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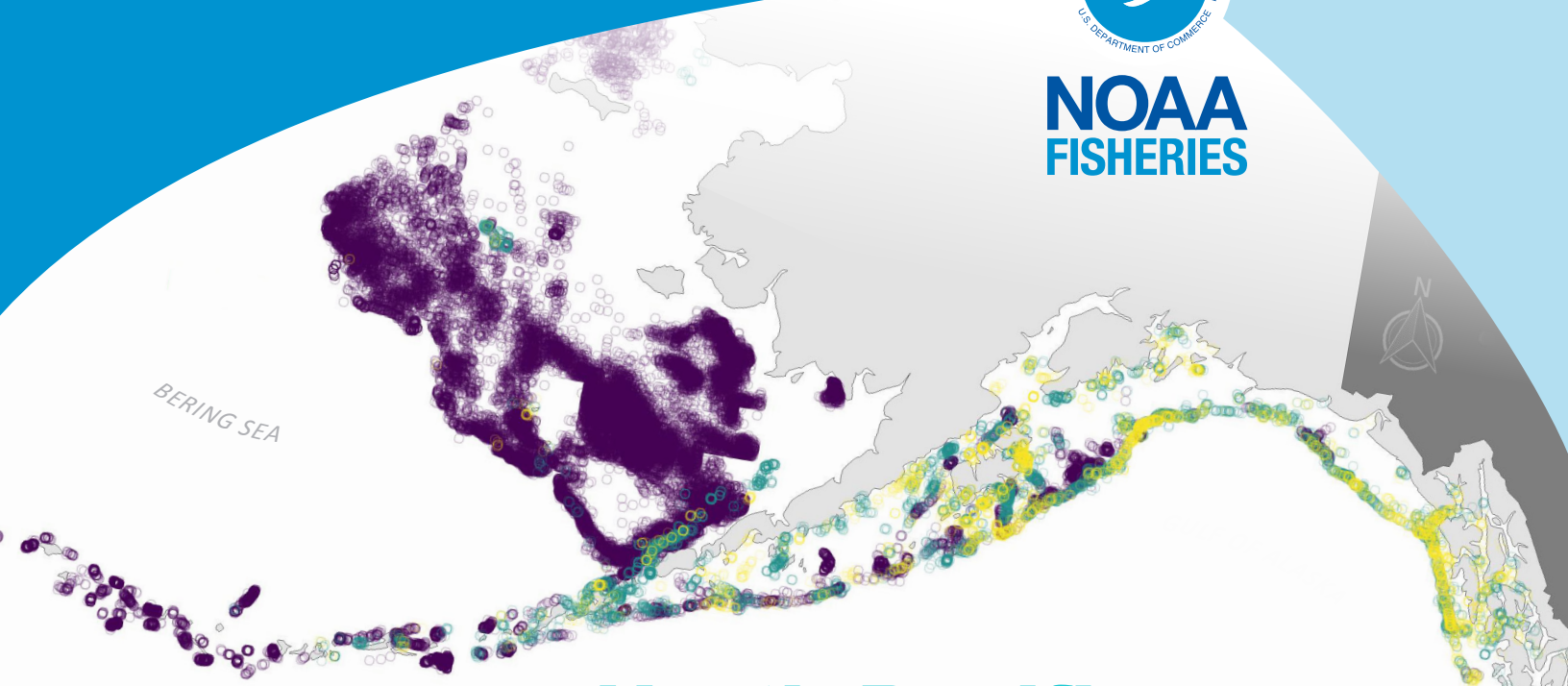

North Pacific Observer Program 2020 Annual Report

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North Pacific Observer Program 2020 Annual Report

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Contents

Executive Summary

This Annual Report provides information, analysis, and recommendations based on the deployment of observers and Electronic Monitoring (EM) systems by the North Pacific Observer Program (Observer Program) during 2020.

Section 313 of the Magnuson-Stevens Act (16 U.S.C. 1862) authorizes the North Pacific Fishery Management Council (Council), in consultation with National Marine Fisheries Service (NMFS), to prepare a fishery research plan for the purpose of 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 Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) management areas. Observers and EM systems collect fishery-dependent information used to estimate total catch and disposition. Observers also collect biological and ecosystem data and interactions with, and biological samples from, 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 resources. Scientists use fishery-dependent data to assess fish stocks, to provide scientific information for fisheries and ecosystem research and fishing fleet behavior, to assess marine mammal interactions with fishing gear, and to assess fishing interactions with habitat.

Each year, the Annual Deployment Plan (ADP) describes the science-driven method for deployment of observers on vessels in the partial coverage category (50 CFR 679.51(a)) in the Pacific halibut and groundfish fisheries off Alaska. The following year, the agency provides an Annual Report with descriptive information and scientific evaluation of the deployment of observers and EM. The ADP and Annual Report process provides information to assess whether the objectives of the Observer Program have been met and a process to make recommendations to improve implementation of the program to further these objectives.

Response to COVID-19 and Program Summary

- Starting in March 2020, the COVID-19 pandemic created limitations on available air travel and "shelter in place" restrictions, particularly in many remote Alaska communities. The situation impacted observer deployment and the agency responded in order to protect public health and to ensure the safety of fishermen and observers, while maintaining an ongoing supply of fish to markets. As a result, the Observer Program completely reengineered observer logistic processes including observer training classes, briefing and debriefing protocols, extensions to observer deployment, and modifications to sampling protocols to minimize observers from vessels interacting with staff in processing plants.
- Under the emergency rule signed on 24 March 2020, NMFS temporarily waived the requirement for vessels in the Partial Coverage Category to carry a fishery observer starting on 26 March 2020. On 18 April 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. On 30 June

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 Alaska 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.
- Despite all of the challenges of 2020, the agency was able to safely continue many of the observer program operations. There were 373 observers that were trained, briefed, and equipped for deployment to vessels and processing facilities operating in the BSAI and GOA groundfish and halibut fisheries.
- Twenty-one Fisheries Monitoring and Analysis Division (FMA) staff members completed 105 debriefings in Anchorage and 469 debriefings in Seattle; the majority of these were completed virtually.
- In 2020, observers collected data on board 259 fixed gear and trawl vessels and at 11 processing facilities for a total of 40,838 observer days (39,153 full coverage days on vessels and in plants; and 1,685 partial coverage days on vessels and plants). NMFS approved 169 vessels in the 2020 EM selection pool. Of these, 131 vessels fished at least 1 trip but not all vessels were selected to turn on their EM system. In 2020, EM data was collected from 105 unique vessels on a total of 253 trips (193 hook-and-line trips and 60 pot trips).
- Overall, for all federal fisheries off Alaska, 4,072 trips (44.8%) and 375 vessels (38.2%) were monitored by either an observer or EM system in 2020.

Fees and Budget

- The expenditures for observer deployment in 2020 in the partial coverage category was $2,729,486 for 1,977 observer days. The number of observer days included days at the shoreside processing plants for situations where vessel observers were not able to follow fish into the plant to complete their sampling, due to COVID restrictions. Federal funds on the contract were used to pay for plant observers to complete this sampling.
- Fee billing statements for 2020 were mailed to 104 processors and registered buyers in January 2021 for a total of $2,469,241 in observer fees (Section 2.1).
- The breakdown in contribution to the 2020 observer fees by species was: 42% Pacific halibut, 35% sablefish, 9% Pacific cod, 11% pollock, and 3% all other groundfish species (Table 2-2).
- In 2020, the average cost per observer sea day in the partial coverage category was $1,381 (based on the cost of $2,729,486 for 1,977 observer days) (Section 2.3.1).
- In 2020, the average cost per EM sea day in the partial coverage category was $922 (based on $1,328,995 adjusted cost for 1,442 EM sea days). The amortization schedule

adjusts for the hardware costs to spread these costs over five years (see Section 2.3.4 and Appendix A).

Deployment Performance Review

Chapter 3 provides a review of the deployment of observers and EM relative to the intended sampling plan and goals of the Observer Program. This year, changes to the analysis were necessary to address the adjustments to the deployment of observers caused by COVID-19. The changes made throughout the year by NMFS in response to health and safety conditions created three separate time periods. In the first time period, deployment was based on trips among all ports of departure, and followed the original 2020 ADP. During the second time period, NMFS temporarily waived observer requirements for some vessels between 26 March and 30 June. Therefore, there was no expectation of achieving deployment rates partial coverage strata. Starting in July, NMFS expanded observer deployment to include 13 ports in addition to Kodiak. During this third time period, there was an expectation of monitoring rates, but it also recognizes that sampling frame was reduced to 13 ports and only included those trips that declared to use the same port for departure and arrival.

Deployment Rates

A summary of the number of vessels and trips in each stratum and realized coverage rates in 2020 are as follows:

Coverage category	Strata		Total vessels	Total trips	Sampled trips	Expected coverage rate	Realized coverage rate	Met expectations?*
Full coverage	Full		143	2,864	2,856	100.0	99.7	**
	Trawl EM (BSAI)		21	494	494	100.0	100.0	Yes
Partial coverage	Hook-and-Line	Jan. 1 - Mar. 25	50	82	11	15.4	13.4	Yes
		Mar. 26 - Jun. 30	180	547	6	*Not applicable due to waivers & COVID*		
		Jul. 1 - Dec. 31	239	849	87	15.4	10.2	No
	Pot	Jan. 1 - Mar. 25	64	161	25	15.2	15.5	Yes
		Mar. 26 - Jun. 30	38	152	5	*Not applicable due to waivers & COVID*		
		Jul. 1 - Dec. 31	80	295	25	15.2	8.5	No
	Trawl	Jan. 1 - Mar. 25	45	392	88	19.6	22.4	Yes
		Mar. 26 - Jun. 30	20	171	16	*Not applicable due to waivers & COVID*		
		Jul. 1 - Dec. 31	29	347	56	19.6	16.1	Yes

Coverage category	Strata	Total vessels	Total trips	Sampled trips	Expected coverage rate	Realized coverage rate	Met expectations?*
	EM Hook-and-Line	126	643	193	30.0	30.0	Yes
	EM Pot	30	194	60	30.0	30.9	Yes
	Trawl EM (GOA)	31	477	153	30.0***	32.1	Yes
No selection	Zero Coverage	320	1,403	0	0.0	0.0	Yes
	Zero Coverage- EM Research	2	22	0	0.0	0.0	Yes

*The expectation for partial coverage strata is that selection rates are within the 95% confidence intervals of realized deployment rates. The expectation for full and zero coverage strata are that coverage rates are exactly 100% and 0%, respectively.
** One full coverage trip was released due to COVID and 11 full coverage trips were unmonitored due to a fixed gear catcher vessel that due to vessel size and target fishery was in full coverage, but mistakenly logged trips as partial coverage.
***The trawl EM program requires video on 100% of trips for compliance monitoring. In addition, there is shoreside sampling by observers on a random selection of trips. This table evaluates the goal of 30% coverage of shoreside monitoring to collect biological samples and census counts of salmon and halibut PSC.

Temporal Patterns

Section 3.7.1 evaluated the possibility for temporal bias in each stratum. The relative advantage to EM compared to observers in a COVID-19 environment was evident by the fact that no temporal disruptions to fisheries monitoring occurred for the EM strata (Fig. 3-3). In comparison, observer deployment into the hook-and-line and pot strata was nearly zero during the waiver period (during which there was no statistical expectation for the monitoring rate), and substantially below expected rates for much of the time period after modified coverage was restored (Fig. 3-3). Deployment of observers into the trawl stratum, which did not receive as many waivers, was less affected (Fig. 3-3).

