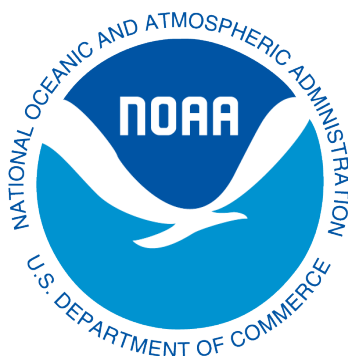


2021 Annual Deployment Plan for Observers and Electronic Monitoring in the Groundfish and Halibut Fisheries off Alaska

December 2020



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Executive Summary

This 2021 Annual Deployment Plan (ADP) documents how the National Marine Fisheries Service (NMFS) intends to assign fishery observers and electronic monitoring (EM) to vessels and processing plants engaged in halibut and groundfish fisheries in the North Pacific.

Observer fee percentage

- Observer coverage and EM deployment in the partial coverage category is funded through a system of fees based on the ex-vessel value of groundfish and halibut landed by vessels in the partial coverage category.
- Beginning January 1, 2021, landings in the partial coverage category that are subject to the observer fee will be assessed a 1.65 percent using standard ex-vessel prices multiplied by the landed catch weight of groundfish and halibut (85 FR 41424, July 10, 2020).
- NMFS will publish the standard prices for 2021 by the end of December, 2020, and will post the updated information at: <https://www.fisheries.noaa.gov/alaska/commercial-fishing/observer-fee-collection-and-payment-north-pacific-groundfish-and-halibut>.

Sampling 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; 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.
 - In 2021, observers will be deployed according to the port-based trip selection model and EM will be deployed according to trip-selection.
 - 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.
- **Selection pools:**
 - *Observer port-based trip-selection pool:*
 - In 2021, there will be 3 sampling strata for the deployment of observers:
 - 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 making a trip not covered by the EM EFP.
 - *EM trip-selection pool:*

- Vessels fishing with non-trawl gear may submit a request before November 1, 2020, to opt into or out of the EM selection pool. None of the 168 vessels in the EM selection pool in 2020 opted out of the program. Three additional vessels opted in; however, no additional funding is available to accommodate additional vessels at this time. Therefore, NMFS has approved 168 vessels for the EM selection pool for 2021; all these vessels were in the EM pool previously.
- Prior to fishing, all the vessels in the EM selection pool— including those there were previously in the pool —are required to submit and follow an NMFS-approved VMP.
- 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. 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 goal 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 that includes catcher vessels, tender vessels, and shoreside processors. In 2021, 70 vessels are expected to participate in Trawl EM.
 - *No-selection pool:* The no-selection pool will 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 NMF's EM research.
- **Allocation Strategy:** NMFS will implement 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.

Deployment rates

- The budget for EM and observer deployment in 2021 is \$6.13M, which sustains the fixed gear EM program at \$1M and provides shoreside observers to support COVID-19 sampling protocols in processing plants.
- The observer coverage rates expected to be afforded in 2021 are approximately 15-16% across all observer monitored strata, despite the at-sea budget being set higher than 2,000 days, which was the expectation in the draft 2021 ADP. The similarity in monitoring rates between the draft and final 2021 ADP, despite the higher number of monitoring days budgeted in the final ADP, is due to an expected Pacific cod fishery in the GOA for 2021 and an increase in predicted fishing effort. Further, additional expenses are budgeted for COVID-19 safety protocols, such as port-

specific quarantine periods, and to accommodate expected high costs of travel within Alaska. NMFS estimates that 499 trips will be observed at-sea in the partial coverage category.

- The deployment rates (rounded to the nearest whole number) for strata in 2021 are—
 - No Selection – 0%
 - Trawl – 16%
 - 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

Sampling for Chinook Salmon in the Gulf of Alaska

- Dockside monitoring by observers occurs in the pollock fishery to enable complete enumerations of salmon bycatch and conduct biological sampling. To the extent possible, observers will continue to collect genetic samples from salmon caught as bycatch to support efforts to identify stock of origin. COVID-19 protocols at most shoreside processing plants prevent vessel observers from entering the processor to complete any further sampling. NMFS has altered data collection procedures to account for this and added 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 pollock trips that are outside of the trawl EFP that are delivered to tender vessels, and for trips outside of the pollock fishery, the salmon counts and tissue samples will be obtained from all salmon found within observer at-sea samples of the total catch.

Waivers

- NMFS continues to respond to the changing landscape caused by COVID-19 and strives to deploy observers while also keeping operators, communities, and observers safe. 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 when conditions warrant. NMFS will use this authority if an observer that meet State of Alaska health mandates is not available for deployment.
- 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 NMFS is 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.

Introduction

Purpose and Authority

This 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 outlines 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 implements the Council's fishery 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. 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. Scientists also use fishery-dependent data to assess fish stocks, evaluate marine mammal interactions with fishing gear, characterize fishing impacts on habitat, and provide data for fisheries and ecosystem research and fishing fleet behavior.

Process and Schedule

On an annual basis, NMFS develops an ADP to explain 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), which NMFS and the Council recognize are 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 ADP follows the process envisioned by the Council and NFMS when the restructured observer program was developed and implemented. As a result, both the ADP development and the evaluation of data collected by observers and EM is an ongoing process. 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 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 a draft 2021 ADP containing recommendations for deployment methods in the partial coverage category.
- **September – October 2020:**
 - *Review of the draft ADP:* The Council reviewed the draft 2021 ADP and associated Plan Team and Fishery Monitoring Advisory Committee recommendations. Based on input from its advisory bodies and the public, the Council provided recommendations for the final 2021 ADP (Appendix A). NMFS reviewed and considered 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:* The deadline for vessels in the partial coverage category using fixed to request to be in the 2021 EM selection was November 1, 2020.
- **December 2020:** NMFS finalizes and releases the 2021 ADP to the public during the Council meeting.

Observer fee Percentage

Observer coverage and EM deployment in the partial coverage category is funded through a system of fees based on the ex-vessel value of groundfish and halibut landed by vessels in the partial coverage category. On July 10, 2020, NMFS published the final rule to adjust the North Pacific Observer Program fee percentage (85 FR 41424, July 10, 2020). Beginning Jan 1, 2021, landings in the partial coverage category that are subject to the observer fee will be assessed a 1.65 percent using standard ex-vessel prices multiplied by the landed catch weight of groundfish and halibut. NMFS will publish the standard prices for 2021 by the end of December, 2020, and will post the updated information at: <https://www.fisheries.noaa.gov/alaska/commercial-fishing/observer-fee-collection-and-payment-north-pacific-groundfish-and-halibut>.

