82.89	18.03
			POT	0.039	14.51	61.04	23.79
			TRW	0.684	18.56	91.76	20.22

Table B-5. Mean expected vessels (V_h), trips (N_h), monitored trips (n_h), and monitored days (d_h) within each pool and stratum (h) for each of the Scenarios and allocation schemes evaluated.

Scenario	Pool	Stratum (h)	V_h	N_h	Equal Rates		15% + Opt	
					n_h	d_h	n_h	d_h
1	OB	HAL	424	1,901	297	1,592	285	1,527
	OB	POT	118	763	119	624	111	583
	OB	TRW	73	1,455	227	658	264	766
	ZE	HAL	319	1,250	0	0	0	0
	ZE	POT	3	8	0	0	0	0
2	OB	HAL	288	1,297	232	1,303	224	1,258
	OB	POT	93	596	144	760	137	719
	OB	TRW	67	902	149	441	173	513
	EM	HAL	136	596	179	872	179	872
	EM	POT	25	167	50	259	50	259
	EM	TRW	38	542	542	1,516	542	1,516
	ZE	HAL	319	1,240	0	0	0	0
	ZE	POT	3	7	0	0	0	0
3	OB	HAL	343	1,383	254	1,328	246	1,284
	OB	POT	97	613	153	783	144	739
	OB	TRW	70	902	150	443	174	516
	EM	HAL	81	506	152	868	152	868
	EM	POT	21	143	43	252	43	252
	EM	TRW	38	542	542	1,517	542	1,517
	ZE	HAL	319	1,240	0	0	0	0
	ZE	POT	3	7	0	0	0	0

Figure B- 1. Process diagram for the generation of fishing populations and scenarios contained in this appendix. Inputs are outlined in green and randomly repeated processes are outlined in blue.

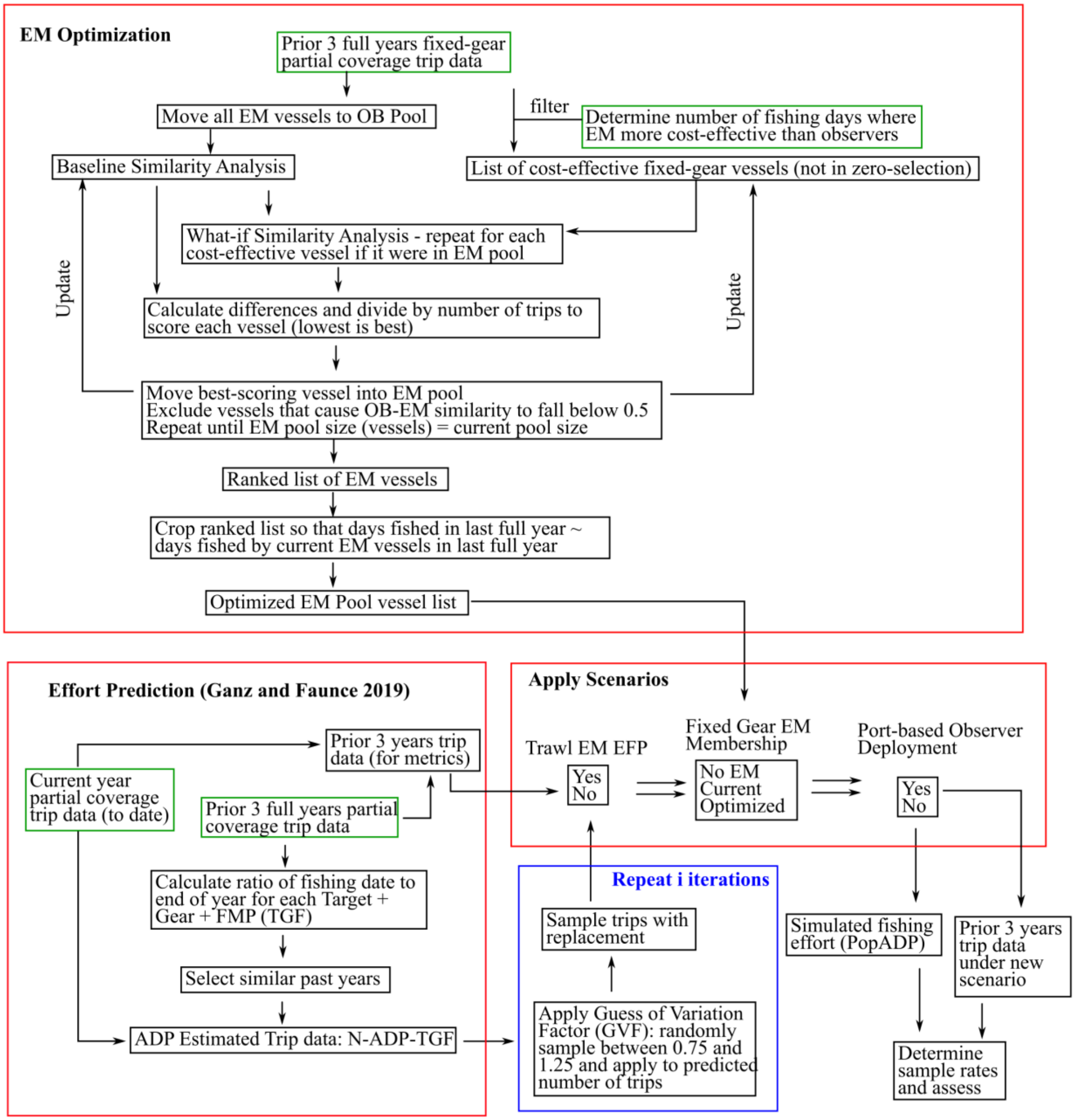


Figure B-2. Process diagram for the evaluation of scenarios under different allocation strategies in this appendix. Note that this process is performed for each of simulated fishing populations generated by the process described in Figure B-1. Inputs are outlined in green and randomly repeated processes are outlined in blue.