Trip Metrics

Six trip metrics were examined in the permutation test. These metrics were as follows: the number of NMFS Areas visited in a trip, trip duration (days), the weight of the landed catch (t), the vessel length (ft), the number of species in the landed catch, and the proportion (0 to 1) of the total catch that is made up of the most predominant species (pMax). The metric 'vessel length' is used to help interpret the results from 'weight of landed catch' since fishing power is positively correlated to vessel length. Specifically, differences in weight *and* length are interpreted as a failure to achieve a random sample of vessels of different sizes, whereas differences in weight only lend more evidence that there was a monitoring effect. The number of species within the landed portion of the catch is a measure of species richness. Of all metric and stratum combinations tested, one had a low *p*-value: observed trips in the hook-and-line stratum were 23.3% (1.28 days) shorter in duration than unobserved trips.

Compliance and Enforcement

The Office of Law Enforcement, Alaska Division (AKD), works closely with the U.S. Coast Guard (USCG), Alaska Wildlife Troopers (AWT), industry, Observer Program, and observer providers to address incidents that affect observers and observer work environments, safety, and sampling. In 2020, observers filed 619 statements. Chapter 5 provides an analysis of potential violations reported by observers which have been corrected for differences in fishery monitoring and fishery effort. These data enable comparisons and help focus and prioritize enforcement efforts, outreach, education, and compliance assistance.

NMFS Recommendations

NMFS recommends the following for the 2022 Draft ADP:

- **Observer Selection Pools**
  - NMFS recommends that the three observer coverage strata defined by gear (hook-and-line, pot, and trawl) remain the same for 2022.
  - Continue to allocate observer deployment using a 15% hurdle plus optimization.
    - Base optimization on discarded groundfish, Pacific halibut PSC, and Chinook salmon PSC or create an alternative optimization by gear type rather than by discards.
  - Consider port-based or trip-based selection for deployment.
    - NMFS will continue to monitor ongoing State of Alaska health mandates, travel restrictions, and quarantine requirements. If necessary, the observer deployment strategy in 2022 will prioritize methods that protect lives and livelihoods, including port-based deployment.
- **Fixed Gear EM Selection Pool**
  - NMFS recommends that the EM selection pool be composed of up to 168 fixed gear vessels, which would maintain the size of the EM pool from 2021. If additional funds become available, the number of EM boats could increase by Council's recommendation of 30 additional vessels.
  - If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS recommends prioritizing placement in the EM selection pool as follows:
    - Vessels that are already equipped with EM systems.
    - Vessels that are unlikely to introduce data gaps based on 3 years of past fishing history. This would be consistent with the Council's research priority to evaluate data gaps in biological samples due to implementation of EM.
    - Vessels 40-57.5 ft length overall (LOA) where carrying a human observer has been problematic due to bunk space or life raft limitations.
  - For 2022, if a vessel operator had repeated problems with EM system reliability or video quality or has failed to comply with the requirements in their Vessel

Monitoring Plan, NMFS may disapprove a Vessel Monitoring Plan for 2022 and the vessel may be removed from the EM pool.

- **Trawl EM EFP**
  - NMFS recommends continuing the pelagic trawl electronic monitoring (EM) EFP in 2022.
  - NMFS supports increasing the number of participants and continuing efforts to improve processor participation and support.
- **ODDS**
  - NMFS recommends that all ODDS trips be closed using the existing pull down menu that lists eLandings report numbers associated with the vessel. This recommendation will strengthen the existing linkage between ODDS and eLandings.
  - NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).

In addition to ongoing implementation of trawl EM, NMFS recommends collaborating with industry partners on the following EM development and cost efficiency projects.

- Evaluating more cost-effective and mobile EM systems.
- Exploring alternative EM review protocols to minimize changes in catch handling required by EM participants.
- Testing EM configurations which could allow a vessel to have multiple VMPs and therefore allow cross-over between the fixed gear EM program and the trawl EM EFP.

Integrated Partial Coverage Analysis

- NMFS recommends developing an integrated evaluation of the partial coverage category. This would account for upcoming changes to the trawl components of partial coverage (BSAI Pacific cod Limited Access Program and transition of Trawl EM to a regulated program) and a new contract for observer coverage in the partial coverage category. An integrated view of fixed gear would enable evaluation of each data collection method (observers and EM) and design sampling that combines both to be most effective. The analysis would incorporate the goal of spending the limited, available funding more efficiently such that more coverage (both EM and observers) is achieved for the cost.

- NMFS recommends that this effort be conducted holistically with a target date of being fully implemented by 2024. To enable staff to work on the analysis, NMFS recommends that the elements of the 2022 ADP are carried forward to 2023.

1. Introduction

This annual report provides information, analysis, and recommendations based on deployment of observers and Electronic Monitoring (EM) systems under the North Pacific Observer Program (Observer Program) during 2020. Section 313 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1862) authorizes the North Pacific Fishery Management Council (Council), in consultation with National Marine Fisheries Service (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 Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) management areas.

Observers and EM systems collect fishery-dependent information used to estimate total catch and disposition. Observers also collect biological and ecosystem data and interactions with, and biological samples from, 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.

All vessels and processors that participate in federally managed or parallel groundfish and Pacific halibut fisheries off Alaska (except catcher vessels delivering unsorted codends to a mothership) are assigned to one of two categories: 1) the full observer coverage category (full coverage) or 2) the partial observer coverage category (partial coverage). Vessels and processors in the full coverage category have at least one observer present during all fishing or processing activity. Vessels and processors in the partial coverage category are assigned observer coverage according to the scientific sampling plan described in the Annual Deployment Plan (ADP) developed by NMFS in consultation with the Council. Vessels volunteering into the partial coverage EM program are assigned random coverage based on prescribed policy of 30 % coverage. Since 2013, observers have been deployed in the partial coverage category using established random sampling methods to collect data on a statistically reliable sample of fishing vessels in the partial coverage category. Some vessels and processors may be in full coverage for part of the year and partial coverage at other times of the year depending on the observer coverage requirements for specific fisheries.

Observer coverage in the full coverage category is industry-funded through a pay-as-you-go system whereby fishing vessels procure observer services through NMFS-permitted observer service providers. Observer or EM coverage in the partial coverage category is funded through a system of fees collected from fishery participants (vessels and processing plants) under authority of Section 313 of the Magnuson-Stevens Act. The fee is based on the ex-vessel value of groundfish and Pacific halibut and is assessed on landings by vessels not included in the full

coverage category. The system of fees fairly and equitably distributes the cost of observer coverage among all vessels and processors in the partial coverage category.

The current structure of the Observer Program, including the definition of full and partial coverage, random deployment methods, and the fee system has been in place since 2013 when the changes were implemented under Amendment 86 to the Fishery Management Plan (FMP) for Groundfish of the BSAI Management Area and Amendment 76 to the FMP for Groundfish of the GOA (Amendments 86/76)[1]. Since 2013, a series of regulatory and Fishery Management Plan (FMP) amendments have been implemented to amend the Council's fisheries research plan and make specific modifications to observer coverage requirements under the Observer Program:

- BSAI Amendment 112 and GOA Amendment 102 revised observer coverage requirements for catcher/processors (81 FR 17403, 29 March 2016). This rule allowed small, non-trawl catcher/processors that met specific criteria to choose to be in the partial observer coverage category. Effective 29 March 2016.

- BSAI Amendment 109 revised observer coverage requirements and placed catcher vessels less than or equal to 46 ft LOA when groundfish fishing under a Community Development Quota (CDQ) into the partial coverage category (81 FR 26738, 4 May 2016). Effective 3 June 2016.

- A regulatory amendment (81 FR 67113, 30 September 2016) revised observer coverage requirements for BSAI trawl catcher vessels and allows the owner of a trawl catcher vessel to request, on an annual basis, placement in the full observer coverage category for all directed fishing for groundfish using trawl gear in the BSAI for one year. Effective 31 October 2016.

- BSAI Amendment 114 and GOA Amendment 104 integrated EM into the North Pacific Observer Program (82 FR 36991, 7 September 2017). The rule established a process for owners or operators of vessels using non-trawl gear to request to participate in the EM selection pool and the requirements for vessel owners or operators while in the EM selection pool.

- A regulatory amendment (84 FR 55044, 15 October 2019) implemented regulations for catch handling and monitoring requirements to allow halibut bycatch to be sorted on the deck of trawl catcher/processors and motherships when operating in the non-pollock groundfish fisheries off Alaska. This rule allows halibut to be returned to the water faster while also ensuring that observer data continue to result in reliable estimates of halibut incidental catch rate and viability. Effective 14 November 2019. Implemented 1 January 2020.

[1] The final rule for Amendments 86/76 was published in the *Federal Register* on 21 November 2012 (77 FR 70062).

- NMFS published a final rule (85 FR 41424, 10 July 2020) to adjust the North Pacific Observer Program fee from 1.25 % to 1.65 % of the ex-vessel value of landings subject to the fee. This final rule is intended to increase funds available to support observer and electronic monitoring systems deployment in the partial coverage category of the Observer Program and increase the likelihood of meeting desired monitoring objectives. Effective 10 August 2020. Implemented 1 January 2021.
- NMFS published a temporary emergency action (85 FR 17285, 27 March 2020) to provide NMFS with the authority to waive observer coverage and other observer program requirements. NMFS took this action to address public health concerns relating to the COVID-19 Pandemic. Effective 24 March 2020, Implemented 24 March 2020. This rule has been extended through further rulemaking (85 FR 16307, 29 March 2021) through 26 March 2022 or until the Secretary of Health and Human Services determines that the COVID-19 Pandemic is no longer a public health emergency, whichever is earlier.

1.1.1. Observer Coverage Categories and Coverage Levels

1.1.1. Full Coverage

Vessels and processors in the full observer coverage category must comply with observer coverage requirements at all times when fish are harvested or processed. Specific requirements are defined in regulation at 50 CFR § 679.51(a) (2). The full coverage category includes the following:

- Catcher/processors (with limited exceptions).
- Motherships.
- Catcher vessels participating in programs that have transferable prohibited species catch (PSC) allocations as part of a catch share program.
- Catcher vessels using trawl gear that have requested placement in the full coverage category for all fishing activity in the BSAI for one year.
- Inshore processors receiving or processing Bering Sea pollock.

Independent estimates of catch, at-sea discards, and prohibited species catch (PSC) -- among other data -- are collected aboard all catcher/processors and motherships in the full observer coverage category. Requiring at least one observer on every catcher/processor means that at-sea discards and PSC estimates are not based on self-reported data or extrapolated observer data from other vessels. Catcher vessels participating in programs with transferable PSC allocations as part of a catch share program also are included in the full coverage category. These programs include Bering Sea pollock (both American Fisheries Act and Community Development Quota (CDQ) programs), the groundfish CDQ fisheries (CDQ fisheries other than Pacific halibut and fixed-gear sablefish; only vessels greater than 46 ft LOA), and the Central GOA Rockfish Program.

Independent observer data are important under these catch share programs because quota share recipients are prohibited from exceeding any allocation, including, in many cases, transferable PSC allocations. Allocations of exclusive harvest privileges can create increased incentive to misreport as compared to open-access or limited-access fisheries. Transferable PSC allocations also present challenges for accurate accounting because these species are not retained for sale and they represent a potentially costly limitation on the full harvest of the target species. To enforce a prohibition against exceeding a transferable target species or PSC allocation, NMFS must demonstrate that the quota holder had catch that exceeded the allocation. Supporting a quota overage case for target species or PSC that could be discarded at sea from an unobserved vessel requires NMFS to rely on either industry reports or estimated catch based on discard rates from other similar observed vessels. These indirect data sources create additional challenges to NMFS in an enforcement action. In addition, the smaller the pool from which to draw similar observed vessels and trips, the more difficult it is to construct representative at-sea discard and PSC rates for individual unobserved vessels.

Inshore processors receiving deliveries of Bering Sea pollock are in the full coverage category because of the need to monitor and count salmon under transferable PSC allocations.