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 in addition to Kodiak, which further reduced 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 enumeration of salmon bycatch and to 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. Observers will be deployed according to a 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).

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.

Selection Pools (Stratification Scheme)

The division of the population of partial coverage trips into selection pools, or strata, is the stratification scheme. Each year, the ADP defines the deployment strata and how vessels are assigned to specific partial coverage selection pools.

Port-Based Trip-Selection Pool for Observer Deployment:

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.

Electronic Monitoring (EM) Selection Pool:

Vessels in the partial coverage category using fixed gear had the opportunity to request to be in the 2021 EM selection pool using ODDS. Any vessel in the EM selection pool in 2020 remains eligible to be in the EM selection pool unless a request is submitted to leave the EM selection pool, NMFS has disapproved the vessel's VMP, or if vessel operator has repeat problems with EM system reliability or video quality or has failed to comply with the requirements in their VMP. All the requests to be in or out of the EM selection pool for 2021 must have been received by November 1, 2020. Any vessel that did 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.

The fixed-gear EM pool in 2021 will consist of 168 vessels approved by NMFS. No vessels requested to be removed and 3 additional requested to be added to the EM pool; however no new funds to support fixed gear EM were received, and therefore no new vessels were approved by NMFS to participate in fixed gear EM for 2021.

Vessel owner/operators receive notification of NMFS approval of their placement in the EM pool by logging into ODDS. Once approved, that vessel will remain in the EM selection pool for the duration of the calendar year. Each year, all the vessels in the EM selection pool—including those there were previously in the pool—are required to submit and follow an NMFS-approved Vessel Monitoring Plan¹.

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.

¹ The 2021 VMP template is available at: <https://alaskafisheries.noaa.gov/fisheries/electronic-monitoring>

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.

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

Trawl Electronic Monitoring 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 Alaska². NMFS approved the EFP in January, 2020, allowing pollock catcher vessels using pelagic trawl gear to use EM systems in lieu of at sea observers. The goal 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 that includes catcher vessels, tender vessels, and shoreside processors. In 2021, 70 vessels are expected to participate in Trawl EM.

Summary of 2021 Deployment Strata:

The following deployment strata will be in place for vessels in the partial coverage category for deployment of observers (50 CFR 679.51(a)) and electronic monitoring ((50 CFR 679.51(f)) in 2021:

- ***Observer Port-Based Trip-Selection Pool:*** Observers will be deployed from select ports throughout Alaska in 3 sampling strata:
 - ***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 vessels in the partial coverage category fishing trawl gear and not participating in the trawl EM EFP.
- ***Electronic monitoring (EM) trip-selection pool:*** NMFS has approved 168 fixed gear vessels in the EM selection pool in 2021. Prior to fishing, all the vessels in the EM selection pool—including those there were previously in the pool—are required to submit and follow an NMFS-approved VMP.

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

- **Trawl EM trip-selection pool:** This pool is composed of all vessels fishing under the EFP permit.
- **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:
 - fixed-gear vessels less than 40 ft LOA³ and vessels fishing with jig gear, which includes handline, jig, troll, and dinglebar troll gear; and
 - three fixed-gear vessels voluntarily participating in EM innovation and research (Appendix C).

Allocation Strategy

Allocation strategy refers to the method of allocating deployment trips among strata. Starting in 2018, NMFS has implemented the observer allocation strategy of 15% threshold 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 draft ADP and previous ADPs have provided more information on the threshold approach and the methods used to evaluate the chances of data being available to inform inseason management under varying observer coverage levels (NMFS 2020; 2019; 2018a; 2018b). The draft 2021 ADP provided 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. 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.

In 2021, NMFS will implement an observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut PSC, 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.

Deployment Rates

The trip selection rate for vessels in the EM selection pool is based on recommendations from the Council and the selection rate will be 30% of trips in 2021.

To determine the deployment rates for the observer-deployment strata, NMFS uses the available sea-day budget and estimates of anticipated fishing effort. The budget is set with the goal of stabilizing observer coverage rates across years to avoid having very high coverage rates driven by high revenue years followed by low coverage rates in years with low revenue. The budget for EM and observer deployment in 2021 is \$6.13M, which sustains the fixed gear EM program at \$1M and provides \$658,622 for shoreside observers to support COVID-19 sampling protocols in processing plants for Pollock offloads in the GOA.

The estimates of available sea-day budget and anticipated fishing effort are the primary inputs into simulation models used to generate anticipated outcomes from different selection rates (Appendix B). Sample size (using “15% + Optimization” allocation) and resulting coverage rate estimates were

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

generated through simulation following the approach used for previous ADPs in which each simulation trial mimics an ADP selection draw for the year (Appendix B). Each vessel in the sampling strata of the partial-coverage fleet does not undertake identical numbers of trips and days in a year; the simulation approach provides NMFS with a full range of potential outcomes from random sampling (selections) of different vessels and trips. The simulated deployment rates were determined from an evaluation of estimated annual program costs assessed against the risk of exceeding the Observer Program’s available funds.

The coverage rates expected to be afforded in 2021 are approximately 15-16% across all observer monitored strata (Table 1), despite the at-sea budget being set higher than 2,000 days, which was the expectation in the draft 2021 ADP (NMFS 2020). The similarity in monitoring rates between the draft and final 2021 ADP, despite the higher number of monitoring days budgeted in the final ADP, is due to an expected Pacific cod fishery in the GOA for 2021 and an increase in predicted fishing effort (Appendix B). Further, additional expenses are budgeted for COVID-19 safety protocols, such as port-specific quarantine periods, and to accommodate expected high costs of travel within Alaska. NMFS estimates that 499 trips will be observed at-sea in the partial coverage category (Table 1).

The deployment rates (rounded to the nearest whole number) for strata in 2021 are—

- No Selection – 0%
- Hook-and-line – 15%
- Pot – 15%
- Trawl vessels not participating in the EM EFP – 16%
- Fixed-Gear EM – 30%
- Trawl EM EFP–100% at-sea EM; plus: 30% shoreside monitoring in GOA or 100% shoreside monitoring in BS

Table 1. Summary of total trips, allocation weights, deployment rates, and the number of trips expected to be observed in each observer-sampling stratum in 2021.