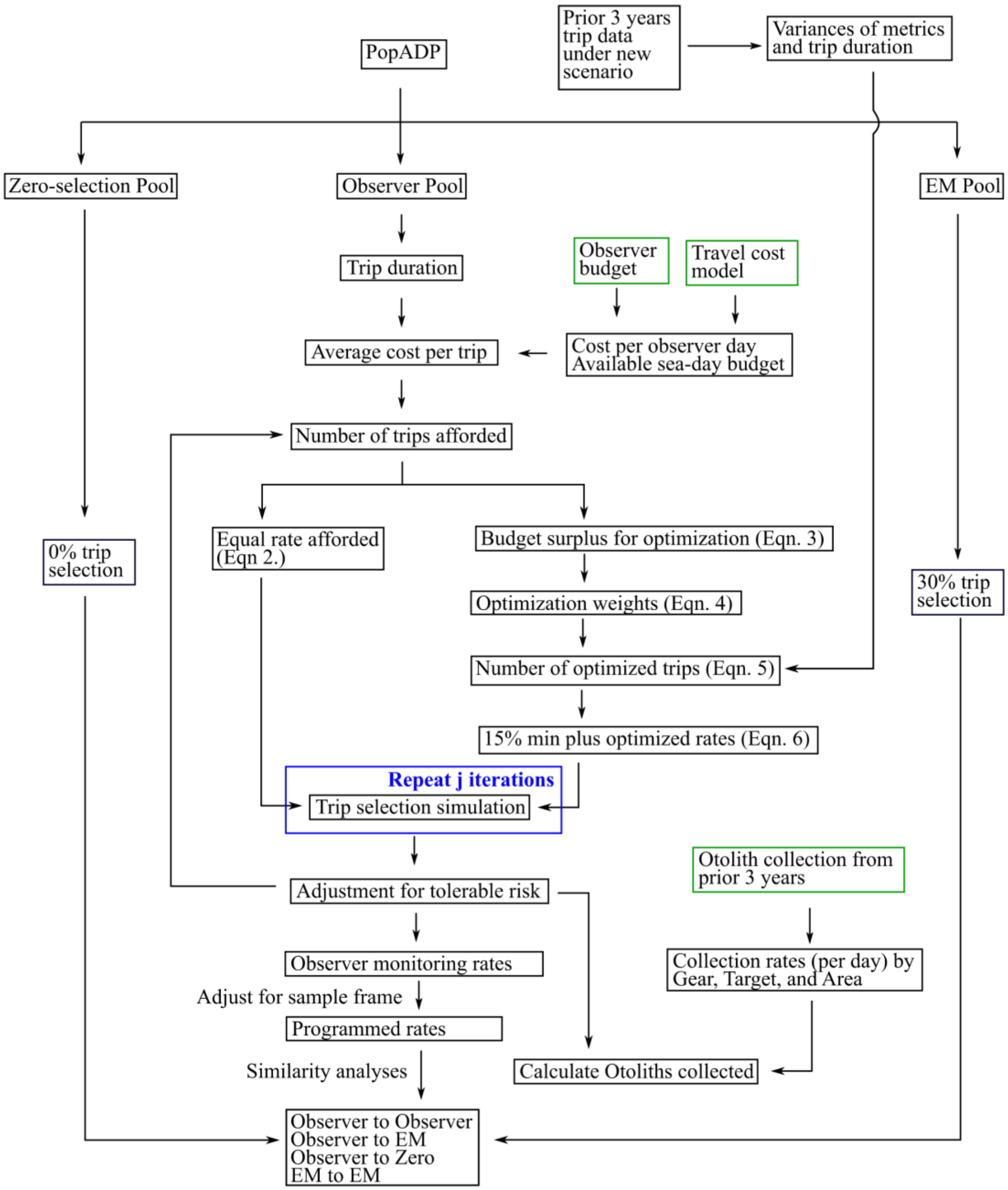


Figure B-3. Partial coverage fishing effort (in trips) from 2017 to 2020. Points in red (2020 and 2021) are estimates based on past fishing effort. Red bars around the 2021 fishing effort represent the Guess Variation Factor (GVF) that was applied to that estimate in order to account for uncertainty. Simulations in this analysis had an equal probability of containing any number of trips within the GVF range.

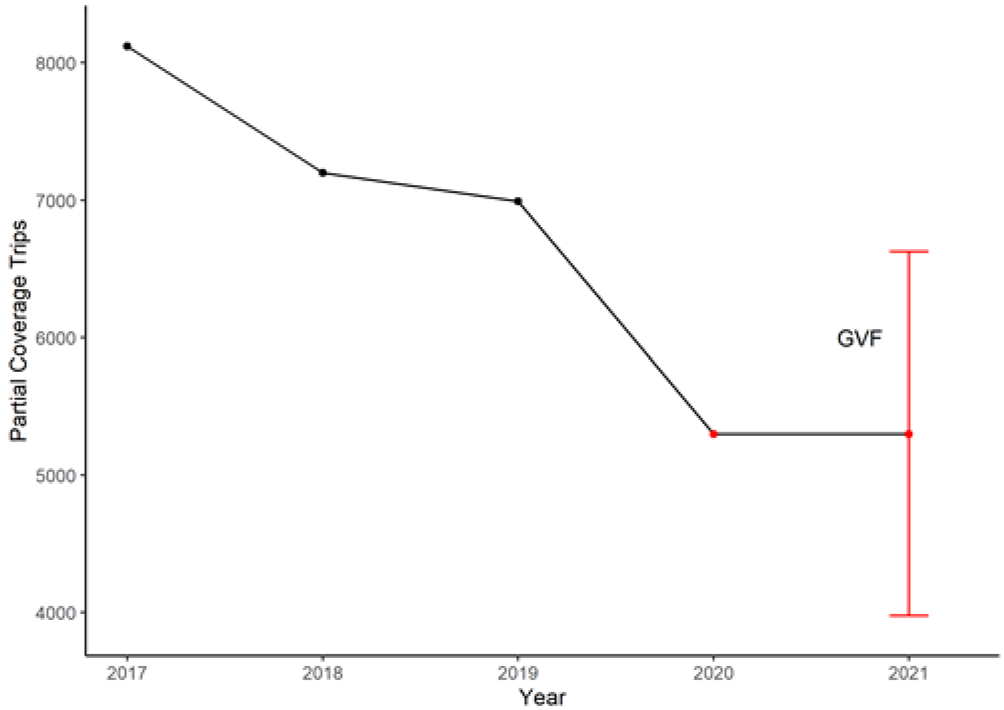


Figure B-4. Budget outcomes for each Scenario and allocation examined across all iterations and populations. The gray filled dome shape is the relative frequency of the budget expended. The blue line is the budget required for a fiscally sustainable fishery monitoring program, while the red dashed lines denote extreme (0.5 and 99.5%) outcomes.