1.1.2. Partial Coverage

The partial observer coverage category includes the following:

- Catcher vessels designated on a Federal Fisheries Permit when directed fishing for groundfish in federally managed or parallel fisheries, except those in the full coverage category.
- Catcher vessels when fishing for Pacific halibut individual fishing quota (IFQ) or sablefish IFQ (there are no PSC limits for these fisheries).
- Catcher vessels when fishing for Pacific halibut CDQ, fixed-gear sablefish CDQ, or groundfish CDQ using pot or jig gear; or catcher vessels less than or equal to 46 ft LOA using hook-and-line gear fishing for groundfish.
- Catcher/processors that meet criteria that allows assignment to the partial coverage category.
- Shoreside or stationary floating processors, except those in the full coverage category.

Each year, the ADP describes the science-driven method for deployment of observers on vessels in the partial coverage category (50 CFR 679.51(a)) in the Pacific halibut and groundfish fisheries off Alaska. The 2020 ADP (NMFS 2019) is summarized in Section 1.3.

1.2. Annual Planning and Reporting Process

Amendments 86/76 established an annual process of 1) developing an Annual Deployment Plan (ADP) that describes plans and goals for observer deployment in the partial coverage category in the upcoming year, and 2) preparing an annual report providing information and evaluating performance in the prior year.

The ADP describes how observer coverage and EM will be assigned to vessels and processors in the partial observer coverage category in the upcoming year. NMFS develops each ADP in consultation with the Council after reviewing an evaluation of deployment performance for the previous year. 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 2020 ADP is summarized in Section 1.3 of this report.

The Annual Report provides descriptive information, analysis, and recommendations based on observer deployment in the previous year. An important component of the annual report is Chapter 3, the "deployment performance review" chapter, which statistically evaluates the deployment of observers and EM in the previous year. The purpose of the deployment performance review is to evaluate whether observer deployment and monitoring goals detailed in regulation and the ADP were achieved and to identify recommendations for observer deployment in order to promote the collection of data necessary to conserve and manage the groundfish and halibut fisheries. The annual report is an important source of information in developing the proposed ADP for the next year and informing potential regulatory changes to the Observer Program.

The annual planning and reporting process is described below:

- **February – May**: NMFS staff compile the annual report for the previous year. Chapter 3 (the deployment performance review) is prepared by the Fishery Monitoring Science Committee, which is described in more detail in Chapter 3.
- **May – June**: NMFS presents the annual report to the Council (and the Council's Monitoring Committees, Advisory Panel, and Scientific and Statistical Committee, as deemed appropriate by the Council) and to the public. The Council may recommend adjustments to observer deployment to prioritize data collection based on conservation and management needs. The Council and public provide input to NMFS on the annual report. This input may be factored into the draft ADP, the next annual report, or other reports or analyses for the Council.
- **June – August**: Using information from the prior year's annual report and Council recommendations, NMFS prepares a draft ADP for the upcoming year.
- **September**: NMFS releases the draft ADP in early September each year to allow review by the Groundfish and Crab Plan Teams. The Council's Monitoring Committee also reviews the draft ADP prior to the Council's October meeting and provides written recommendations to the Council.
- **October**: The Council (and the Council's Monitoring Committees, Advisory Panel, and Scientific and Statistical Committee, as deemed appropriate by the Council) reviews the analysis used to prepare the draft ADP as well any input from the public. NMFS reviews and considers comments made by the Council and its committees, however extensive revisions to the analysis used to prepare the draft ADP are not feasible between October and December.

- **December**: NMFS finalizes the ADP by computing the selection rates for the upcoming year using a refined estimate of the total budget and expected fishing effort. Ideally the final ADP will be released to the public prior to the December Council meeting. NMFS also evaluates whether the Environmental Assessment (EA) prepared for Observer Program Restructuring (NPFMC and NMFS 2011) needs to be supplemented for the ADP. In 2014, NMFS prepared a Supplementary Information Report explaining why the EA did not need to be supplemented. In 2015, NMFS prepared a Supplemental Environmental Assessment (NMFS 2015) in response to a Court Order to consider whether the restructured Observer Program would yield reliable, high-quality data given likely variations in costs and revenues.

1.3. Summary of the 2020 Annual Deployment Plan 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 Alaska communities. The situation impacted observer deployment and the agency responded in order to protect public health and to ensure the safety of fishermen and observers, while maintaining an ongoing supply of fish to markets. As a result, the Observer Program completely reengineered observer logistic processes including observer training classes, briefing and debriefing protocols, extensions to observer deployment, and modifications to sampling protocols to minimize observers from vessels interacting with staff in processing plants.

Under the emergency rule signed on 24 March 2020, NMFS temporarily waived the requirement for vessels in the partial coverage category to carry a fishery observer from 26 March through 19 April 2020. NMFS granted the waiver for observer coverage on vessels in the partial coverage fleet based on the following factors:

- Limitations on available air travel in Alaska, particularly in many remote Alaska communities that further constricted travel due to concerns about the COVID-19 pandemic.
- Absence of State of Alaska Marine Highway System service providing alternative travel methods among certain ports within Alaska.

- Limitations on travel throughout the State of Alaska, including local "shelter in place" restrictions, which requested self-quarantine practices for anyone traveling into remote communities. These additional limitations limited the ability of observers to be able to fulfill their mission critical work.
- The need to conserve limited observer capacity to be able to provide coverage capability for other vessels and processing facilities participating in the full coverage category.

On 18 April 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 time frame). On 30 June 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 Alaska 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.

1.4. Changes Since the 2020 ADP

Although the focus of this Annual Report is on performance in 2020, changes have been made to the partial observer coverage sampling plan that are being implemented in 2021 (Table 1-1). Here we provide a summary of the changes that have been made since the 2020 ADP.

Consistent with revisions to observer deployment due to COVID-19, in 2021, 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. These ports include the following: 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.

NMFS approved 169 vessels for the EM selection pool for 2021; all these vessels were in the EM pool previously. As part of the VMP approval process in 2021, 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.

The Trawl Electronic Monitoring Trip-Selection 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.

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

- 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.

Table 1-1. -- Sampling strata and selection pools in the partial coverage category from 2013 to the present. The partial coverage selection rates set through the Annual Deployment Plan since 2013 are noted and the realized coverage rates evaluated in the Annual Report are noted in parentheses. PreIm = Pre-implementation, prior to a fully regulated program; CP = catcher/processor vessel; CV = catcher vessel; GOA= Gulf of Alaska; BS = Bering Sea; H&L = hook-and-line gear; LOA = vessel length overall.

Year	Observer trip selection **Trip-selection across all ports** Observer coverage required on all randomly selected trips	**Port-based trip selection** Observer coverage on randomly selected trips in specific ports	**Fixed-gear EM trip selection pool** EM required on randomly selected	**Trawl EM**	**Observer vessel selection pool**	**No selection pool** Observer coverage not required
2021	n/a	Deployment in 13 ports Trawl 16%; H&L 15%; Pot 15%	Fixed gear (H&L and Pot) EM: 30%	100% at-sea EM; 30% shoreside monitoring in GOA and 100% shoreside monitoring in BS	n/a	Vessels <40' LOA and Jig gear EM Innovation Research 4 vessels
2020	July 1 – Dec 31: Limited waivers March 26- June 30: Waivers issued due to COVID-19 Jan 1 – March 25: Trawl: 20% H&L: 15% Pot: 15%	Deployment in 13 ports Deployment in Kodiak Deployment in all ports				
2019	Trawl: 24% (25.2); Trawl Tender: 27% (35.7); H&L: 18% (17.6); Pot: 15% (14.0); Tender Pot: 16% (29.5)	n/a		n/a		
2018	Trawl: 20% (20.3); Trawl Tender: 17% (35.0); H&L: 17% (15.5); Pot: 16% (15.5); Tender Pot: 17% (29.0)		H&L EM: 30%; Pot EM PreIm: 30% (not used in catch accounting)			
2017	Trawl: 18% (20.7); Trawl Tender: 14% (18.8); H&L: 11% (12.0); H&L Tender: 25% (0); Pot: 4% (7.7); Pot Tender: 4% (5.3)		n/a	n/a		EM PreIm ~90 vessels
2016	Trawl: 28% (28.0); H&L: 15% (15.0); Pot: 15% (14.7)					EM PreIm 60 vessels
2015	Large Vessel: 24% (23.4) Trawl CVs, Small CPs, H&L/Pot CVs ≥ 57.5'; Small Vessel: 12% (11.2) H&L/Pot CVs >40' and <57.5'		n/a			EM PreIm 12 vessels
2014	All Trawl CVs and H&L/Pot vessels ≥ 57.5' LOA: 16% (15.1)				H&L/Pot CVs >40' and <57.5': 12% (15.6)	Voluntary EM
2013	All Trawl CVs and H&L/Pot vessels ≥ 57.5' LOA: 14.5% (14.8)				H&L/Pot CVs >40' and <57.5': 11% (10.6)	Vessels <40' LOA and Jig gear

2. Fees and Budget

2.1. Budget for Partial Coverage Category in 2020

Section 313(d) of the Magnuson-Stevens Act authorizes the creation of the North Pacific Fishery Observer Fund ("Observer Fund") within the U.S. Treasury. This was the 8th year that fees were collected from the partial coverage fleet. The following section provides information on the amount of fees that accrued on landings made in 2020 that are anticipated to be collected in 2021, as well as the amount of fees collected in 2019 that were obligated to the partial coverage contract to pay for sea days in 2020.

Fee billing statements for 2020 were mailed to 104 processors and registered buyers in January 2021. A total of $2,469,241 in observer fees were billed. At the time of this publication, five processors had not yet paid observer fees totaling $10,909. In order to collect delinquent fees, ten 30-day notices were mailed in March. Additional notices will be mailed as needed. Processors submitting late fee payments were charged a onetime administrative fee of $25 plus interest on the observer fees with each notice.

The sequestration of funds initiated under the 2011 Budget Control Act continues to affect the Observer Fund. Each year, the Observer Fund is subject to sequestration, meaning a percentage of the fee revenue is held in the Fund. However, each year we also receive the sequestered funds from the previous year.

A total authorized transfer from the Observer Fund of $2,412,611was made to the Alaska Fisheries Science Center (AFSC) to be used to support the observer deployment contract in fishing year 2020 (Table 2-1).

2.2. Fees Collected from 2020, Summarized by Species, Gear, and Area

Observer coverage for the partial coverage category is funded through a system of fees based on the ex-vessel value of groundfish and Pacific halibut, with potential supplements from Federal appropriations. The observer fee is assessed on landings accruing against a Federal total allowable catch (TAC) for groundfish or a commercial halibut quota made by vessels that are subject to Federal regulations and not included in the full coverage category. Therefore, a fee is only assessed on landings of groundfish from vessels designated on a Federal Fisheries Permit or from vessels landing IFQ or CDQ halibut or IFQ sablefish. Within the subset of vessels subject to the observer fee, only landings accruing against the Federal TAC are included in the fee assessment.[2]

A fee equal to 1.25% of the ex-vessel value is assessed on the landings of groundfish and halibut subject to the fee. Ex-vessel value is determined by multiplying the standard price for groundfish by the round weight equivalent for each species, gear, and port combination, and the standard

[2]A table with additional information about which landings are and are not subject to the observer fee is in NMFS regulations at 679.55(c) (CFR 679.55 Observer Fees) and shown on page 2 of an informational bulletin available online at: Observer Fee Collection.

price for halibut by the headed and gutted weight equivalent. The standard ex-vessel prices used for 2020 fee assessments were published in the *Federal Register* on 16 December 2019 (83 FR 65146).[3] Table 2-2, Table 2-3, and Table 2-4 summarize the observer fees that accrued for 2020.