Stratum	Total Number of Expected Trips	Allocation Weight	Deployment Rate (%)	Number of Trips Expected to be Observed At-sea
Hook-and-line	1,603	0.26	15.13	242
Pot	713	0.04	15.04	107
Trawl (vessels not participating in trawl EM EFP)	930	0.70	16.12	150
Total	3,246	1.00	15.37	499

Waivers

NMFS continues to respond to the changing landscape caused by COVID-19 and strives to deploy observers while also keeping operators, communities, and observers safe. Consistent with existing regulatory authority at 50 CFR 679.51(a)(1) and with the Council's recommendation (Appendix A), NMFS may release trips from observer coverage on a case-by-case basis for vessels in the Partial coverage category. NMFS maintains the ability to release vessels in the partial coverage category on a case by case basis in all ports (including our listed deployment ports) when conditions warrant. NMFS

will use this authority if an observer that meet State of Alaska health mandates is not available for deployment. 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 NMFS is 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.

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.

Dockside Sampling in the Gulf of Alaska

Dockside monitoring by observers occurs in the pollock fishery to enable complete enumeration of salmon bycatch and to conduct biological sampling. To the extent possible, observers will continue to collect genetic samples from salmon caught as bycatch to support efforts to identify stock of origin. COVID-19 protocols at most shoreside processing plants prevent vessel observers from entering the processor to complete any further sampling. NMFS has altered data collection procedures to account for this and added shore-based observer coverage (Table B-2) 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 pollock trips that are outside of the trawl EFP that are delivered to tender vessels, or for trips outside of the pollock fishery, salmon counts and tissue samples will be obtained from all salmon found within observer at-sea samples of 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 form⁴ to NMFS. Eight catcher/processors requested, and NMFS approved, placement in the partial coverage category for the 2021 fishing year.

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>

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 ODDS5 prior to October 15, 2020 for the 2021 fishing year. NMFS published the list of 19 catcher vessels that have been approved to be in the full coverage category in 2021 on the website at: <https://www.fisheries.noaa.gov/resource/document/bsai-trawl-catcher-vessels-cvs-full-coverage>.

Vessels Participating in Halibut Deck Sorting

On October 24, 2019, NMFS published a final rule to implement regulations allowing halibut to be sorted on deck of trawl catcher/processors in the non-Pollock fisheries off Alaska. Fishing under the new regulations began on January 20, 2020. The final rule implementing this program under regulation does not specify the amount of time allowed for vessel crew to sort, and observers to discard, deck-sorted halibut, allowing NMFS to adjust sorting times in response to new information. In 2021, NMFS will allow all vessels operating under these regulations 35 minutes to deck-sort and discard halibut. This uniform time allowance maintains the protocol from 2020 and is consistent with the fact that there are no data to support vessel-specific deviations from the time limit.

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.

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>

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Appendix A. Council motions related to Annual Report and 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.

Council Motion
C-5 Observer Annual Deployment Plan
October 14, 2020

The Council supports using the three gear-based deployment strata (hook-and-line, pot, and trawl) and allocation scheme of 15% plus optimized allocation based on discarded groundfish, halibut PSC, and Chinook salmon PSC for the 2021 Observer Annual Deployment Plan (ADP). Observer coverage rates resulting from this approach and the final budget are expected in the final 2021 ADP in December. The Council also supports:

- maintaining the current coverage/selection rates for vessels carrying electronic monitoring (30%fixed gear; 100% trawl gear);
- due to COVID-19, continuing to deploy observers from select ports throughout Alaska consistent with the revisions to the 2020 ADP;
- the ability for NMFS to release a vessel or trip from observer coverage on a case-by-case basis;
- the proposed zero selection pool;
- the criteria to determine new potential participants in the fixed gear electronic monitoring pool if funding is insufficient to accommodate all new requests.

The Council recognizes that COVID-19 has disrupted efforts on several Council priority tasks related to achieving cost efficiencies in the observer program. The Council recommends NMFS develop an abbreviated Annual Report on 2020 deployment and requests an updated timeline for the following analyses related to cost efficiency: 1) integration of electronic monitoring into the determination of baseline observer coverage necessary in fixed gear to meet data gaps, including exploration of existing data sources to provide information on average weights of discards and biological data for stock assessments; 2) re-evaluation of the 'zero selection' pool criteria; and 3) re-evaluation of the bias metrics.

Council motion
C-5 Trawl EM Committee Report
October 14, 2020

The Council expresses its support for extension of the EFP for the development of EM for the pollock trawl fishery in the CGOA, WGOA and BSAI through 2022, and requests NMFS to determine the best approach for accomplishing that. The Council supports the trawl EM Committee recommendations for changes to the EFP for 2021.

Appendix B. Calculation of the Selection Rates for 2021

Introduction

The Annual Deployment Plans (ADP) specify how fishery monitoring assets (observers and Electronic monitoring equipment (EM)) are deployed into fishing operations of the North Pacific. The ADP provides an annual process for NMFS and the Council to evaluate deployment of fishery monitoring assets and improve the sampling design in response to changing needs. Although the sampling design hierarchy used by the North Pacific Observer Program for obtaining fishery dependent data has several levels, the ADP is important since it affects the first, and top-most level of this hierarchy (Cahalan and Faunce 2020). The ADP is focused on fishing operations for which sampling rates will be less than 100% (i.e., 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 the composition of the partial coverage fleet have resulted from NMFS policy, Council Action, and regulations.

The ADP process includes a draft and final version. The draft ADP is focused on presenting alternative deployment designs for consideration for the year ahead, while the final ADP is focused on predicting the most likely coverage rate that available budgets can afford given the selected design from the draft ADP. Both the draft and final 2021 ADP have been influenced substantially by the current COVID-19 pandemic in 2020, and the authors have included descriptions of those adjustments in each document.

Since the inception of the ADP process, trip-selection has been the preferred method to deploy fishery monitoring assets into the partial-coverage fleet. Trip-selection refers to the use of the fishing trip as the primary sampling unit. Trip-selection is accomplished through the Observer Declare and Deploy System (ODDS). Partial coverage trip-selection participants are sent a letter prior to the start of the calendar year with their username and password so that they may access the ODDS and log planned fishing trips electronically. There is also a telephone number that many fishermen use to log trips. Each logged trip is assigned a random number of four digits ranging from 0 to 1. This random number is evaluated against a pre-programmed selection rate in ODDS. If the random number is below or equal to the selection rate, then a trip is selected for observation.

Changes to the 2020 ADP

An emergency rule waived observer coverage in the partial coverage fleet of the North Pacific between 26 March and 28 June 2020 in response to the COVID-19 pandemic.⁶ In order to safely allow the resumption of observer-based fishery monitoring, NMFS has required observers to complete a 14-day quarantine upon arrival at a new port since that time. This new rule necessitated re-examination of how observers were being deployed into the partial coverage fleet. The result was to institute port-based trip-selection. This deployment method is trip-selection, but excludes fishing activities from observation if they do not depart from and deliver catch 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) receive 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. 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,

⁶ NOAA Fisheries Alaska Information Bulletins IB 20-29 and IB 20-45.