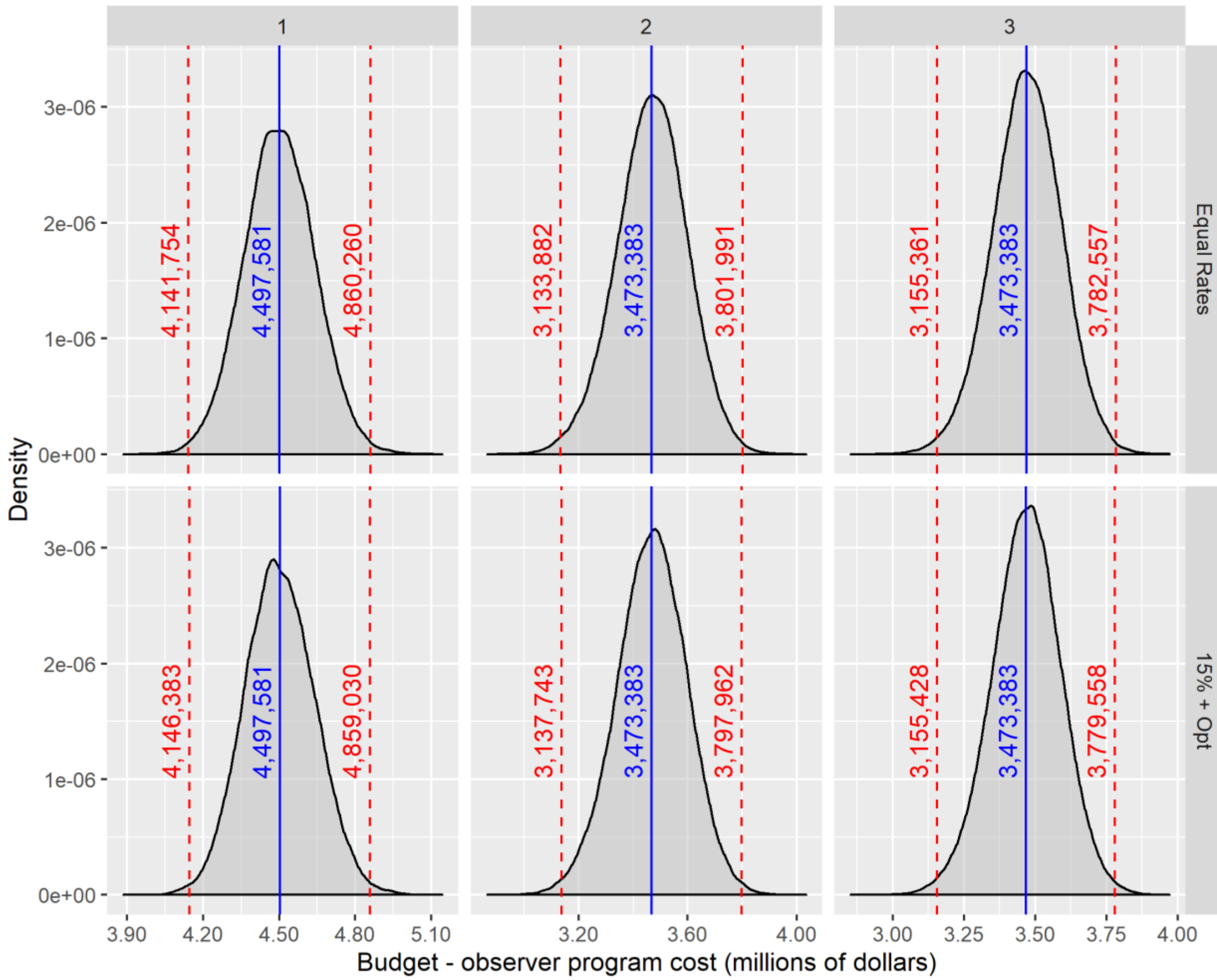


Figure B-5. Selection rates (height of the colored bar) for each Scenario and Allocation strategy estimated from this appendix with 95% confidence bounds. The dashed blue line represents the 15% hurdle.