2.2.1. Fee Collection Compared to Previous years

In 2020, nearly every aspect of life felt the impact of the COVID pandemic; fishing effort was no exception. One of the ways this impact can be seen on fishing effort is in the lag in observer fee assessment. The overall amount of observer fees assessed in 2020 was the lowest annual amount since the Observer Program restructure. Throughout the year, the cumulative amount of fees assessed in 2020 were below the mean amount assessed in previous years (Fig. 2-1, left panel). Factors such as quotas and standard prices contribute to the magnitude of fees in a year and these are established prior to the onset fishing. In an attempt to minimize the influence of quota size and standard price variability on fee comparisons across years, cumulative fees were compared as proportions of their overall annual fees (Fig. 2-1, middle panel). The fees in 2020 appear to lag behind earlier years. The amount of lag each day in 2020 is indicated as the difference between the proportions (Fig. 2-1, right panel). The 2020 fees started out similarly in 2020 compared to previous years, but began to lag following January and appear to lag throughout most of the year. The 2020 lag increased until the middle of May where it reached a maximum of 14%. The lag then decreased, but the proportion of 2020 fees did not "catch up" to previous years until the middle of November. In previous years, half of the fees were assessed by approximately June 1st, on average, but in 2020 that milestone was not reached until late July.

The overall observer fees within a year are comprised of fees on different species. Figure 2-2 indicates the proportion of each species' overall annual fee total by day for the four predominant species, throughout the year. Some evidence of the lag discussed above can be seen for individual species. The halibut heatmap shows days with larger proportions of the annual halibut fee total in 2020 occurring in the summer rather than spring and more days in the fall with larger proportions. The sablefish heatmap shows fewer days in 2020 in the spring and summer comprising higher percentages of the overall total compared to earlier years but more in the fall.

2.3. Cost

2.3.1. Program Structure

The Fisheries Monitoring and Analysis Division (FMA) at the Alaska Fisheries Science Center (AFSC) oversees the Observer Program and is responsible for a suite of activities that support the overall observer data collection in the groundfish and halibut fisheries in Alaska. FMA has staff located in Seattle, Washington; and in Anchorage, Kodiak, and Dutch Harbor, Alaska. The AFSC allocates a budget to FMA each fiscal year to support these activities. FMA staff are responsible for training, briefing, debriefing, and oversight of observers who collect catch data on board fishing vessels and at shoreside processing plants. FMA is also responsible for quality

[3] Available online in the *Federal Register* at: 83 FR 65146.

control/quality assurance of observer data, conducting research and development of fishery monitoring technologies, and providing a host of fishery-dependent data products and services.

The FMA Division is organized into four programs: Observer Training and Curriculum Development; Debriefing and Data Quality Control; Application Development and Data Presentation; and Division Management and Analytic Services.

Observer Training and Curriculum Development ensures that observers are properly trained and equipped for their deployments. Observers are trained to follow FMA's established data collection procedures while deployed on commercial fishing vessels or stationed at processing facilities. Training materials are regularly updated and created in response to changes in regulations and data needs for stock assessment and ecosystem-based fishery modeling efforts. Training methods are routinely updated to best convey the complex topics and concepts to the observer work force. Program staff also manage FMA's extensive gear inventory to ensure a sufficient supply for observers throughout the year at all FMA office locations and develop inventory control systems and policies to maintain safety equipment, provide sampling equipment readiness, and monitor equipment losses.

Debriefing and Quality Control assures FMA's established data collection procedures were properly followed during observer deployments to commercial fishing vessels and processing facilities. Staff members assist at-sea observers through communications (referred to as in-season advising) available through custom software for answering questions, correcting data errors, and ensuring safety concerns are addressed. Data quality control activities, both in-season and post-deployment include data entry, data validation, and observer support, as well as industry, interagency, and interdivisional support. Staff members install and maintain custom software which is used to transmit observer information and data, ensure observers are trained on the use and configuration of software, and provide near real-time data quality control and guidance for observers using these systems. In addition, they document and evaluate each observer's data collection methodologies through interviews, electronic vessel surveys, and written descriptions submitted the observer. Staff conduct data quality control checks on data collected by fishery observers by verifying the accuracy of recorded data, identifying errors, and ensuring observers make the necessary corrections.

Application Development and Data Presentation develops custom software that supports the recording of fishing effort, location, species composition and biological data collected by fishery observers from North Pacific commercial fisheries. This software enables the transmission, validation, and loading of those data, the editing and reporting of current and vetted data sets; observer logistics and contract management; and the recording of bird and marine mammal data collections for both internal and external use. In collaboration with FMA analysts, staff working under this activity developed and continue to support ODDS which allows vessel owners to register, edit, and close fishing trips. This application was developed with independent modules for FMA management, the partial coverage observer services provider, including the ODDS call center, EM service providers, and each vessel owner.

Division Management emphasizes coordinating and prioritizing resources across programs and activities, as well as managing links between the programs and overall costs. In addition, overall management and supervision of staff, budget, and contracting is required to ensure resources are appropriately allocated and staff understand their responsibilities and priorities. Staff provide advice to support policy development, decision-making, and regulatory and program development by NMFS and the Council. They also provide guidance and advice on policy issues, monitoring programs, and related topics at the regional, national, and international level.

Analytic Services collaborates with scientists throughout the AFSC to ensure that observer data meet the needs of stock assessment and ecosystem-based fishery modeling efforts. In addition, analysts perform independent research aimed at identifying bias and variances associated with fishery-dependent sampling. Analysts work closely with the Alaska Regional Office and Council staff to ensure that FMA provides relevant, high-quality information for fisheries management and in support of requests from the Council and other stakeholders.

Division Management also oversees the partial coverage deployment and funding to ensure the infrastructure and contracts are in place to meet the observer deployment requirements of BSAI Amendment 86 and GOA Amendment 76. FMA staff provide oversight of the fishery observer services provider contract, serving as the primary point of contact for the contract provider and FMA. The contract provider and FMA staff coordinate with industry, schedule vessel inspections as needed, and participate in decision- making for partial coverage vessels that are selected for coverage but request a release from the requirement.

EM was formed as a unique activity within FMA under Division Management starting in 2013 and has continued to dedicate staff time to the development and integration of electronic technologies in Alaska fisheries. More information about the EM innovation results is provided in Appendix B.

Program Field Offices

The Anchorage Field Office ensures FMA's established data collection procedures were properly followed during observer deployments to commercial fishing vessels and processing facilities as well as provides observers with support in the field during their deployment. Staff assist at-sea observers through in-season advising and mid-cruise debriefings. In addition, they document and evaluate each observer's data collection methodologies through interviews, electronic vessel surveys, and written descriptions submitted by observers, as well as conduct data quality control checks to verify data accuracy by identifying errors and ensuring the observer makes the necessary corrections. Staff conduct 1- and 2-day briefings at this field office and maintain an inventory of complete sampling and safety gear sets for observers redeploying directly from the Anchorage office.

The Kodiak Field Office provides support to observers primarily assigned to vessels in the GOA. Support includes conducting pre-cruise briefings with vessel representatives and observers prior to the observer's first trip aboard, conducting mid-cruise debriefings with observers to address any safety concerns on their vessels, reviewing their data collection methodology and recorded

data, providing in situ problem resolution, and issuing sampling and safety equipment. In addition, staff receive, track, and ship biological samples that are collected by observers in support of resource management, scientific research, and observer training. Staff also serve as the primary FMA contact for observed vessels and processing facilities in the GOA and therefore played a key role in coordinating on the pelagic trawl EM exempted fishing permit in 2020.

The Dutch Harbor Field Office provides support primarily to observers assigned to vessels in the Bering Sea and Aleutian Islands. Support includes conducting pre-cruise briefings with vessel representatives and observers prior to the observer's first trip aboard, conducting mid-cruise debriefings with observers to address any safety concerns on their vessels, reviewing data collection methodology and recorded data, providing in situ problem resolutions, and issuing sampling and safety equipment. In addition, staff conduct observer sample station and scale inspections on board commercial fishing vessels to ensure the sample stations meet the standards required in federal regulations. Staff also serve as the primary FMA contact for observed vessels and processing facilities in the Bering Sea and Aleutian Islands.

2.3.2. Contract Costs for Partial Coverage

NOAA's Acquisition and Grants Office (AGO) secures and administers contracts for NMFS. FMA staff participate in contracting by initiating requirements documents, providing funding, and participating in the contract review and award process through formal source evaluation boards. The processes for Federal contracts follow the Federal Acquisition Regulations (FAR) and Commerce Acquisition Regulations (CAR). NMFS receive legal guidance on the FAR and CAR through NOAA contract attorneys and AGO staff.

After NOAA awards a contract, FMA staff participate by assigning a Contracting Officer Representative (COR) to the contract. The COR provides direct technical oversight of the contract by monitoring contract performance, identifying and resolving operational issues, and reviewing and approving invoices. While FMA is directly involved in day-to-day contract management through its assigned COR, NOAA retains full authority over the contract through their appointed Contract Officer (CO). The NOAA CO can modify, extend, cancel, and award contracts.

Contracts for observer services are awarded through a competitive process, allowing any company that provides these services to bid. The observer coverage for the first 2 years (2013 and 2014) of the program was procured through a 2-year contract awarded to AIS, Inc. A second contract was awarded for the subsequent 5 years of the program to AIS, Inc., in April 2015. A third contract was competed and subsequently awarded for up to 5 years of the program to AIS, Inc., in July of 2019.

Table 2-1 provides a summary of funds expended and observer days used since 2017. Note that past Annual Reports used funds obligated instead of funds expended to calculate an average sea day cost. An obligation of funds is a legal liability to disburse funds upon receiving the service – in this case the provision of observer coverage. Obligations of funds therefore reflect the

potential quantities of service, not the cost of the realized service. Expenditures are the disbursement of funds and are directly related to the service.

In 2020, the average cost per observer sea day in the partial coverage category was $1,381 (based on the cost of $2,729,486 for 1977 observer days). The average cost per observer sea day is a combination of a daily rate, which is paid for the number of days the observer is on a vessel or at a shoreside processing plant, and reimbursable travel costs. In 2020, the reimbursable travel costs also included quarantine days. The contractor also needs to recoup their total costs and profit through the daily sea day rate, which includes costs for days the observers are not on a boat. These days include training, travel, deployment in the field but not on a boat, and debriefing. In 2020, the number of observer sea days included deployment days at shoreside processing plants for situations where vessel observers were not able to enter processing plants to complete their sampling, due to COVID restrictions. Federal funds were used to pay for shoreside observers to complete this sampling.

The average annual cost per sea day in partial coverage have ranged between $895 and $1,381 since 2014 (Table 2-5). Much of this variation is associated with number of sea days used each days, as the cost of "optional" sea days are less expensive than "guaranteed" sea days under the federal contract. Additionally, there is variation from year-to-year in travel costs which, for Alaska, tend to be higher per trip than other regions of the country.

While past Annual Reports have included observer sea day costs from other federal observer programs around the Nation, this information was not available for 2020. The National Observer Program has convened a small working group comprised of regional observer program managers to better describe observer sea day costs – or other metric – such that cost comparisons can be made not just year-over-year in one region, but among regions with similar cost models.

2.3.3. Costs for Full Coverage

The costs associated with the full coverage category are paid by the commercial fishing industry directly to certified observer providers. This cost structure is sometimes referred to as "pay as you go." The services carried out by observer providers include paying observers, deploying observers to vessels and shoreside processors, recruiting, training and debriefing. There are currently four active certified providers in Alaska.

Since 2011, certified observer providers have been required to submit to NMFS copies of all of their invoices for observer coverage. The regulations require the submission of the following:

- Vessel or processor name.
- Dates of observer coverage.
- Information about any dates billed that are not observer coverage days.
- Rate charged for observer coverage in dollars per day (the daily rate).
- Total amount charged (number of days multiplied by daily rate).
- The amount charged for air transportation.
- The amount charged for any other observer expenses with each cost category separated and identified.