(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.

The draft 2021 ADP

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 (Appendix A). The draft 2021 ADP included two alternative ways observed trips could be allocated among strata, and within each of these, presented three alternative scenarios as to how the EM pool of vessels could be composed for economic efficiency and data integrity. These were provided to facilitate meaningful movement towards the goal of one fully-integrated fishery monitoring program, where each monitoring tool is maximized towards efficiency and effectiveness.

This analysis attempts to predict future fishing effort and afforded expenditures towards fishery monitoring in the North Pacific based on the decisions made by NMFS after consultation with the North Pacific Fishery Management Council (NPFMC or Council) at their October 2020 meeting regarding the draft 2021 ADP (NMFS 2020).

The 2021 Sampling Design

The sampling design for fishery monitoring deployment 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*).

The design selected from the draft ADP was that of *status quo*. According to this design, EM and observers are separately deployed. EM is deployed by trip-selection, and observers are deployed by port-based trip-selection. Sampling rates have been set by policy outside of the ADP for strata monitored by EM and are set by optimization algorithms in the ADP for strata monitored by observers (Table B-1).

Methods

The methods in this section largely follow those used in the draft 2021 ADP (NMFS 2020). They are visually depicted in Figure B-1.

Data Preparation: Defining the partial coverage fleet

A dedicated dataset developed by the staff of the Sustainable Fisheries Division of the Alaska Regional Office (AKRO) and the Fisheries Monitoring Division (FMA) of the Alaska Fisheries Science Center was used in this analysis. Briefly, these data consist of species-specific catch amounts, fishing dates, locations, catch disposition, observation status, and associated ADP strata from 1 January, 2013, to 23 October, 2020.

As in past ADPs, trip data were altered to reflect the partial coverage fishing in the upcoming year. These alterations included: (1) using ODDS data to more accurately model the duration that observers are assigned to selected fishing trips (NMFS 2019, Appendix C), (2) labeling fishing activity by four 'historical low volume' Catcher-Processors as belonging to the partial coverage category, (3) labeling fishing by AFA eligible trawl vessels targeting Pacific cod in the BSAI as belonging to the full coverage fleet if they indicated this was their preferred coverage for this activity in 2021, and (4) removing vessels with no probability of selection from the analysis (i.e., all trips corresponding to hook and line and pot gear on vessels < 40' LOA, as well as vessels fishing jig gear). Vessel lists for a Pollock Trawl EM Exempted Fishing Permit (EFP) and Fixed Gear EM participation were updated following

information provided by industry (Trawl EM) and approval processes by the FMA Division of the AFSC after Nov. 1⁷ respectively. Selection rates for these EM strata were set at 30%.

Three gear-based strata were identified for observer-based monitoring in the preferred scenario of the draft 2021 ADP:

- **HAL:** Hook-and-line vessels greater than or equal to 40 feet (ft) length overall (LOA).
- **POT:** Pot vessels greater than or equal to 40 ft LOA
- **TRW:** Trawl vessels not participating in the EM EFP.

The sample allocation strategy for observer monitored strata follows that recommended by NMFS in the draft 2021 ADP and details can be found in that document (NMFS 2020). Briefly, sample sizes in the present analysis are determined from a “15% + Optimization” allocation. In this method, only available sample days above those needed to achieve 15% coverage are allocated through an optimization routine. Optimal allocations arise from an equally weighted blend of three optimal allocations among strata that each consider trip cost and variance in either discarded groundfish, Pacific halibut prohibited species catch (PSC), or Chinook salmon PSC. If the baseline 15% coverage cannot be achieved, all strata get the same sampling rate.

Budget Forecasting

Partial coverage observer deployment is paid for according to a negotiated contract between NMFS and its partial coverage 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 provider. 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 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 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 the observer program can be sustained for a predetermined period of time. This method ensures the most up-to-date cost information is used while balancing the needs for a stable fishery monitoring program.

In this analysis a budget was set so that the minimum contract size of 2,000 guaranteed days could be realized for fiscal year 2020-21 and the same sized contract for subsequent calendar years until 2024 while also sustaining a \$1M EM fishery monitoring program. In addition, the budget in 2021 provides shoreside observers to support COVID-19 sampling protocols in processing plants (Table B-2). Further, estimates costs for a dockside fishery monitoring program to support the shoreside observer component of Trawl EM in the remaining years of the contract were incorporated into model costs, should Trawl EM be established in regulations. This resulted in an increase in the at-sea observer budget relative to the draft 2021 ADP as well as increased anticipated costs in the future. Plant monitoring days were assumed to be static between years but their costs were inflated for 2021 to account for additional costs

⁷ The rules governing fixed-gear EM participation are specified in regulations published in 2017. Participation in EM is voluntary. Between September 1 and November 1 of each year, vessels can request to participate in EM through ODDS. After November 1, NMFS approves or denies EM requests based on vessel eligibility and the available funding.

due to COVID-19 safety protocols. Total expenditures in simulated fishery monitoring deployments for 2021 were set so that there was an equal chance of being over or under budget.

Accounting for uncertainties

The uncertainties inherent in this analysis include 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.

Predicting future fishing effort

Future fishing effort for the upcoming year was predicted by largely following the methods detailed in Ganz and Faunce (2019). 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 average ratio of total effort to effort to date from previous years, and projections were made for each stratum, FMP, and target species combination for 2020. There were some exceptions. For EM POT Pacific cod in the BSAI, only the average ratio between 2018 and 2019 was used to project 2020 effort, since effort in 2017 was so starkly different from other years. For other groups, a ratio of 1 was applied, since those fisheries were finished before 23 October.

The resulting estimate for the end of the year trips in 2020 was used as the predicted fishing effort (in terms of numbers of trips) for 2021 (2021 predictions). One notable adjustment was that fishing effort targeting Pacific cod in the Gulf of Alaska (GOA) was set to 2019 levels, given that directed fishing for Pacific cod in the GOA was closed in 2020, making 2019 the most recent indication of what fishing effort for GOA Pacific cod will be like. Adjustments to fishing effort were not made in anticipation of quota changes between years following Ganz and Faunce (2019).

A source population of trips from which to draw simulated versions of the 2021 fishing effort (source population) was created by appending 2019 trips that occurred after October 23rd to 2020 trips that occurred before or on October 23rd.