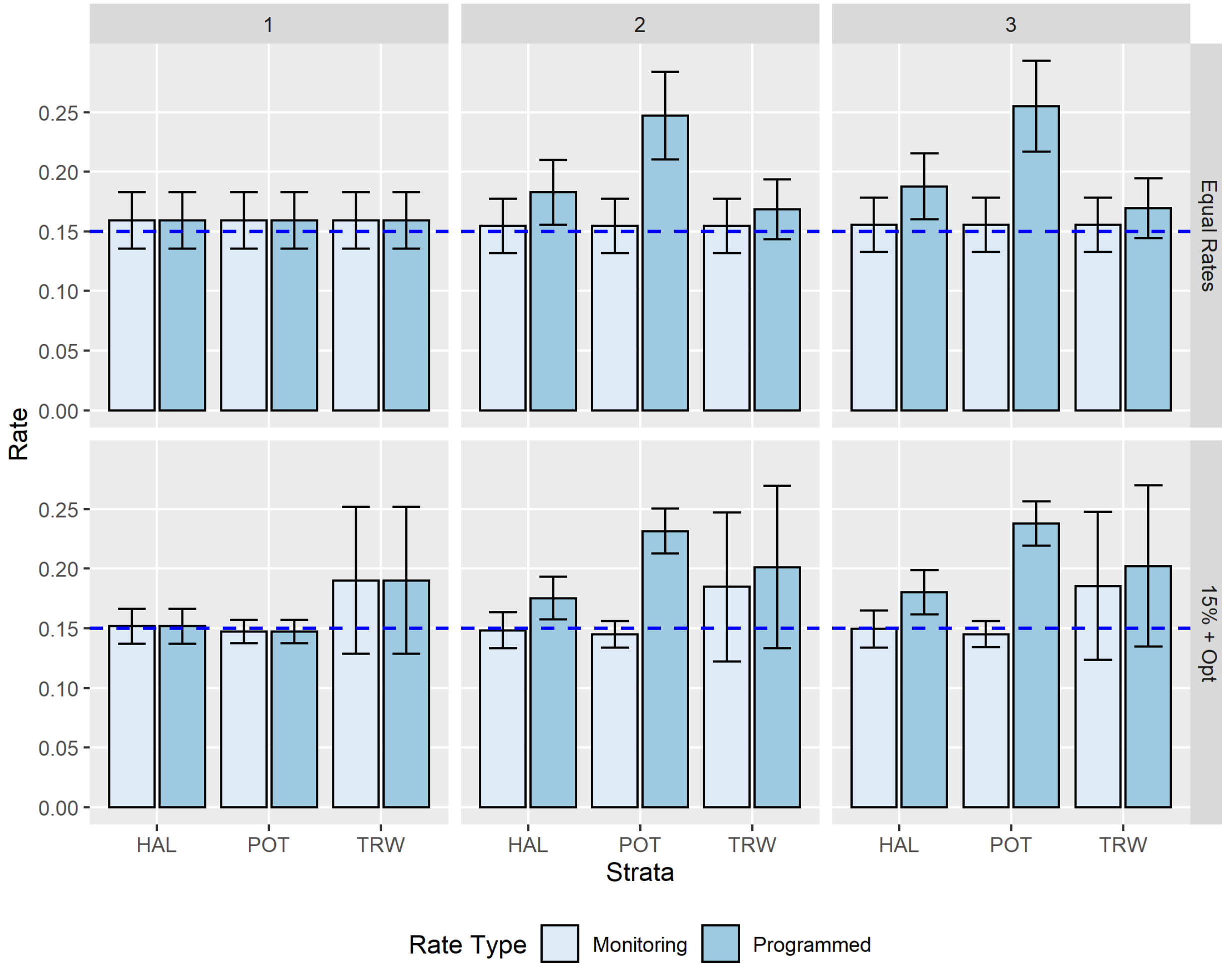


Figure B-6. Partial coverage GOA Pollock otolith collection under different scenarios and allocation strategies. Colors represent the proportion of simulations where observers collected at least 1 otolith pair within spatiotemporal domains. Gray numbers represent the average number of partial coverage trips that targeted pollock within the spatiotemporal domains.

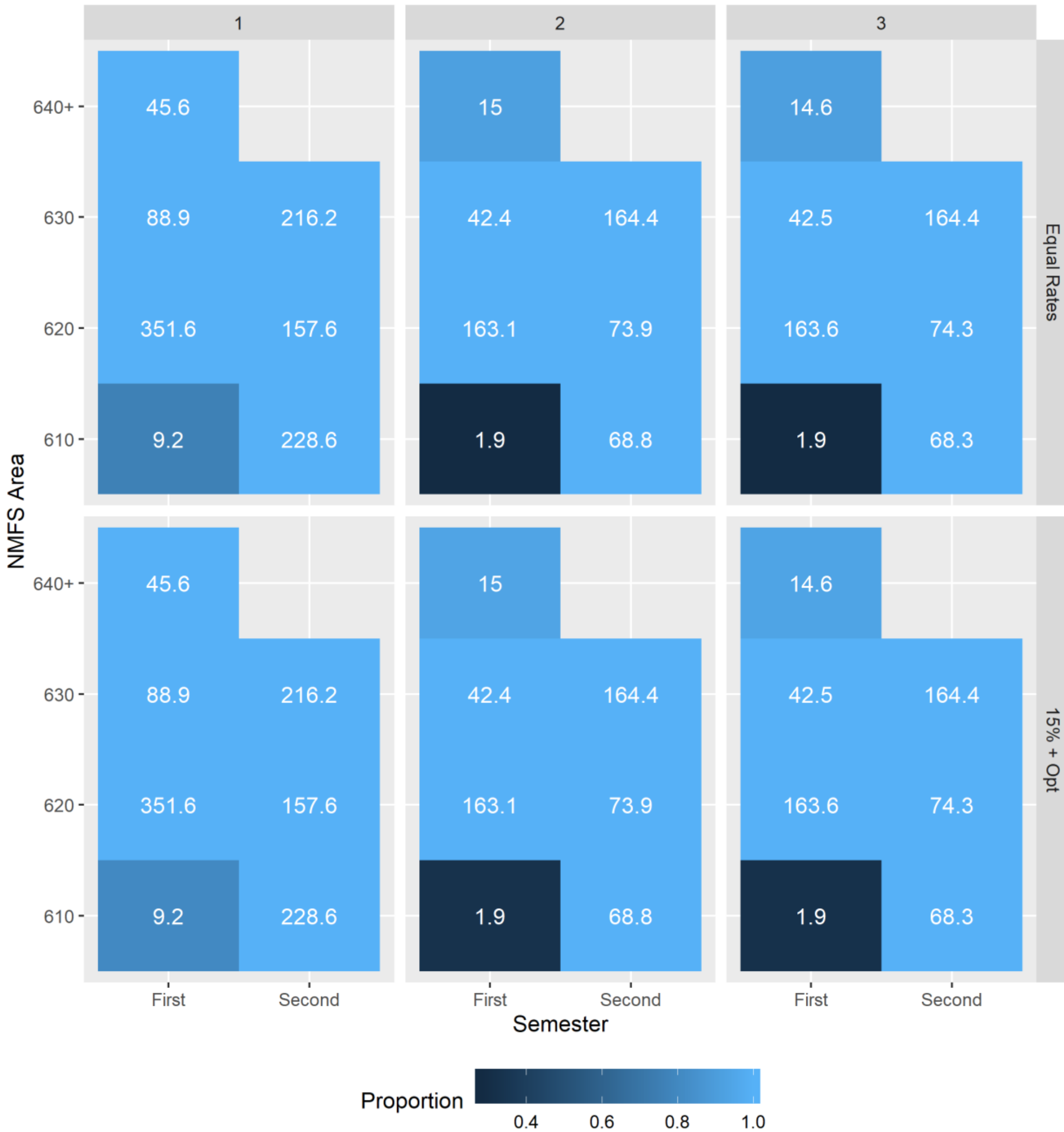


Figure B-7. Partial coverage sablefish otolith collection under different scenarios and deployment strategies. Colors represent the proportion of simulations where observers collected otoliths within spatiotemporal domains. Gray numbers represent the average number of trips that targeted sablefish.

Figure B-8. Similarity of observed trips to unobserved trips in the HAL stratum for major Gear + Target Species + FMP combinations (height of the colored bar) with 95% confidence bounds. Vertical axis scores as depicted in Table B-1. Comparisons in each row are described in Table B-2. Error bars represent 95% probability distributions.