The invoices data were used to calculate the average cost of observer coverage in the full coverage category for 2020. The observer invoice data are confidential under section 402(b)(1) of the Magnuson-Stevens Act. Therefore, summarized information may be provided in this report only when the cost data used in the summary statistic derives from invoices submitted by at least three observer providers. This confidentiality requirement limits the detail of the average cost data that may be reported to the public, as noted below.

Table 2-6 presents total and average costs in the full coverage sector for each year 2014-2020. In 2020, 154 vessels and processing facilities were billed for observer coverage in the full coverage category representing a 9% drop from the 170 that were billed in 2019. This drop is mostly due to the number of AFA pollock catcher vessels that opted to participate in the Electronic Monitoring EFP in the BSAI. These full-coverage vessels were exempted from carrying an observer during the EFP. The total invoiced amount in 2020 was $14,624,445, up 4% from the 2019 total of $14,004,293. The total number of observer days represented by these invoices in 2020 was 39,039, up 7% from the 2019 total of 36,376 billed full-coverage days.

The total number of observer days represented by these invoices in 2020 was 39,039, up 7% from the 2019 total of 36,376 billed full-coverage days. The increase in the number of billed full coverage days from 2019 to 2020 was a result of an increase in the number of full coverage plant observer deployment days. Also, full coverage deployments tended to be generally longer in 2020 (although not across the board) to ensure observers could satisfactorily complete COVID-19 quarantine protocols, often while remaining assigned to a vessel or processing facility. The average "fully-loaded" cost per day of observer coverage in the full coverage category in 2020 was $375, down 3% from 2019 when it was $385. This 'fully-loaded' average combines invoiced amounts for the daily rate per observer day plus all other costs for transportation and other expenses.

Figure 2-3 and Figure 2-4 summarize the average costs to fishing vessels and processing facilities in the full coverage category by sector and gear type in 2020. These sector and gear type categories are catcher/processors and motherships (CP/MS) with hook-and-line gear, CP/MS with pot gear, CP/MS with non-pelagic trawl gear, CP/MS with pelagic trawl gear, catcher vessels (CVs) using non-pelagic trawl gear, CVs using pelagic trawl gear, and shoreside processing plants (both floating and stationary). Costs include a daily observer rate, charged for every day an observer is assigned, as well as "incidental" costs, which are typically charges to cover airfare, lodging, and other logistics.

Figure 2-3 shows the average number of billed observer days, the average fully-loaded cost per day of observer coverage[4], the average daily rate observer providers charged for observer

[4] For a vessel within a gear and sector category, the vessel's annual total daily rate is calculated by dividing the total cost for observer coverage (inclusive of costs paid for observers, airfare, and other incidental costs) by the number of observer days. The average total daily rate is calculated as a simple average of each vessel's annual total daily rate.

coverage[5], and the average percent of incidental costs per day, per vessel or plant in each sector and gear type category[6]. Days may include days by more than one observer in a year, and person-days of coverage for an operation may exceed 365 days in a year if multiple observers were present. The sector with the highest average number of billed full coverage observer days per vessel was CP/MS using non-pelagic trawl gear (564 days per vessel, up 2% from 2019's total of 551 days). This sector consistently has a high number of observer deployment days and this is explained by the year-round operation of these vessels, the two-observer requirement while operating in the BSAI, and in some cases, a third observer while executing halibut deck-sorting operations. In 2020 shoreside processors also had a high number of average billed observer days (482 days per processor, up 58% from 305 in 2019). The strong increase in this sector was due to supplemental shoreside monitoring in support of the Electronic Monitoring EFP. The lowest average number of days per vessel was on CVs using non-pelagic trawl gear (18 days, up 6% from 2019's average of 17 days).

The average daily observer rate per vessel or processing facility (not including incidental costs) across all sectors and gear types was $349 in 2020, up 0.3% from approximately $348 in 2019. The highest daily rate was for CVs using non-pelagic trawl gear ($373) and the lowest daily rate was for CP/MS with pelagic trawl gear ($345).

The average fully-loaded daily rate per vessel of processing facility (which includes all incidental costs) across all sectors and gear types was $375, down 3% from 2019 when it was $385. The highest rate was for catcher vessels using non-pelagic trawl gear ($421, with 11% incidental costs) and the lowest rate was for CP/MS using pelagic trawl gear ($362, with 5% incidental costs). The overall average percentage of incidental costs per day to the total cost per day across all gear types and sectors was 6.7%[7], down from 9.5% in 2019.

These differences in "fully-loaded" daily costs (from incidental costs) between sectors may be explained by operational processes. For example, several trawl CP/MS elected to carry their observers up to the fishing grounds in Alaska from Seattle at the beginning of the season, keeping their airfare costs lower. In contrast, some trawl catcher vessels fish in remote areas and may incur higher airfare charges to get observers to those locations. Additionally, COVID-19 quarantine protocols in 2020 affected how vessels and plants swapped observers during non-fishing or non-processing periods. Several CP/MS vessels elected to 'keep' their observers through periods when they were not actively fishing to complete quarantine, thereby increasing their *overall* cost in the form of Daily costs, but reducing their incidental travel expenses that would have been required for observer replacement.

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[5] For a vessel within a gear and sector category, the vessel's annual daily observer rate is calculated by dividing the costs paid for observers (excluding airfare and other incidental costs) by the number of observer days. The average daily observer rate is calculated by as a simple average of each vessel's annual daily observer rate.

[6] The average number of observer days per vessel is calculated by dividing total observer days in each gear and sector category by the total number of vessels in that category. For vessels that fished multiple gear types, total observer days was calculated by weighting the proportion of hauls in each category to sum to 1 for each observer-day.

[7] Calculated as total incidental costs divided by the total cost of coverage.

Figure 2-4 shows the estimated average annual incidental and daily observer costs for observer coverage for vessels and processors in 2020. Daily observer costs equal the product of the daily rate for an observer and the number of days of observer coverage. Incidental costs equal total invoiced expenses minus the daily observer costs, and are primarily costs of transporting observers to and from their stations, including airfare, ground transportation, lodging etc.

More information about the comparison of costs per observer day for full and partial coverage is described in Section 2.4.3.

2.3.4. Costs for Electronic Monitoring

The Council has tasked NMFS with implementing EM for the purposes of catch estimation on fixed gear vessels 40-57 ft in length and actively participates in its development through the EM Workgroup and EM Pre-Implementation plans. An important component of the new EM program is evaluating costs. Table 2-7 reflects the costs of the fixed gear EM program in 2020. Much of the cost structure was designed by the EM Workgroup and categorizes one-time, amortized (for infrastructure, equipment, and capacity building, where the benefit extends over several years and the cost is proportioned among each of those years), and recurring costs. Amortized costs are largely the cost of installed EM equipment and assumes a 5-year life, recognizing that the actual equipment life may be longer. A simplified fully-loaded daily rate was calculated for the EM program that included amortized equipment costs, recurring operational costs, and video review. In 2020, the average cost per EM sea day in the partial coverage category was $922 (based on $1,328,995 adjusted annual cost for 1,442 EM sea days).

EM costs are dependent on the number of vessels participating in the EM program, the number of systems that need to be purchased and/or replaced on an annual or recurrent basis deployment rates, field support services, video review, and other factors.

2.4. Cost Savings and Efficiencies

2.4.1. Partial Coverage

The current observer service provider contract was awarded on 30 July 2019. The rates that NMFS currently pays the observer services contractor were established through a competitive bidding process. This contract has several components designed to improve efficiency and reduce costs. For example, the new contract requires that a partially observed sea day (i.e., a day that begins after 1200 (noon) or returns to port before 1201) is paid at an amount equal to one-half the daily rate. The lower rate applies to all days completed by the contractor in which an observed vessel leaves or arrives in port before or after the designated times.

Similar to the last contract, NMFS included the provision for observers to participate in NMFS fishery-independent surveys using funds made available through AFSC. This allows AIS, Inc., to provide additional work to their employees during the summer season when observer opportunities as part of the ADP are more limited. This provides their employees continuity in employment, additional experience, and may help to reduce employee turnover, thereby

increasing overall efficiency. NMFS benefits from trained observers with sea experience to help to conduct their survey fieldwork. The current observer services contract expires 16 August 2024.

2.4.2. Full Coverage

NMFS has implemented regulations that govern the terms of observer deployment (e.g., limiting deployment the duration, setting minimum qualifications, requiring specific experience for observers assigned to certain deployments, etc.). Efficiencies could potentially be gained by increasing competition, reducing constraints, or increasing efficiency of activities supported by NMFS. Note that NMFS waived several regulations for the full-coverage observer program in 2020 in order to increase operational flexibility and ensure COVID-19 safety protocols could be maintained

The majority of full coverage business is conducted by three of the four NMFS-permitted observer providers. The most recent newly permitted observer provider was AIS, Inc., which received a permit to deploy observers in the full coverage category in August 2016. This pool is down from a high of 10 permitted providers in 1991. It is NMFS' understanding that the pool was reduced due to competition, so it is uncertain if additional providers could be competitive, or if the impact would result in substantial increases in efficiency.

2.4.3. Comparing Costs Between the Full and Partial Coverage Categories

There are several factors that impact how comparable the average observer coverage costs per day are between in the partial coverage category and the full coverage category.

- The partial coverage contract is a federal contract between NMFS and the observer provider company, whereas the full coverage observer providers do not operate under a federal contract. Instead, full coverage observer providers are permitted by NMFS and contract observer services directly with vessels.
- Federal contracts are subject to Federal Acquisition Regulations, Fair Labor Standards Act, and Service Contract Act requirements, and applicable Department of Labor Wage Rate Determination which establish, among other things, minimum wage and benefits for observers, including overtime. Some of these same regulations and requirements can also apply to full coverage observer providers depending on the size of the companies.
- All travel costs and expenses incurred in partial coverage are reimbursed in accordance with the Government's Travel Regulations. These include specified per diem rates which are paid regardless of actual expenses.
- The costs associated with the partial coverage component are a daily fee NMFS pays for each sea day, and a reimbursable cost for travel as defined in the NOAA contract. Because NMFS only pays for sea days, the daily rate charged to NMFS must factor in an estimate for the contractor's fixed costs for unobserved days. Note that in 2020, a "sea day" includes observer days at shoreside processing plants. Increasing the proportion of time spent at sea or at plants would increase the efficiency of the overall program since it

would lower fixed costs to the contractor and allow for a newly negotiated lower daily rate charged to NMFS. Higher coverage rates equate to greater efficiency and lower costs per day, while lower coverage costs equate to lower efficiency and greater costs per day.

- Observers in the partial coverage category are often deployed out of many small, remote port locations which increases travel and lodging costs. While NMFS constrained the number of ports from which observers were deployed in the latter half of 2020, the contract also had to absorb quarantine costs in each of these ports
- Observers in the partial coverage category are often only deployed on a vessel for one trip which is significantly shorter (1 to 5 days) than the typical vessel deployment for full coverage observers (60 to 90 days), requiring more travel between vessels.
- Partial coverage by its very nature is inefficient on a cost per unit basis compared to full coverage. This is because partial coverage samples the fleet, such that gains are made in overall costs in monitoring. However, predicting where observers will be deployed and in what amount is difficult with random selection procedures. The risk and uncertainty regarding the number of observed days is borne solely by the partial coverage observer provider and increase costs on a per unit (daily rate) basis.

Due to the inherent differences between the full and partial coverage categories, the most salient comparison of costs is a "fully loaded" daily rate, which is calculated as the total funds expended divided by the number of observed days.