Uncertainty due to COVID-19

The relationship between past and future fishing efforts 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 2021 predictions were altered to incorporate variation in effort between -5% to +20 % following a normal distribution. This adjustment was reduced from the -25 to +25% range that followed a uniform distribution in the draft 2021 ADP. The revised prediction values were chosen in recognition that the effects of COVID-19 had a negative effect on fishing effort in 2020 but that effort in 2021 may rebound slightly with the potential of vaccines. The upper limit in these adjusted predictions roughly represent the difference between the 2021 predictions and fishing effort in 2019 (the most recent year without COVID-19). The process of generating adjusted 2021 predicted fishing effort was repeated 1000 times. The result of these adjustments was a median increase in fishing trip estimates by 7.5 % overall over original 2021 predictions.

Each adjusted 2021 prediction was used as a sample size to sample the source population with replacement to generate a new population of trips. The result was 1000 versions of the 2021 fishing effort (2021 simulated populations), each with their own unique mean trip duration distributions.

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 91.12 % probability of being under the EFP by random draw based on past participation in the EFP on a trip by trip basis.

Determining deployment rates for 2021

The selection rate that can be afforded in the coming year depends on several factors, chiefly the amount of fishing that is expected to occur, available budget, and estimated monitoring costs. It is important to note that, while the 2021 partial coverage fishing effort was predicted by stratum, FMP area, and target species, observers are only deployed by stratum. The optimal sample allocation weightings for each stratum were calculated using an updated 2017 - 2020 data set by following the methods detailed in the draft 2021 ADP for the preferred design (NMFS 2020).

Uncertainty in trip-selection

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 selected, more trips may be afforded by the same amount of money (and hence a higher selection rate) than if longer trips were selected. As in past ADPs, the analysis of potential deployment rates was conducted through iterative, stratified random sampling without replacement. For each 2021 simulated 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 to incorporate differences in ODDS selections and selected trip durations (a total of 100,000 iterations result; 1,000 populations × 100 ODDS selections).

Sample sizes among strata for all iterations were in terms of fishing trips and were set equal to the sum of two elements: the base rate of 15% multiplied by the total number of trips in the stratum, and the allocation weighting multiplied by the total number of trips available for optimal allocation after the days available for base-rate coverage had been accounted for among all strata.

Uncertainty in monitoring costs

The total cost of the observer-based fishery monitoring program was calculated using the cost of an observer day and the distribution of trip durations from each iteration. Cost per day was estimated in order to most closely match costing by the partial-coverage contract. Estimates of cost per day took into account whether the day was a guaranteed day (up to 2000 days), an optional day, or plant day, estimated travel costs from a linear model using monthly days purchased against travel cost invoices, and additional costs due to COVID-19 quarantine protocols for 2021. Total cost was then compared to the total budget available for the year. The steps taken to calculate selection rates are depicted as a diagram in Figure B-1.

The available budgets for partial-coverage at-sea observer deployment and fixed-gear EM were set at \$4,484,978 and \$1,000,000, respectively. Additionally, an estimated \$658,622 was budgeted for plant observers to monitor GOA pollock offloads (Table B-2).

Accounting for uncertainty in the monitoring rate caused by COVID-19

Fishery monitoring selection rates for observer deployment in the section above 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 necessitated by COVID-19 requires an adjustment to the selection rates. So far, methods have resulted in a *monitoring rate*, which is the selection rate that would occur if all trips in the stratum were accessible to observation, and is the stratum-specific target of monitoring coverage. However, when not all trips in the stratum are within the sampling frame, a *sample frame adjusted rate* is required. The sample frame adjusted rate is the selection rate that is required of trips within the sample frame in order to achieve the monitoring rate. Continuing off the previous example, if only 80 of the 100 trips are expected to be within the sample frame, a sample frame adjusted rate of 18.75% ($15 / 80$) is required to monitor 15 trips and achieve the 15% monitoring rate for the stratum. Adjustments were made to monitoring rates to correct for the sampling frame issues caused by COVID-19 safety protocols. 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.

The fishing data used for the source population only had the offload port specified, and not the embark port. The draft 2021 ADP therefore assumed for all trips that the embark port was the same as the disembark port and did 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 as part of COVID-19 safety protocols. This simplification was useful for the draft 2021 ADP because it placed reasonable constraints on simulations of trip selection for the similarity analyses. To calculate the sample frame adjustment, the current analysis used a model-based approach to correct for this simplification and determine the degree to which the port of departure and port of landing are both within the sampling frame. ODDS data from 2017-2020 was used to generate a model to calculate the proportion of trips in each stratum that this condition was not true. The model was applied to the number of trips within each stratum to account for the proportion of trips that would be waived for having an embark port outside the sample frame.

In addition to corrections to account for sampling frame issues, an additional adjustment was made to account for anticipated waivers from coverage not related to port of departure or landing. Assuming a trip is within the sample frame (departs and offloads from ports in the list), trips may be waived if the vessel’s planned depart and offload ports differ, if the observer provider cannot assign an observer who has quarantined for 14-days with only 3-days of notice, or if the provider or observers do not feel safe with the vessel’s quarantine status. These additional waiver rates for each stratum were estimated for 2021 by first calculating actual waiver rates in 2020 using ODDS data and then adjusted them further through discussions with the observer provider regarding expectations for 2021. The *programmed rate* is the rate that resulted when the additional 2021 waiver rate estimations were applied to the sample frame adjusted rate, and represents the trip selection rates that must be programmed into ODDS in order to

achieve the monitoring rates for the strata. The relationship between the different selection rates is provided in Figure B-3.

Results and Discussion

In the present analysis, the fixed-gear EM pool consisted of 168 vessels approved by NMFS. No vessels requested to be removed. Since no new funds to support fixed gear EM were received, no additional vessels were approved by NMFS to participate in fixed gear EM for 2021. Vessels that volunteered for continued participation in federally funded fixed-gear EM Research were considered to be placed in the zero selection pool (Appendix C). A list of 70 vessels expected to participate in Trawl EM was received 20 November 2020. Expected vessel participation for the other fishery monitoring strata is provided in Table B-2.

The expected coverage rates expected to be afforded in 2021 are approximately 15-16% across all observer monitored strata, despite the at-sea budget being set higher than 2000 days, which was the expectation in the draft 2021 ADP. The similarity in monitoring rates between the draft and final 2021 ADP, despite the higher number of monitoring days budgeted in the final ADP, is due to the addition of a Pacific cod fishery in the GOA for 2021 (Barbeaux et al. 2020) and an increase in predicted fishing effort.

Adjustments to the monitoring rate were required as the result of COVID-19 safety protocols. Port based trip-selection disproportionately affects the POT stratum, since trips within the POT stratum tend to utilize ports outside of the sample frame much more than trips within the HAL or TRW strata. Additional waiver rates (after accounting for the sample frame) are also expected to be higher for fixed gear strata (HAL and POT) relative to the TRW stratum because they have a greater tendency to offload at ports that differ from their embark ports (Figure B-3).