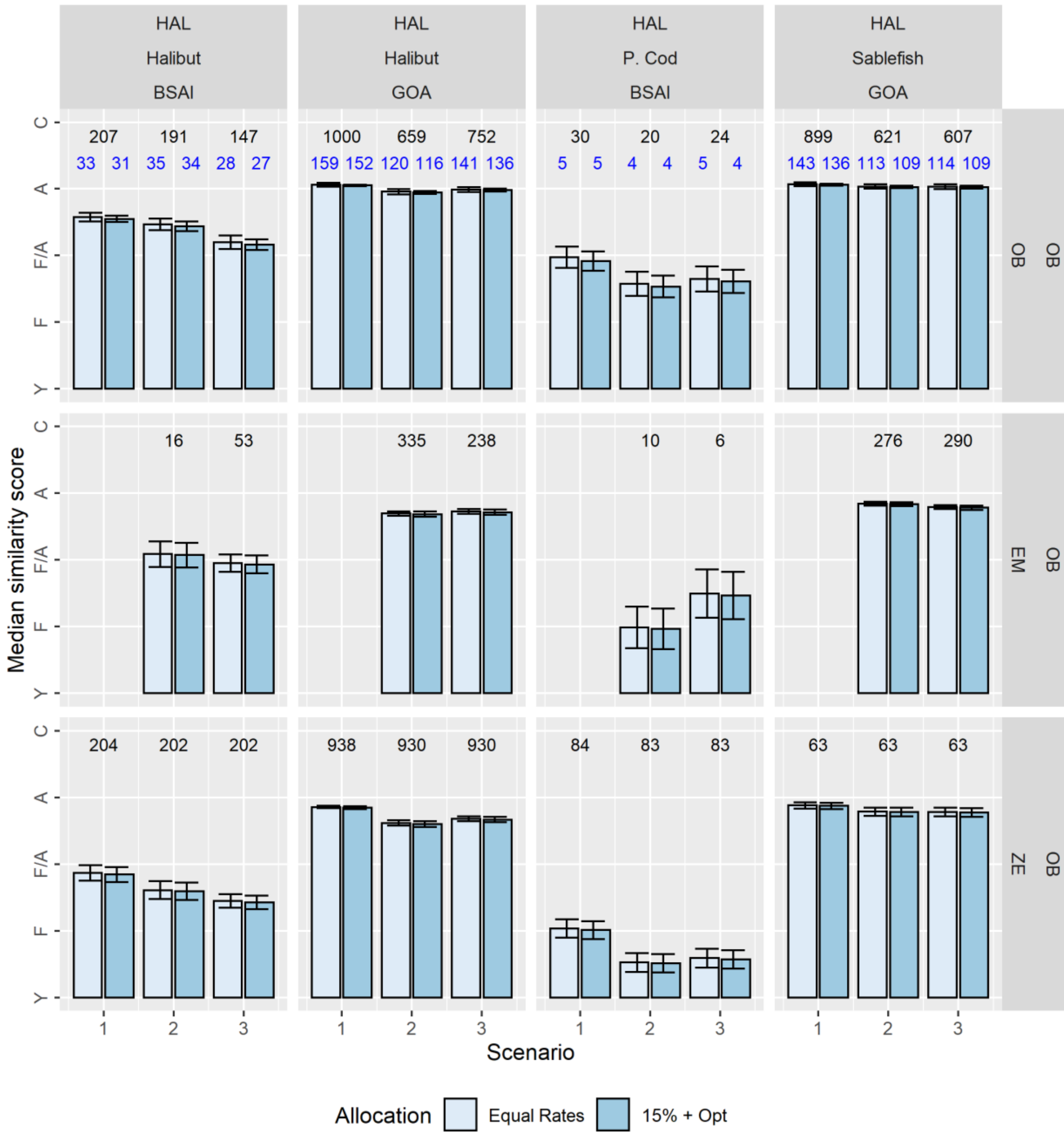


Figure B-9. Similarity of observed trips to unobserved trips in the POT stratum for major Gear + Target Species + FMP combinations (height of the colored bar) with 95% confidence bounds. Vertical axis scores as depicted in Table B-1. Comparisons in each row are described in Table B-2. Error bars represent 95% probability distributions.

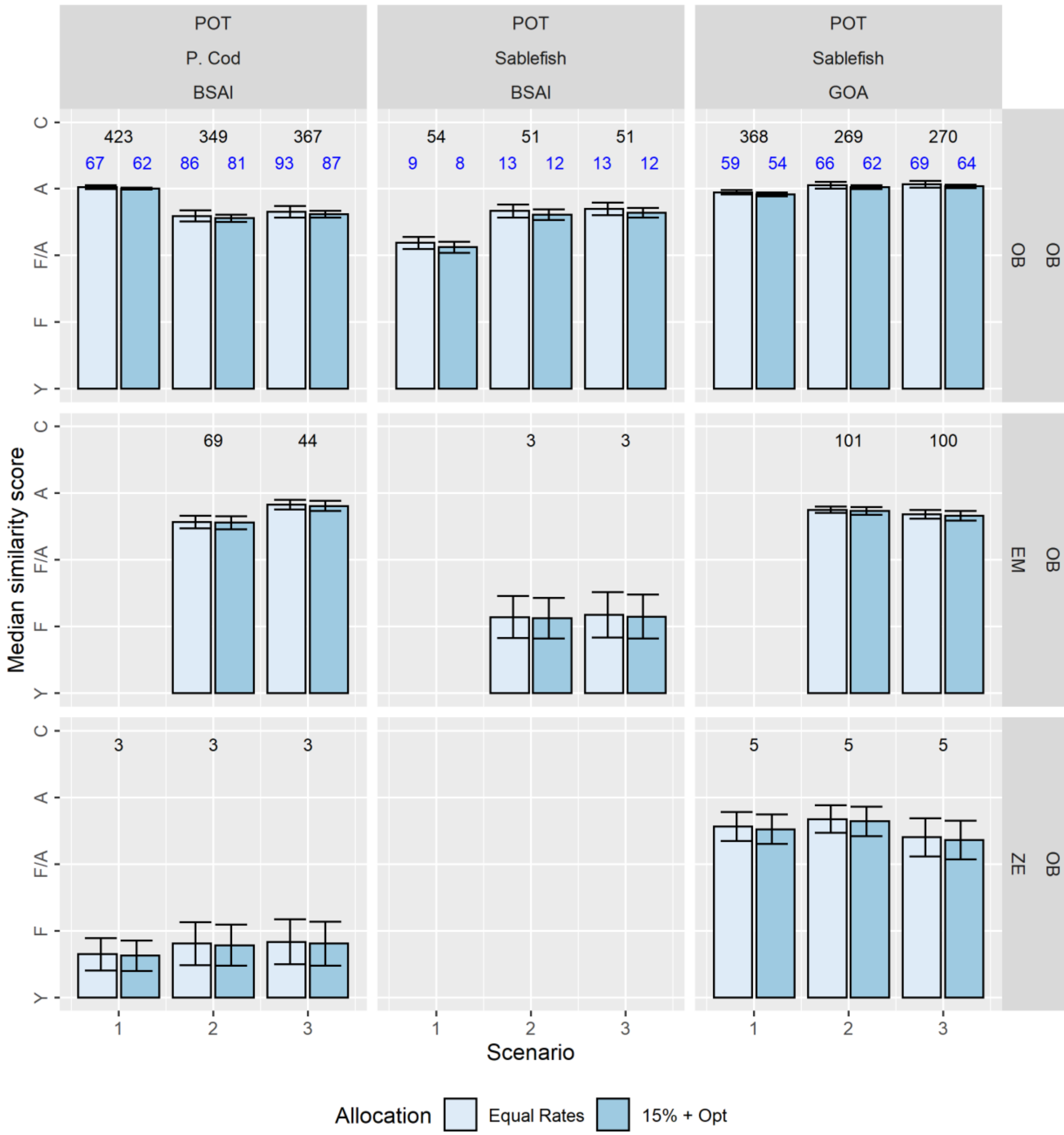


Figure B-10. Similarity of observed trips to unobserved trips in the TRW stratum for major Gear + Target Species + FMP combinations (height of the colored bar) with 95% confidence bounds. Vertical axis scores as depicted in Table B-1. Comparisons in each row are described in Table B-2. Error bars represent 95% probability distributions.