The fully loaded rate for each year of the partial coverage contract is shown in Table 2-5. For example, in 2020, the fully loaded rate was $2,729,486 ÷ 1,977 days = $1,381 per day. This calculation is appropriate for partial coverage since most trips in this category have a similar duration ranging between 1 and 5 days.

The average daily observer rate (variable costs only) for full coverage was similar across all gear and sector categories at approximately $375 per day (Table 2-6 and Fig. 2-3). Compared to a partial coverage observer that may be deployed onto multiple vessels for 1 to 5 days at a time, an observer deployed onto a full coverage vessel boards once and may stay on that vessel for a month or more. Assuming the costs of paying an observer for a day and maintaining an observer provider infrastructure are constant, the fixed costs are likely to be dominated by travel and temporary housing. These fixed costs as a proportion of the total cost for an observer deployment will decline with increased deployment duration. Therefore, the fully loaded rate of an observer day will also decline with an increase in the number of invoiced days for a given vessel in a given month. We can illustrate this phenomenon using the full coverage invoice database maintained by FMA (Fig. 2-5). The per-day base rate for observer coverage per permitted provider is known. Therefore, this value multiplied by the total number of invoiced days yields the total base invoice cost. Since the total invoice amounts are known, a subtraction of the total base invoice from the total invoice amount will either yield a zero, or a positive value. Only those invoices that included travel costs and therefore "fully loaded" and were considered further. The fully loaded invoice value was divided by the number of days on the invoice,

yielding a fully loaded daily rate for each invoice. The fully loaded rate as a function of the total number of observed days in the invoice declines as expected.

Table 2-1. -- Summary of the fees and Federal funding for partial coverage observer sea days from 2013 to 2021.

Calendar year	Funding category	Observer fees received	Funds sequestered	Prior year sequester funds received	Funds obligated to contract	Observer sea days at start of the year	Observer sea days purchased during year	Total observer sea days used during year
2013	Fees					4,535	1,913	3,533
	Federal Funds				$1,885,166			
2014	Fees	$4,251,452	($306,105)		$3,044,606	2,915	4,368	4,573
	Federal Funds				$1,892,808			
2015	Fees	$3,451,478	($251,958)	$306,105	$3,058,036	2,710	5,330	5,318
	Federal Funds				$2,700,000			
2016	Fees	$3,775,522	($256,735)	$251,958	$5,144,983	2,722	5,277	4,749
	Federal Funds				$390,800			
2017	Fees	$3,592,750	($247,900)	$256,735	$3,542,196	3,322	5,285	2,591
	Federal Funds				$1,398,531			
2018	Fees	$3,799,560	($250,771)	$247,900	$2,396,040	5,858	2,350	3,207
	Federal Funds				$0			
2019	Fees	$3,244,801	($201,178)	$250,771	$2,412,611	5,001	4,600	3,316
	Federal Funds				$2,135,670			
2020	Fees	$2,894,448	($170,772)	$201,178	$4,990,546	2,266	5,784	1,977[8]
	Federal Funds				$1,905,169			
2021	Fees					296[9]		
	Federal Funds							

[8] Includes sea days, shoreside processing plant days, and quarantine days.

[9] For 2021, NMFS modified the contract to move funds from sea days to travel. This modification reduced available sea days for the start of the fishing year.

Table 2-2. -- Observer fees[10] in 2020 by gear, vessel size category, and species or species group for all areas combined.

Gear	Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other species	Total all species
Hook-and-Line	<40	$175,602	$8,115	$5,234	$0	$296	$189,247
	40 - 57.5	$401,669	$216,344	$1,670	$0	$5,414	$625,098
	>57.5	$457,392	$220,097	$543	$0	$4,748	$682,780
	Gear Subtotal	$1,034,664	$444,556	$7,447	$0	$10,458	$1,497,125
Jig	<40	$389	$0	$0	$1	$40	$430
	40 - 57.5	$1,975	$0	$78	$0	$291	$2,345
	Gear Subtotal	$2,365	$0	$78	$1	$331	$2,775
Pot	<40	$0	$2,410	$0	$0	$1	$2,411
	40 - 57.5	$460	$88,744	$4,273	$0	$506	$93,982
	>57.5	$4,014	$317,063	$130,549	$0	$1,432	$453,059
	Gear Subtotal	$4,474	$408,218	$134,822	$0	$1,938	$549,453
Trawl	40 - 57.5	$0	$0	$0	$671	$19	$690
	>57.5	$0	$6,889	$85,162	$269,074	$58,075	$419,199
	Gear Subtotal	$0	$6,889	$85,162	$269,744	$58,093	$419,888
Total all gear		**$1,041,502**	**$859,663**	**$227,509**	**$269,746**	**$70,821**	**$2,469,241**
Percent by species		**42%**	**35%**	**9%**	**11%**	**3%**	**100%**

Rounding error sometimes results in slight differences in row and column totals.

[10] The unpaid portion of the observer fees are included. Administrative fees and interest charged for late fee payments are not included.

Table 2-3. -- Observer fees[11] in 2020 by gear, vessel size category, and species or species group in the Gulf of Alaska.[12]

Gear	Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other species	Total all species
Hook-and-Line	<40	$155,854	$7,738	$71	$0	$291	$163,954
	40 - 57.5	$334,560	$212,997	$394	$0	$5,275	$553,226
	>57.5	$349,492	$217,187	$388	$0	$4,648	$571,716
	Gear Subtotal	$839,906	$437,921	$853	$0	$10,214	$1,288,895
Jig	<40	$389	$0	$0	$1	$40	$430
	40 - 57.5	$1,975	$0	$12	$0	$291	$2,279
	Gear Subtotal	$2,365	$0	$12	$1	$331	$2,709
Pot	<40	$0	$2,017	$0	$0	$0	$2,017
	40 - 57.5	$460	$83,227	$29	$0	$70	$83,786
	>57.5	$2,766	$291,935	$32	$0	$252	$294,985
	Gear Subtotal	$3,225	$377,178	$61	$0	$323	$380,788
Trawl	40 - 57.5	$0	$0	$0	$671	$19	$690
	>57.5	$0	$6,889	$16,459	$268,506	$58,062	$349,915
	Gear Subtotal	$0	$6,889	$16,459	$269,177	$58,080	$350,605
Total all gear		**$845,496**	**$821,989**	**$17,386**	**$269,178**	**$68,948**	**$2,022,997**
Percent by species		**42%**	**41%**	**1%**	**13%**	**3%**	**100%**

Rounding error sometimes results in slight differences in row and column totals.

[11] The unpaid portion of the observer fees are included. Administrative fees and interest charged for late fee payment are not included.

[12] The Gulf of Alaska includes Pacific Halibut regulatory areas 2C, 3A, and 3B; and Sablefish regulatory areas Western GOA, Central GOA, West Yakutat, and Southeast Outside.

Table 2-4. -- Observer fees[13] in 2020 by gear, vessel size category, and species or species group in the Bering Sea/Aleutian Islands.[14]

Gear	Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other species	Total all species
Hook-and-Line	<40	$19,748	$378	$5,162	$0	$4	$25,293
	40 - 57.5	$67,109	$3,347	$1,276	$0	$140	$71,872
	>57.5	$107,900	$2,910	$155	$0	$100	$111,065
	Gear Subtotal	$194,757	$6,635	$6,594	$0	$244	$208,230
Jig	40 - 57.5	$0	$0	$66	$0	$0	$66
	Gear Subtotal	$0	$0	$66	$0	$0	$66
Pot	<40	$0	$394	$0	$0	$1	$394
	40 - 57.5	$0	$5,517	$4,243	$0	$435	$10,196
	>57.5	$1,249	$25,128	$130,518	$0	$1,180	$158,074
	Gear Subtotal	$1,249	$31,039	$134,761	$0	$1,616	$168,665
Trawl	>57.5	$0	$0	$68,703	$568	$13	$69,283
	Gear Subtotal	$0	$0	$68,703	$568	$13	$69,283
Total all gear		**$196,006**	**$37,674**	**$210,124**	**$568**	**$1,873**	**$446,244**
Percent by species		**44%**	**8%**	**47%**	**<1%**	**<1%**	**100%**

Rounding error sometimes results in slight differences in row and column totals.

[13] The unpaid portion of the observer fees are included. Administrative fees and interest charged for late fee payment are not included.

[14] The Bering Sea/Aleutian Islands includes Pacific halibut regulatory areas 4A, 4B, 4C, and 4D; and Sablefish regulatory areas Bering Sea and Aleutian Islands.

Table 2-5. -- Average annual observer coverage sea day costs from 2014 to 2020.

Year	Funds expended	Number of observer sea days realized	Average sea day cost
2014	$4,937,414	4,573	$1,080
2015	$5,758,268	5,318	$1,083
2016	$4,186,303	4,677	$895
2017	$3,146,111	2,749	$1,144
2018	$4,425,144	3,207	$1,380
2019	$4,342,098	3,316	$1,309
2020	$2,729,486	1,977	$1,381

Table 2-6. -- Annual observer full coverage sea day costs from 2014 to 2020.

	Sum totals					Average sea day cost		
Year	Billed vessels and plants	Billed full coverage days	Base daily costs	Incidental costs	Fully- loaded costs	Base daily costs	Incidental costs	Fully-loaded costs
2014	177	39,066	$13,028,325	$1,450,220	$14,478,545	$333	$37	$371
2015	177	39,963	$13,623,614	$1,335,407	$14,980,340	$341	$33	$375
2016	179	38,536	$13,242,003	$1,518,717	$14,760,720	$344	$39	$383
2017	171	37,620	$12,972,358	$1,435,974	$14,408,332	$345	$38	$383
2018	167	36,695	$12,674,251	$1,356,088	$14,030,339	$345	$37	$382
2019	170	36,376	$12,666,376	$1,337,931	$14,004,293	$348	$37	$385
2020	154	39,039	$13,639,974	$984,471	$14,624,445	$349	$25	$375

Table 2-7. -- Costs of the 2020 Fixed Gear EM Program.

Cost category	One time	Recurring	Amortized	2020 Total	Prior years amortized	Adjusted annual cost
Project Coordination	$139,574	$339,616	$0	$479,190	$0	$479,190
Data Review, Processing, and Analysis	$0	$189,255	$0	$189,255	$0	$189,255
EM Equipment Services	$0	$57,015	$153,313	$210,328	$418,866	$506,544
Field Technical Services	$0	$201,384	$0	$201,384	$92,197	$293,581
Project totals	**$139,574**	**$787,270**	**$153,313**	**$1,080,157**	**$511,063**	**$1,328,995**

Figure 2-1. -- Comparison of cumulative observer fees by day in 2020 with the mean cumulative observer fees assessed from 2013 to 2019 in inflation adjusted millions of dollars (left), as the proportion of overall annual fees (middle), and the difference between the proportions (right). The shading indicates +/- one standard deviation from the 2013-2019 mean.