Increased fishing effort and cost inefficiency are factors that combine to draw a challenging picture for optimized deployment for observers in the North Pacific in the future. It appears that the 2419 day program will not support much coverage above baseline (15%) levels. However, it is important to recognize that over the entire fleet, coverage in terms of trips is expected to be 44.3%⁸, which is comparable to the actual values (43.3%) observed in 2019 (Ganz et al. 2020).

The expected difference between the available budget and the expended cost is depicted as a risk-profile in Figure B-2. The median and most likely sea-day expenditure for 2020 is expected to be \$681 over budget with a 95% confidence interval of being between \$350,754 under budget and \$343,736 over budget (~ 8 %).

Literature Cited

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⁸ Summed number of observed trips divided by summed number of total trips in Table B-3.

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Table B-1. Description of deployment strata for fisheries monitoring of the partial coverage fleet in 2021. NFWF = National Fish and Wildlife Foundation.

Stratum	Applies to	Stratum Created by	At-Sea				Dockside			
			Monitoring tool	Purpose	Selection Rate	Funding Source	Monitoring tool	Purpose	Selection Rate	Funding Source
Fixed Gear EM	Fixed Gear Vessels that volunteer	Industry /Council /NMFS	EM	Catch Estimation	30%	NFWF / Industry fees	None	NA	0%	NA
Trawl EM	Vessels fishing pelagic trawl gear in the pollock fishery identified in an exempted fishing permit (EFP)	Industry /Council / NMFS	EM	Full retention Compliance	100%	NFWF	Observers	Catch & PSC Estimation/ Biological sampling	30%	NFWF / NMFS
Gear based	Longline, Pot vessels >= 40'; and Trawl vessels not participating in the trawl EM EFP	NMFS / Council	Observers	Catch Estimation	Rates afforded according to baseline + optimization (NMFS 2020)	Industry fees	None	NA	0%	NA
Zero	Jig Vessels, vessels < 40'	NMFS / Council	None	Economic efficiency & logistics (eg lack of bunk space)	0%	None	None	NA	0%	None

Table B-2. Differences in budgets and vessel participation between the Draft 2021 ADP and this analysis. Funding is listed for sectors that are funded through the observer fee and NMFS funds. The number of vessels participating is estimated as the number of unique vessels that fished within each stratum within 365 days prior to the completion of the analyses. Some vessels may fish in multiple strata (e.g., a vessel may fish within both EM POT and EM HAL, or a trawl vessel may fish within the Observer pool and Pollock Trawl EM EFP pools).

	Draft 2021 ADP	Final 2021 ADP
Total anticipated funding (\$)		
At-sea Observer	3,373,000	4,484,978
Fixed-gear EM	1,000,000	1,000,000
Plant Observer (to support COVID-19 sampling protocols)	0	658,622
Total	4,473,000	6,143,600
Vessels participating (partial-coverage)		
At-sea Observer Hook-and-line	288	305
At-sea Observer Pot	93	118
At-sea Observer Trawl	67	77
EM Hook-and-line	136	130
EM Pot	25	40
Pollock trawl EFP (GOA)	38	38

Table B-3. Comparison of the predicted number of trips in a stratum (N_h), the optimal sample weighting (W_{hopt}), predicted observed or monitored trips (n_h), days (d_h), and coverage rates (r_h) resulting from the deployment sampling design described in the text. Values are medians (50th percentile) from simulated populations and are not directly comparable to the mean values presented in table B-4 in the draft 2021 ADP. The values from that document have been re-calculated here for proper comparison.

Pool	Stratum (h)	N_h	W_h	n_h	d_h	r_h (%)
Draft 2021 ADP						
Observer	Hook-and-line	1,301	0.26	194	1,087	15.02
	Pot	598	0.04	89	464	15.01
	Trawl	905	0.70	140	417	15.14
	Total	2,804	1.00	423	1,968	15.09
EM	Hook-and-line	593	-	178	872	30.00
	Pot	162	-	49	259	30.00
	Pollock trawl EFP (GOA)	544	-	163	455	30.00
	Total	1,299	-	390	1,586	30.00
Zero	Hook-and-line	1,245	-	0	0	0.00
	Pot	7	-	0	0	0.00
	Total	1,252	-	0	0	0.00
Final 2021 ADP						
Observer	Hook-and-line	1,603	0.26	242	1,322	15.13
	Pot	713	0.04	107	638	15.04
	Trawl	930	0.70	150	459	16.12
	Total	3,246	1.00	499	2,419	15.37
EM	Hook-and-line	772	-	231	1,212	30.00
	Pot	303	-	91	449	30.00
	Pollock trawl EFP (GOA)	657	-	197	548	30.00
	Total	1,732	-	519	2,209	30.00
Zero	Hook-and-line	1,498	-	0	0	0.00
	Pot	16	-	0	0	0.00
	Total	1,514	-	0	0	0.00
Full	Full	2,853	-	2,853	18,520	100.00
	Pollock trawl EFP (BSAI)	482	-	482	1,657	100.00
	Total	3,335	-	3,335	20,177	100.00

Figure B- 1. Process diagram for the analyses contained in this appendix. Green boxes indicate inputs and blue boxes indicate iterative and random processes.