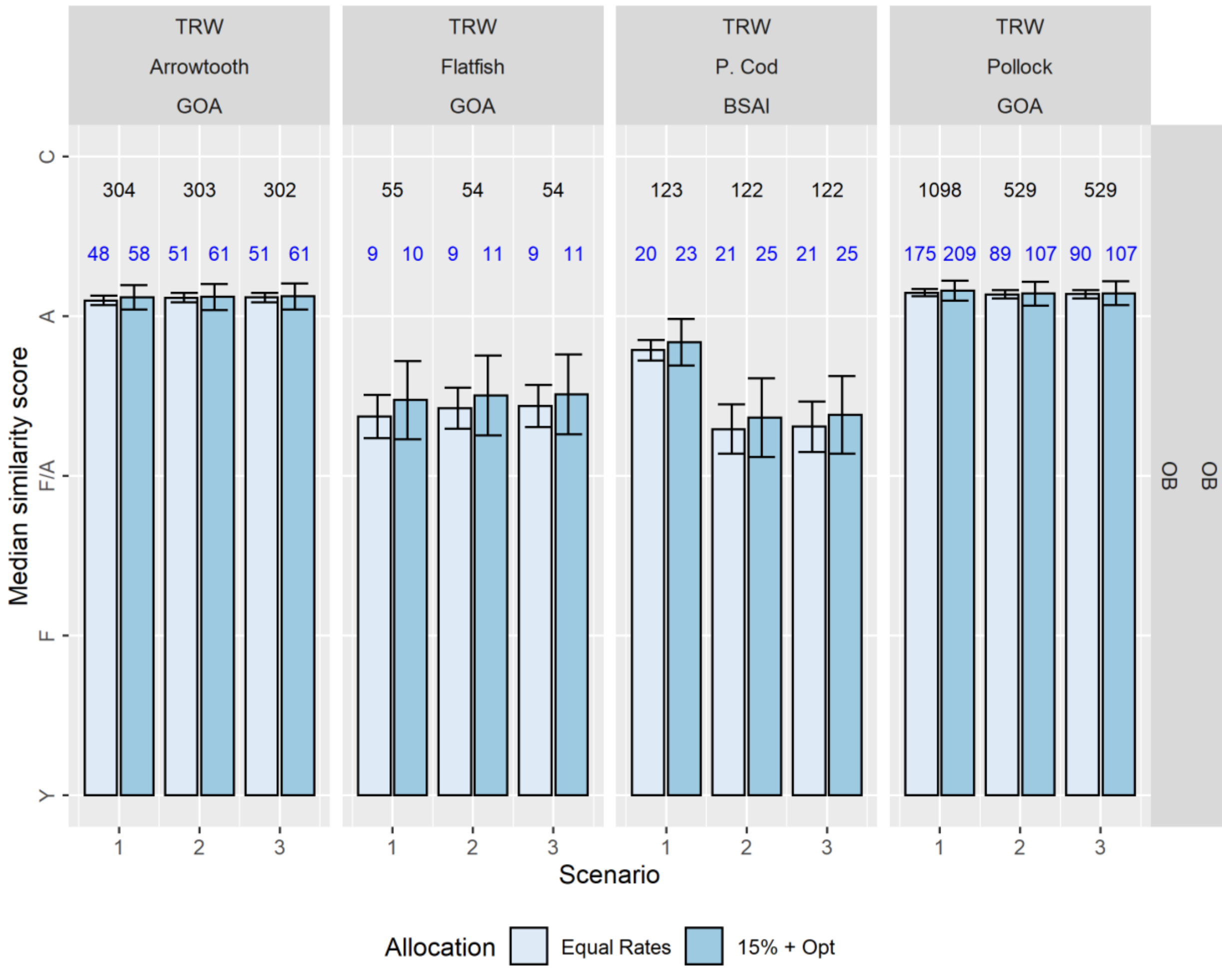


Figure B-11. Similarity of EM monitored trips to unmonitored EM trips in the HAL and POT stratum for major Gear + Target Species + FMP combinations (height of the gray bars) with 95% confidence bounds. Vertical axis scores as depicted in Table B-1. Comparisons in each row are described in Table B-2. Error bars represent 95% probability distributions.