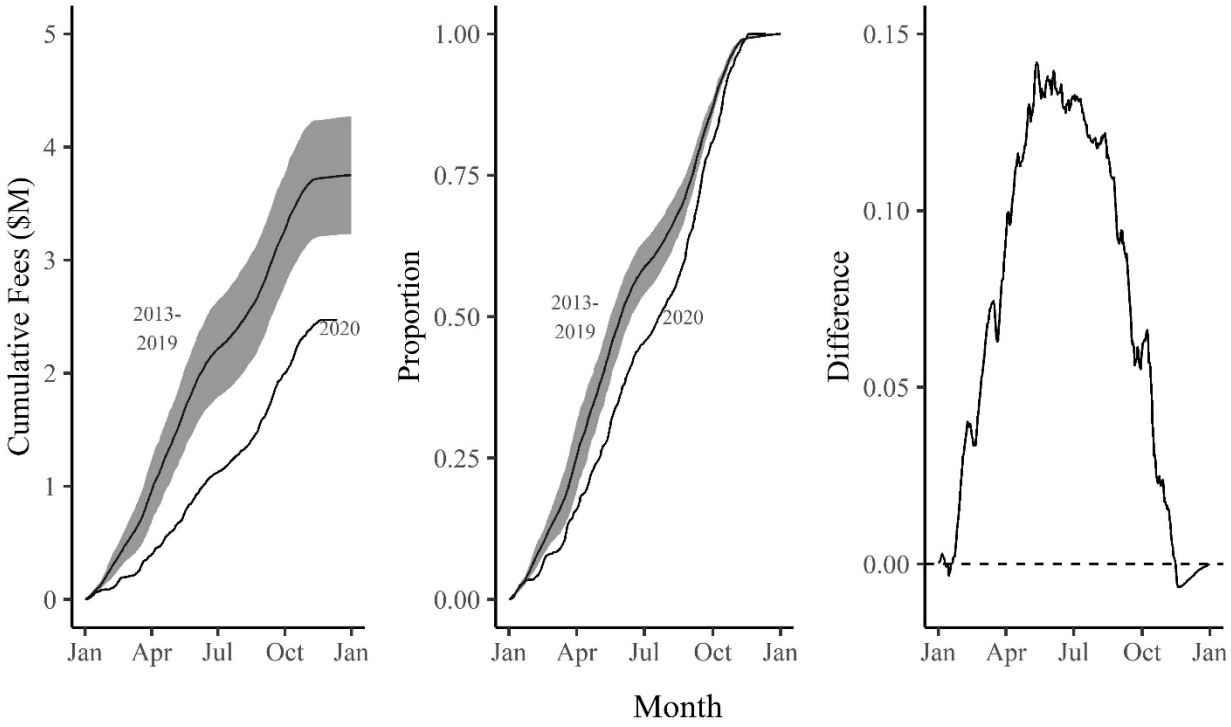


Figure 2-2. -- Proportion of each species' annual observer fees by day, 2013-2020. Note: the scale is different for each species.

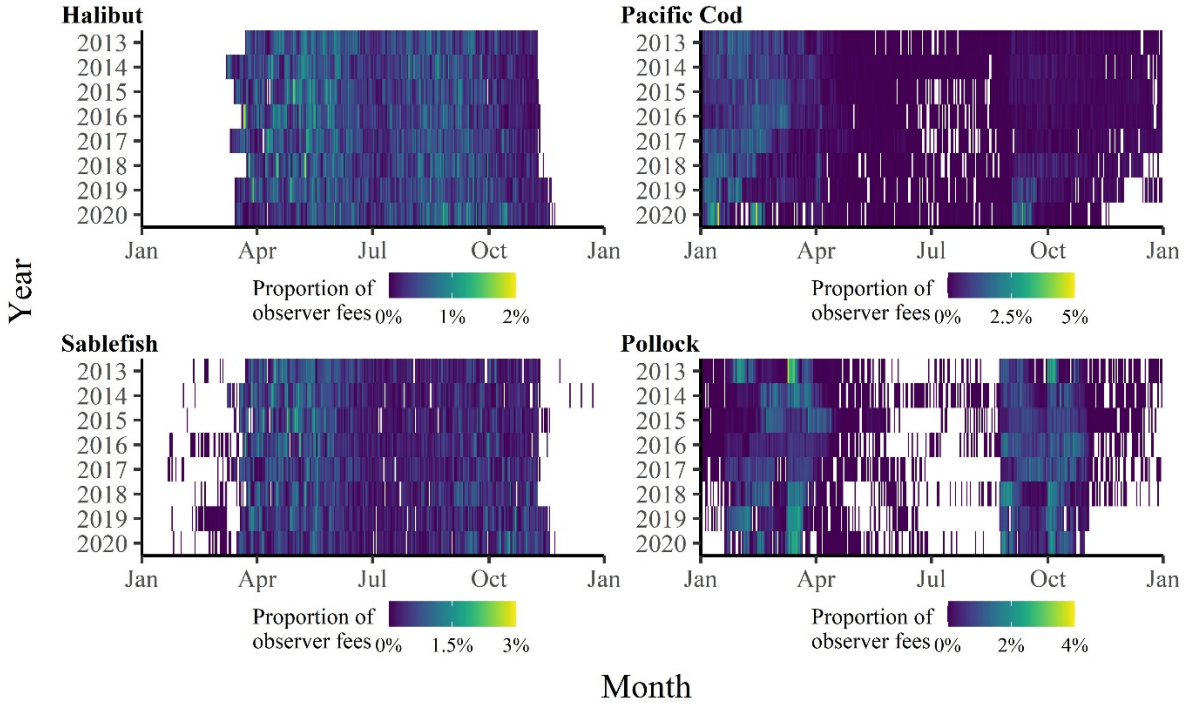


Figure 2-3. -- Average number of full coverage days and average costs per day (including incidental costs), to vessels and processors for observer coverage in the full coverage category in 2020, by gear type and vessel type (CP/MS = catcher processor/mothership, CV = catcher vessel, PLANT = shoreside processor, both floating and land-based). Note that only two observer provider companies provided full coverage observers to shoreside processors in 2020, so the cost data were removed from this analysis to comply with confidentiality rules (days are shown). Error bars represent mean standard error.

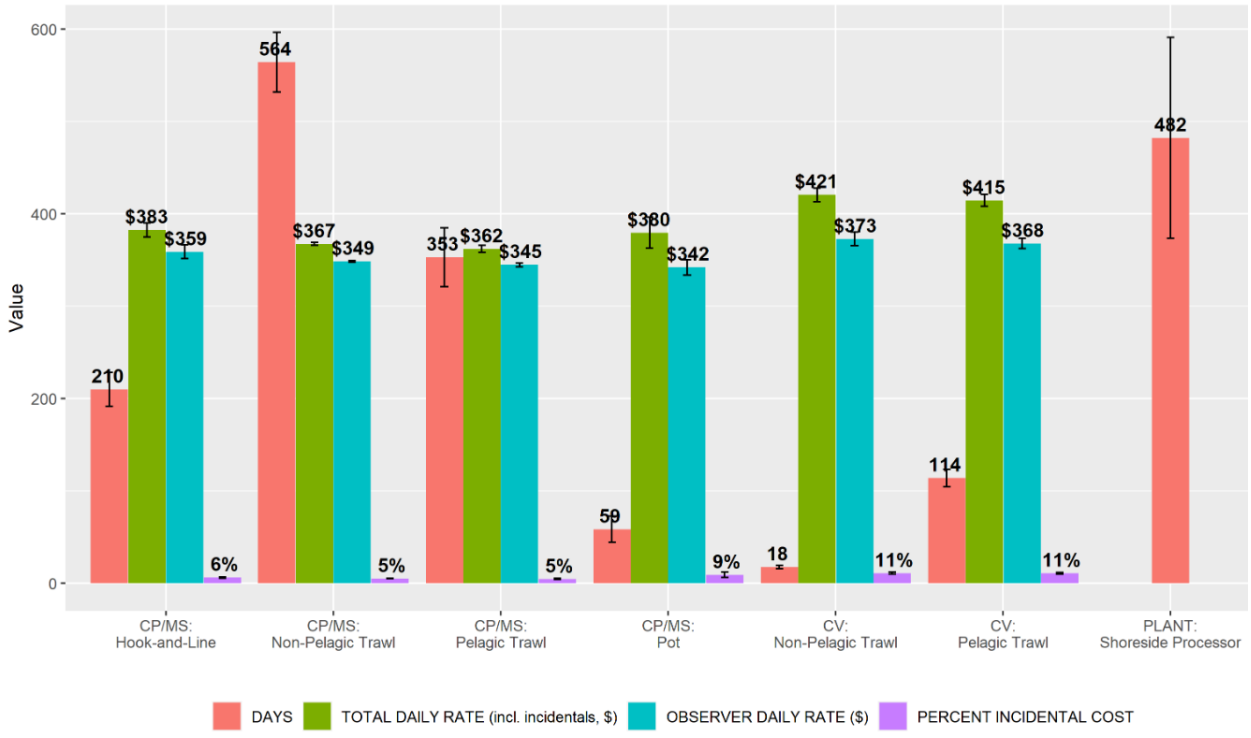


Figure 2-4. -- Average annual cost of observer coverage for vessels and processors in the full coverage category in 2020, by gear type and vessel type (CP/MS = catcher processor/mothership, CV = catcher vessel). Note that costs for shoreside processors were removed from this analysis to comply with confidentiality rules (fewer than three companies provided observers in 2020). Error bars represent mean standard error.

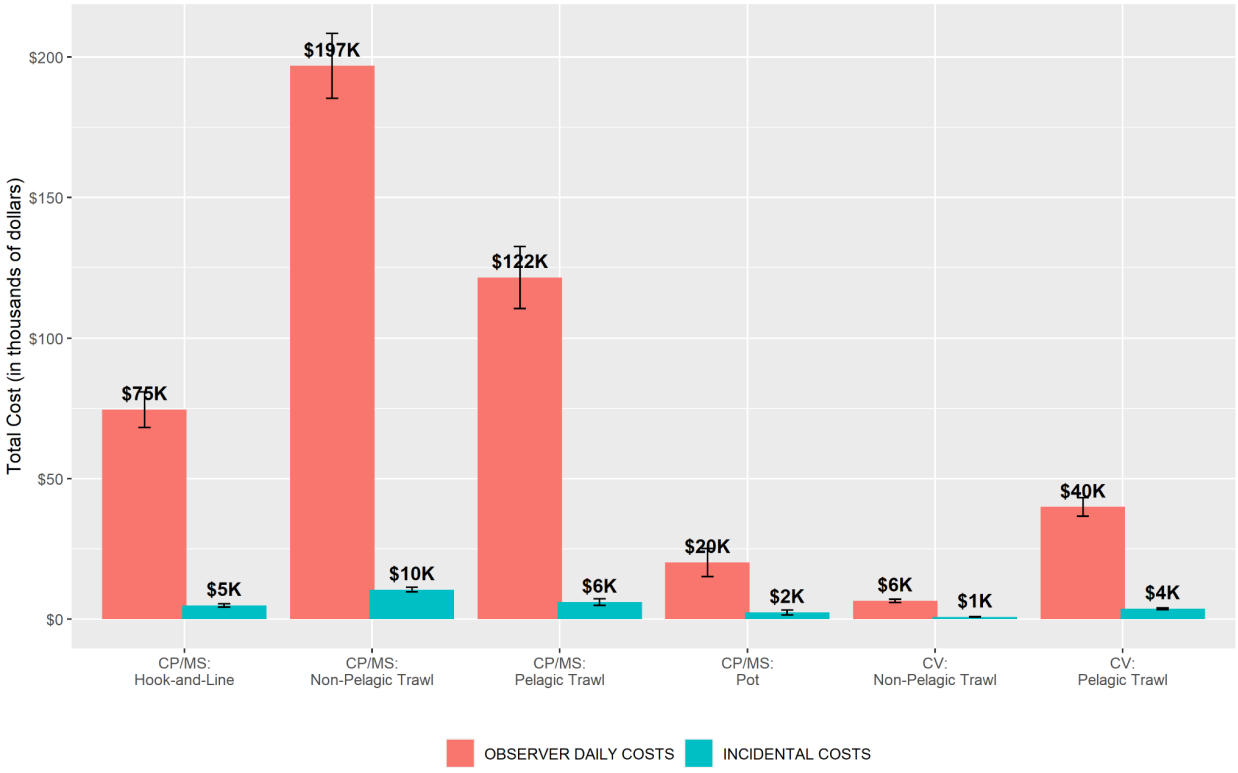
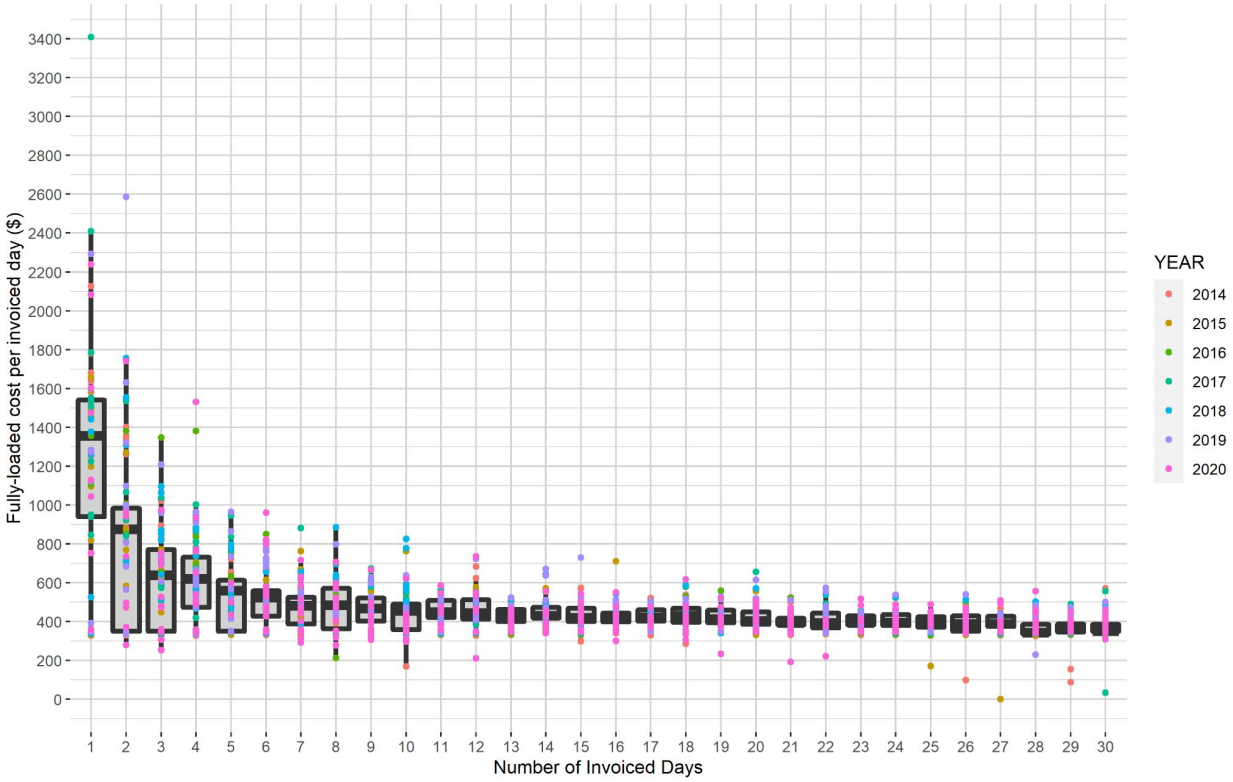