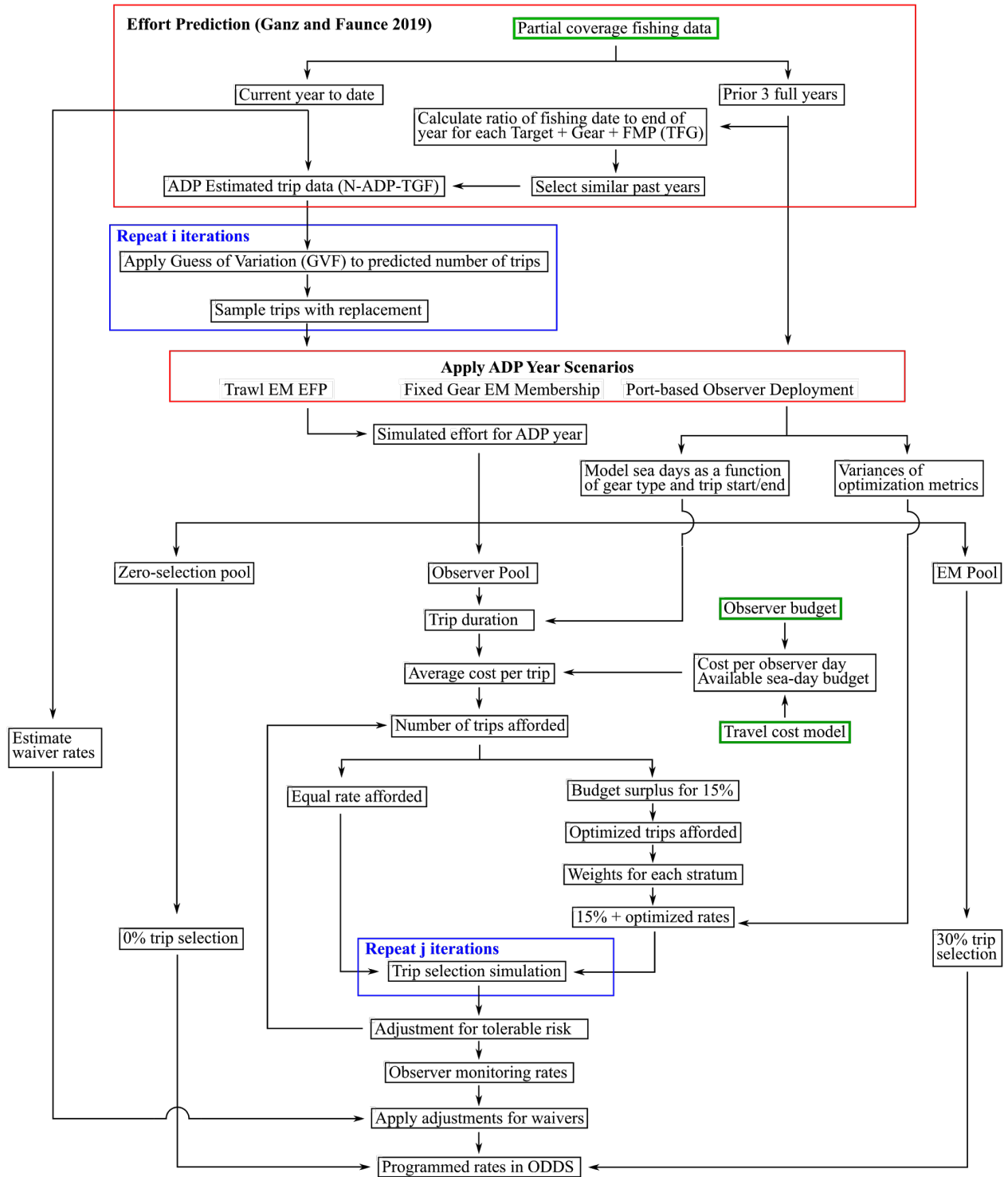


Figure B- 2. Summary of 100,000 outcomes of simulated sampling showing the total cost of the program expected for 2021 subtracted from the available budget (expected budget overages and underages). Vertical lines depict the median difference (dashed blue line) and 95% confidence limits (dashed red lines).

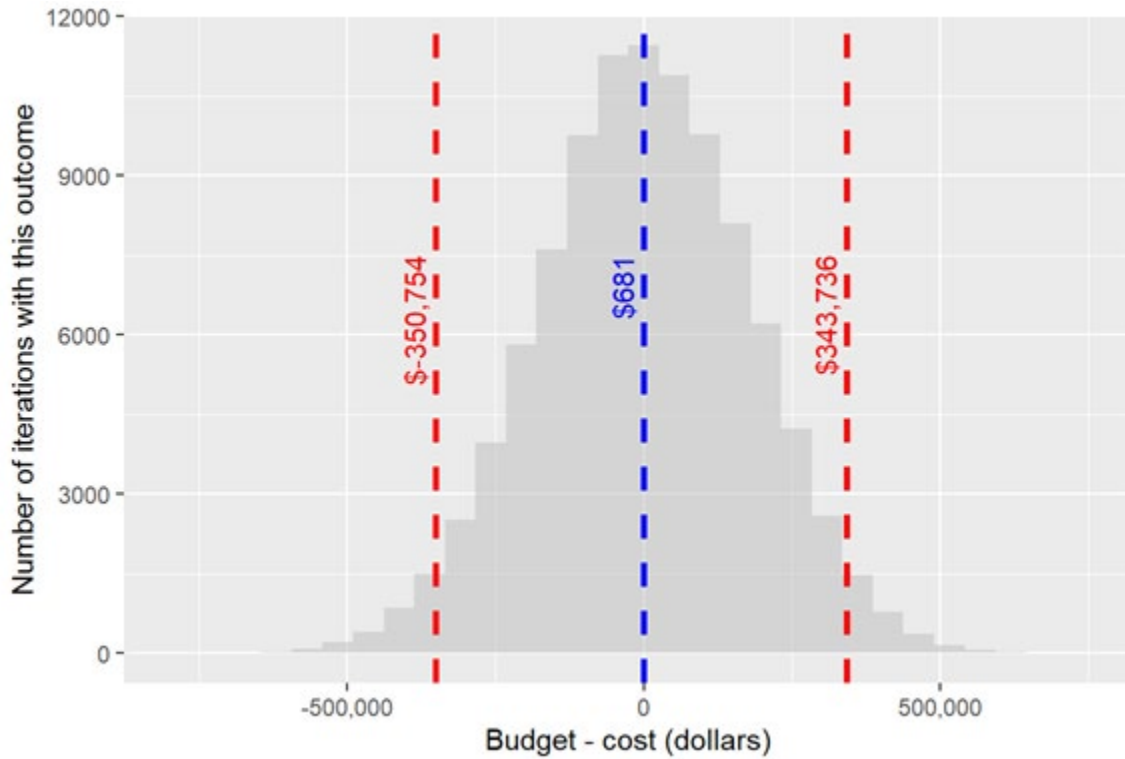
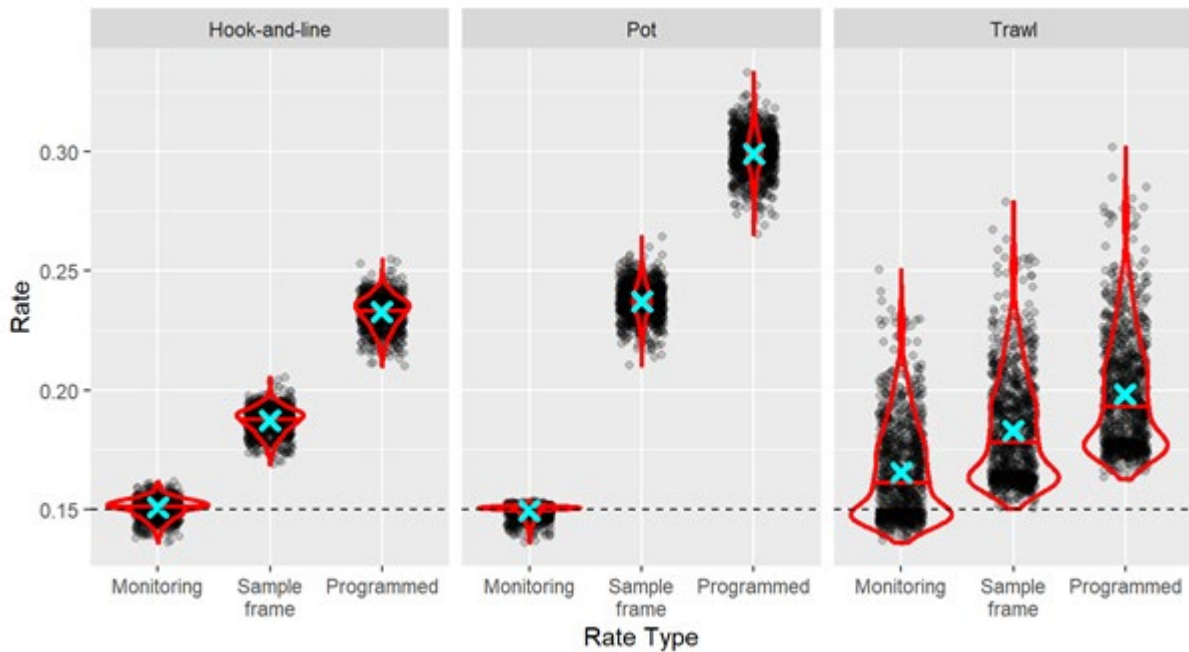