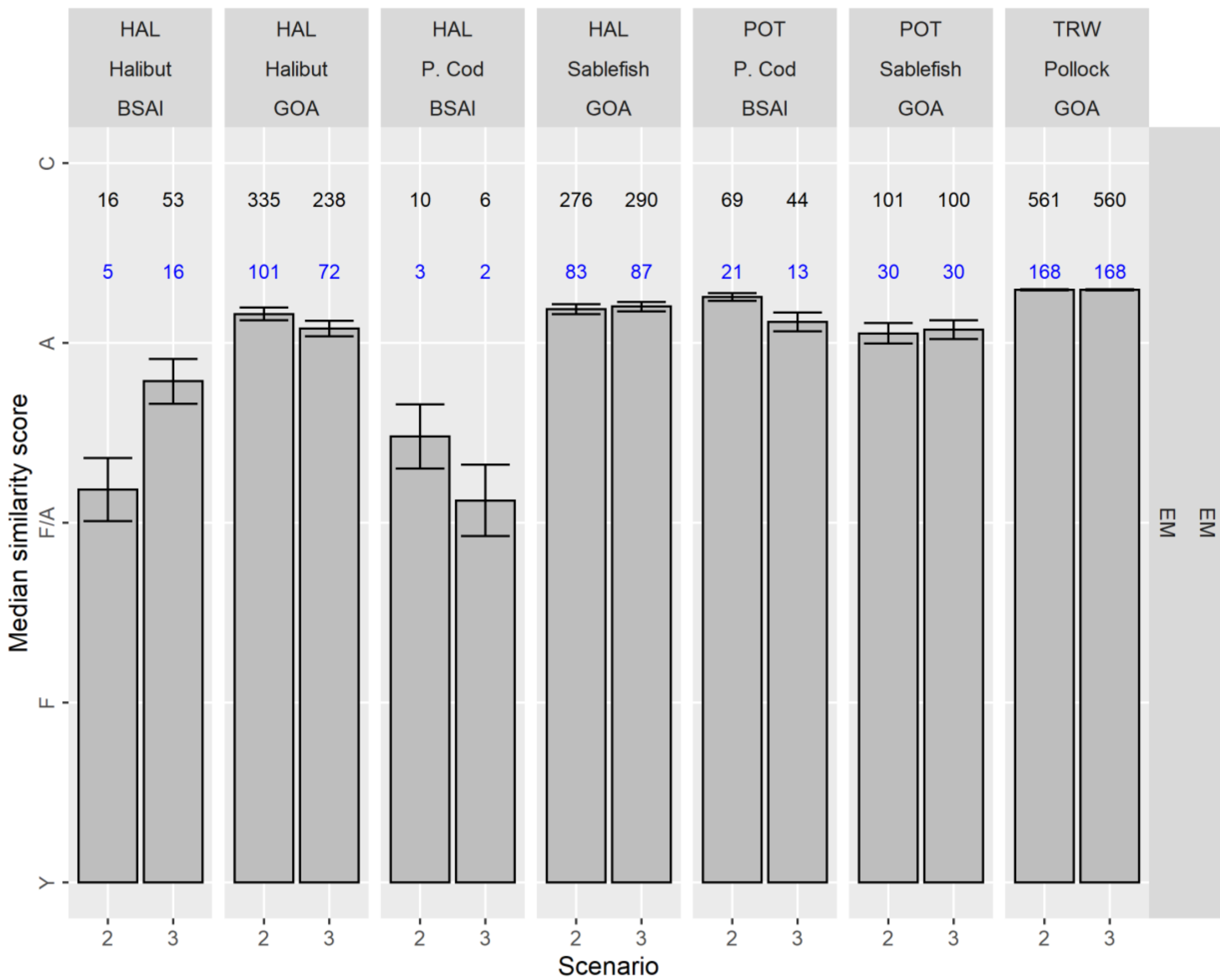


Figure B-12. Similarity of observed trips to unobserved trips for major Gear + Target Species Codes + FMP combinations. Values in each cell of each row in each panel have been coded as a color where the greatest similarity score in each row gets a value of 1 and all other scores in each row are scored relative to that score of 1. In this way darker colors are worse similarity scores, and all rows have the same color scheme. The performance of each scenario can be gauged by the number of dark cells in each column within each panel. The performance of each allocation strategy can be gauged by comparing the pattern of colors in left-hand panels to right-hand panels. Target Species Codes: C = Pacific Cod, I = Pacific halibut, S = Sablefish, H = flathead sole, P = Pollock, W = Arrowtooth flounder. Comparisons in each facet are described in Table B-2.

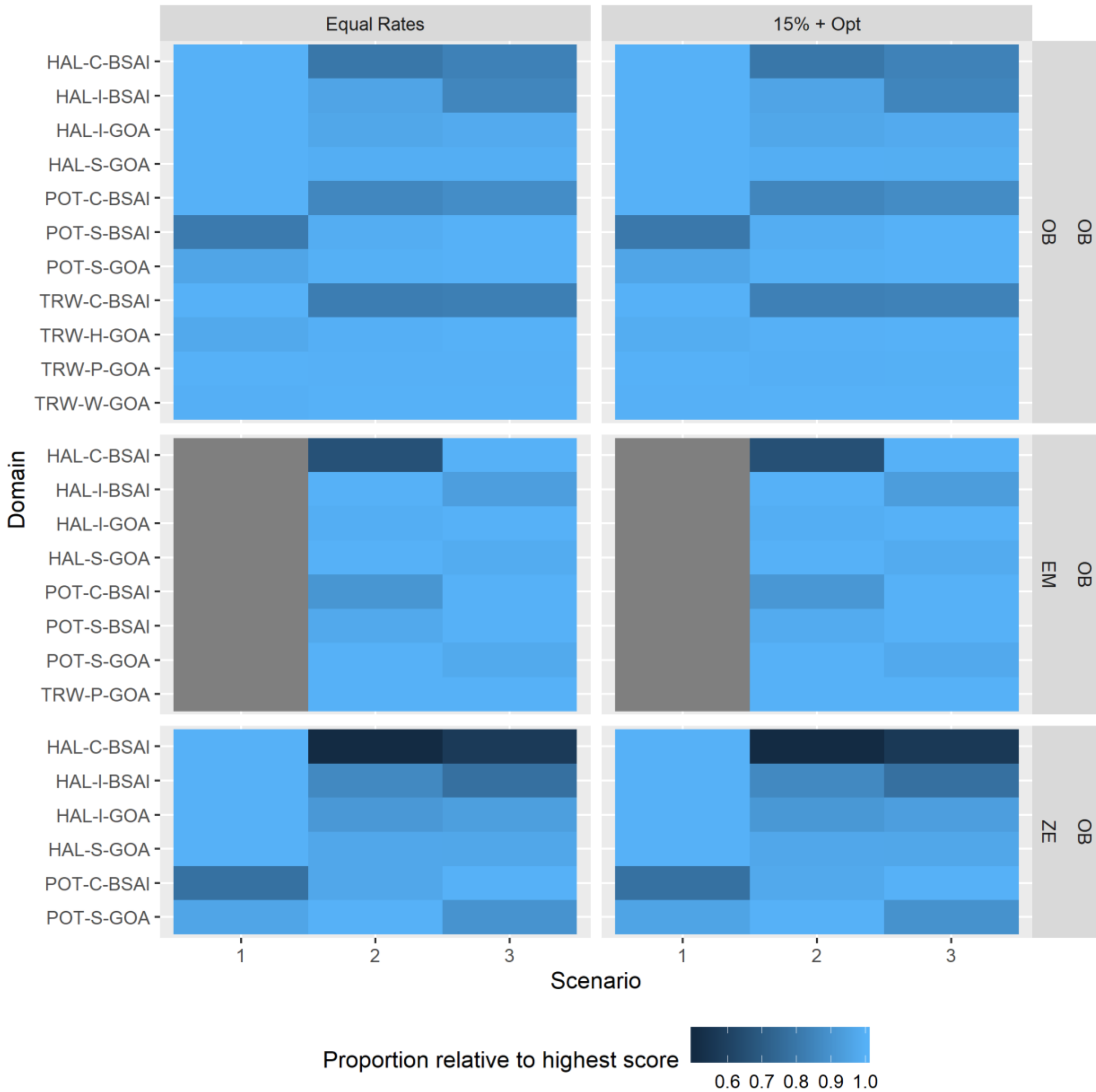
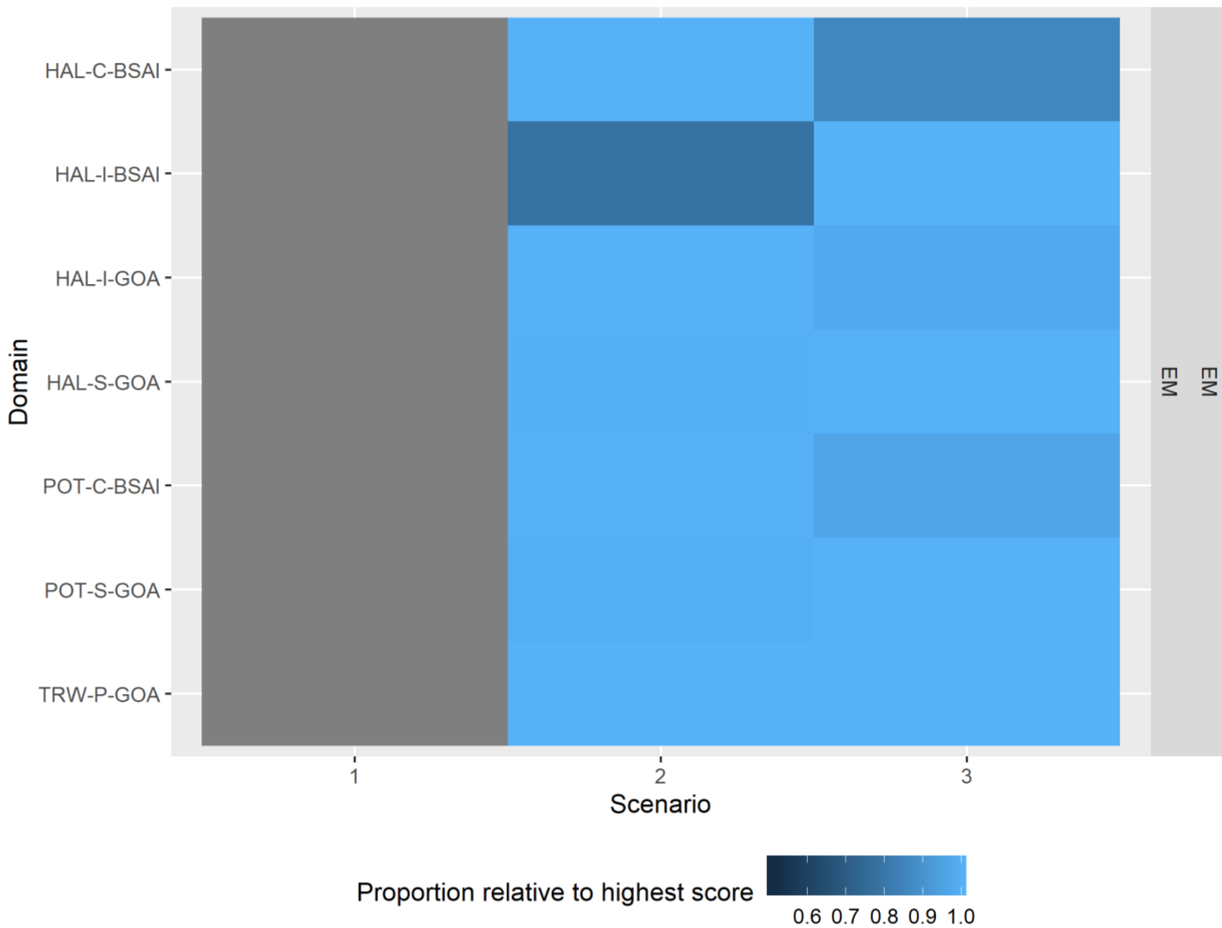


Figure B-13. Similarity of monitored trips to unmonitored EM trips for major Gear + Target Species Codes + FMP combinations. Values in each cell of each row in each panel have been coded as a color where the greatest similarity score in each row gets a value of 1 and all other scores in each row are scored relative to that score of 1. In this way darker colors are worse similarity scores, and all rows have the same color scheme. The performance of each scenario can be gauged by the number of dark cells in each column within each panel. The performance of each allocation strategy can be gauged by comparing the pattern of colors in left-hand panels to right-hand panels. Target Species Codes: C = Pacific Cod, I = Pacific halibut, S = Sablefish, P = Pollock. EM to EM comparisons are described in Table B-2.



Appendix C: 2021 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 Operator*. 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 Operator.*

✓ **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:
  - 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.
  - If you ***are not*** required to complete a NMFS or IPHC logbook then you must complete the EM Effort Logbook found in either *Appendix D – 2021 Longline EM Effort Logbook* or *Appendix E – 2021 Pot EM Effort Logbook.*

Prior to Each Haul or Set

- ✓ **Verify System Is Running Correctly**
  - 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 Operator.*
  - 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:

- ✓ Deployment of pot and hook/line gear in the same set is prohibited.

- ✓ 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:
  - 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 Requirements for POT Gear (includes SLINKY POTS):

✓ Deployment of pot and hook/line gear in the same set is prohibited.

✓ 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 B – Guide for Vessel Operator*.
- **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:**

- 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
- Record the location of the offload in your 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 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 Operator*, and contact NOAA OLE immediately.
  - 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.
  - 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.
  - 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[9]	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[1]	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[1]	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[1]	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[1]	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.
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.

[9] 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
Keyboard/Mouse	Low	Replace with another keyboard/mouse[1]	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[1]	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.
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[1]	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
Streamer line Camera	Low	Restart system; replace with spare camera[1]	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[1]	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[1]	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[1]	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.
Insufficient Lighting	***High***	Replace lights	May fish but cannot retrieve gear at night
Hauling Camera(s)	***High***	Restart system; replace with spare camera[1]	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
Deck/Discard Camera(s)	***High***	Restart system; replace with spare camera[1]	Cease fishing and contact OLE or you may not embark on trip using exemption.
Streamer line Camera	Low	Restart system; replace with spare camera[1]	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[1]	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[1]	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[1]	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 D: EM Annual Process and Step-by-step Guide