Figure B- 3. Afforded strata-specific rates of at-sea observer coverage for 2021 fishing effort.

‘Monitoring’ rates are the overall coverage rates for the strata. ‘Sample frame’ rates are the selection rates required for trips within the sample frame and account for estimated waiver rates for trips that do not depart from and offload to one of 14 listed ports under COVID-19 safety protocols. ‘Programmed’ rates are the final trip selection rates that are programmed into ODDS and account for additional waiver rates (i.e., logistic constraints, and observer safety). The means from all populations are denoted as cyan ‘X’s, the medians from all populations are denoted as red horizontal lines, and the distribution of the points is represented by red ovals (the wider the oval the more outcomes had that value). Individual points within the distributions are the mean selection rates from 100 ODDS simulations performed on 1000 populations (1000 data points are depicted). The 15% hurdle is depicted by the dashed black line.



Appendix C. Electronic Monitoring Innovation Research in 2021

Introduction

In 2021, the Fisheries Monitoring and Analysis Division of the Alaska Fisheries Science Center (AFSC) will continue research and development of innovative electronic monitoring (EM) technologies. This research supports NOAA Fisheries policy encouraging the development of electronic technologies for fishery dependent data collection to complement or improve existing data collection programs. The overall objective is to develop machine vision systems that automate the count, measurement and identification of fish at the source of data collection. Ideally, video/imagery would not necessarily have to be transferred, reviewed, and stored because an onboard application will complete the processing of both sensor and image data into species enumeration and lengths. This type of system would reduce time lags and costs associated with current EM systems and post processing methods. The overall goal of the project is to help address challenges for collecting scientific data remotely to better support bycatch estimation and ecosystem based fisheries monitoring while reducing monitoring costs.

Deployment in 2021

EM innovation research in 2021 will build upon previous work by improving system reliability and machine learning algorithms to provide greater accuracy for length estimation and species identification. Three vessels will participate in EM research and will be in zero coverage when fishing with hook-and-line gear: the F/V's *Middleton*, *Kariel* and *Defender*. Due to logistical and travel constraints resulting from COVID-19 pandemic in 2020, many of the goals for the EM innovation were not able to be realized and this year the same deployment goals are still relevant. The 2021 EM research deployment plan will be:

- Deployment of EM stereo cameras volunteering fishing vessels when they are fishing with hook-and-line gear
- Deployment of EM stereo cameras on AFSC sablefish survey
- Deployment of an EM Lite system (no cameras) on 1 volunteering fishing vessel (F/V *Defender*)
- Deployment of camera chute system on 2-3 trawl vessels that will be fishing and doing halibut deck sorting
- Potential deployments of stereo-camera chute system on a NMFS survey vessel
- The following additional video collection systems may be deployed as time, funding, and industry cooperation allow:
 - IP cameras monitoring shoreside pollock deliveries at a range of plants
 - trawler deck and net video
 - IP cameras monitoring onboard processor catch handling

The image data collected will be used in EM laboratory research to improve the current suite of machine learning algorithms for automated assessment of image quality, catch count, length measurement, and species identification for longline, trawl, plant, or pot gear applications.

EM laboratory research objectives include:

- EM using stereo rail cameras and standard IP cameras
 - Improve catch event detection reliability

- Improve length measurement reliability and accuracy
 - Test wheelhouse monitor for real-time image quality and system health checks
 - Incorporate satellite communications to automate system health checks in real time
 - Continue to build an image library training dataset for species identification
 - Evaluate image-based, real-time sensing of haul retrieval - this approach would improve ease and cost of installation since we would no longer have to install hydraulic/drum sensors
 - Improve/develop algorithms to detect the presence and locations of crew on deck from standard IP camera images, in order to indicate events to monitor more directly
 - Improve/develop algorithms to accurately collect lengths from halibut on a sorting table using standard IP camera images
- EM Lite
 - Test a system that is designed to collect only sensor data (hydraulic pressure and RFID tags) to determine effort (number of hauls) and fishing area
 - Integrate satellite communications to automate delivery of haul information and system health.
- Camera chute systems
 - Improve length measurement reliability and accuracy
 - Develop procedures, software, and hardware to summarize results from the halibut measurement chutes and transmit them for management use
 - Develop algorithms to segment, track, and identify individual fish passing through chutes (or conveyors) when many are present simultaneously
 - Improve camera chutes based on standard IP cameras (rather than stereo cameras) for durability, accuracy, and ease-of-use
- Integration with Observers
 - Improve/develop machine learning to distinguish between Blackspotted and Rougheye Rockfish
 - Begin development of phone/tablet application that will eventually be deployed with observers to aid in species identification
 - Integration of observer-collected species images into the image libraries
- Develop automated image system to monitor offloads for PSC
 - Continue to develop/improve automated processing of video of catches entering plants to detect passing salmon
 - Improve adaptation of camera chute technology to distinguish Chinook salmon from other species
 - Deployments in 2020 will test these automated tools in Kodiak plants to monitor the effectiveness of plant sorting and reporting processes

Publications resulting from EM innovation project research

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