Figure 2-5. -- Relationship between the fully loaded cost per invoiced day for full observer coverage as a function of the number of days invoiced, which is a proxy for the duration of the deployment. The fully-loaded cost per day is calculated as the invoice total divided by the number of days on the invoice.



3. Deployment Performance Review

3.1. Introduction

Each year the Alaska Fisheries Science Center's (AFSC) Fisheries Monitoring and Analysis (FMA) Division establishes a committee to review the scientific elements of the North Pacific Observer Program. This committee, formerly referred to as the Observer Science Committee (OSC), was renamed in 2020 as the Fishery Monitoring Science Committee (FMSC), in order to reflect the addition of electronic monitoring (EM) as a tool being used to monitor fisheries in the North Pacific. Similarly, we use the term 'monitoring' in this chapter when referencing fishing activity that has been monitored either by an observer or with EM.

The FMSC provides scientific advice in the areas of regulatory management, natural science, mathematics, and statistics as they relate to observer and EM deployment and sampling in the groundfish and halibut fisheries of the BSAI and the GOA. The FMSC members have analytical and scientific expertise relating to sampling of groundfish and halibut fisheries of the BSAI and GOA and use of the collected data. If possible, the FMSC is represented by at least one member of the AFSC/FMA (Observer Program) Division, one member of the AFSC/Stock Assessment and Multispecies Assessments Program, one member of the Alaska Regional Office (AKRO) Sustainable Fisheries Division, and one member of the International Pacific Halibut Commission (IPHC).

This chapter contains the FMSC review of the deployment of observers and EM in 2020 relative to the intended sampling plan and goals of the 2020 Annual Deployment Plan (ADP, NMFS 2019). This review identifies where possible biases exist and provides recommendations for further evaluation, including potential improvements to the observer deployment process that should be considered during the development of the 2022 ADP.

The goal of the Observer Program is to achieve a random deployment of observers and EM into fisheries to collect representative data used to estimate catch and bycatch, assess stock status, collect fishery-dependent biological information used in population and ecosystem modeling efforts, and make salmon bycatch stock-of-origin determinations, among other objectives. Therefore, this evaluation focuses on the randomization of observer and EM deployments into primary sampling units, and how departures from a random sample affect data quality.

3.2. The Sampling Design of the Observer Program

Since 2013, the Observer Program has used a stratified hierarchical sampling design with randomization at all levels. Stratification is used to increase the efficiency of sampling by observers and to address logistical issues associated with deployment. By grouping similar fishing activities into strata and sampling those strata appropriately, sampling efficiency is increased and the variance of resulting estimates may also be decreased. Sampling strata are defined in the ADP and are designed such that each unit of deployment (e.g., trip) is assigned to only one stratum.

Within a stratum, observers are deployed randomly to either vessels for a predetermined period of time (termed vessel-selection), or to individual fishing trips (termed trip-selection). In both cases, this initial deployment to the fishery is the first level of the sampling hierarchy and defines the primary sampling unit (PSU; either vessel-periods or individual trips). The list of all PSUs in a stratum defines the sampling frame and should equate to the population of interest for that sampling stratum (e.g., all trips taken by vessels fishing in the Alaska Exclusive Economic Zone). If the sampling frame does not contain all elements of the stratum, the resulting information may be biased. The magnitude and direction of the bias will depend on how different the fishing activities in the sample frame are from actual fishing activity.

Although this report evaluates whether monitoring goals were met, we include a brief summary of the full sampling hierarchy here for context. For each monitored trip, if all hauls cannot be sampled for logistical reasons, hauls are randomly selected to be sampled. Hauls are the secondary sampling units. Randomization of haul selection is designed to allow observers to record and transmit data, attend to other non-sampling responsibilities, and to allow observers time to sleep and eat. Randomization of haul selection also gives EM video reviewers the ability to optimize the amount of video that can be reviewed from each trip. Haul selection is determined using the random sampling tables and random break tables provided by NMFS. For the randomly selected hauls, a random sample of the catch is collected (observers) or selected for video review (EM), and data from those samples are used to determine the species composition and amount of discarded catch. These samples of catch within each haul are the third level of the sampling hierarchy. While observers are trained to collect multiple large samples of catch, the number and size of samples taken from each haul will depend on the vessel configuration, fishing operations, and diversity of catch. The size of EM samples is largely determined by the number of video reviewers available relative to the amount of video to be reviewed.

At the fourth level of the sampling hierarchy, a predetermined number of individual fish of predetermined species is randomly selected from the species composition sample and measured. Lastly, at the fifth sampling level, a random selection of fish is used to collect otoliths, reproductive maturity assessments, stomach contents, genetic tissues, and other biological specimens. The number and species of fish selected for measurement and biological specimen collection is specified each year by the AFSC's stock assessment scientists. Sampling rates for genetic tissue collection by observers has been set since 2011 (Faunce 2015).

Sampling at the fourth and fifth levels of the sampling hierarchy does not occur with EM. Similarly, effort data (e.g., number of hooks on longline vessels) is collected by observers, but not currently collected by EM. Marine mammal and seabird interactions are also documented by observers, but the ability to capture these interactions through EM is limited, due to the fixed location in which the EM equipment is placed.

More information on the sampling design used by observers and the relationship between the sample design and catch estimation can be found in Cahalan and Faunce (2020) and the 2020 Observer Sampling Manual (AFSC 2019). A summary of the 2020 ADP can be found in Section

1.3. The focus of this report is related to deployment, and the evaluation is at the primary level of the sampling hierarchy.

3.3. Performance Review Objectives

The following items from the 2020 ADP have been identified as objectives for evaluation in this report:

- Deploy for the planned number of sea days. This objective will be considered to be met if the actual number of sea days expended falls within the range of values from simulated sampling provided in the 2020 ADP. The Observer Program's budget was expected to cover 2,500 days in 2020.
- Deploy at the coverage rates specified in the 2020 ADP. Following the 2020 ADP, ODDS was programmed to randomly select logged trips at a rate of 15.40% in the *HAL* stratum, 15.23% in the *POT* stratum, 19.59% in the *TRW* stratum, and 30% in the *EM HAL* and *EM POT* strata. Under a randomized deployment scheme, these partial coverage selection rates are expected to be within a 95% confidence interval computed from the realized coverage rates (under the assumption of a binomial distribution for observed trips).
- Collect tissue samples from Chinook and chum salmon as specified in the 2020 Observer Sampling Manual to support the goal of collecting genetic samples from salmon caught as bycatch in groundfish fisheries to identify stock of origin. The sampling protocol established in the 2014 ADP (NMFS 2013) was used in 2020. Under this protocol, observers on vessels delivering to shoreside processors in the GOA trawl walleye pollock (*Gadus chalcogrammus*, hereafter referred to as simply 'pollock') fishery monitor the offload to enumerate salmon bycatch and obtain tissues for genetic analysis from the salmon bycatch. Note that due to COVID-19 safety protocols, vessel observers were unable to enter processing plants to complete this sampling, and shoreside-based observers were deployed to continue these collections. For trips that are delivered to tender vessels and trips outside of the pollock fishery, observers obtain salmon counts and tissue samples from all salmon found within at-sea samples of the total catch.
- Randomize deployment of observers and EM into the partial coverage category of fishing activities. This randomization is used to collect samples that are representative of the entire fishing fleet (monitored trips are equivalent to unmonitored trips within a stratum). Evaluation of this objective is focused on the randomization of observer and EM deployments into primary sampling units, and how departures from a random sample affect data quality.

3.4. Observer Deployment Performance Metrics

Performance metrics have been developed to assess whether the trip-selection process (through the implementation of the 2020 ADP) provides a representative sample of fishing trips in the North Pacific in 2020. These metrics reflect four mechanisms that can impact the quality of the

data: sample frame discrepancies, non-response, differences in trip characteristics, and sample size.

The performance metrics used in this evaluation are as follows:

1. Deployment rates for each stratum, relative to intended values. This is the basic level of evaluation for comparing targeted and achieved sampling rates, where sampling strata are partitions of the entire population about which we want to make inferences (e.g., generate estimates of catch). Implementation challenges can be identified in this step, such as sample frame inadequacy, selection biases, and issues with sample unit definitions.
2. Representativeness of the sample: Randomized sampling is a method used to ensure that the results of sampling reflect the underlying population. Departures from randomization can lead to non-representative data and hence potential bias in estimates of the parameters of interest. A randomized sample design is expected to achieve a rate of monitored events that is similar across both space and time. Representativeness of the sample was divided into three separate components:
    - Temporal representativeness: Plots of expected and actual monitoring effort over time. Periods when these two lines deviate from each other indicate times of the year that were either over or under-sampled relative to expectations defined in the ADP.
    - Spatial representativeness: Plots of monitoring effort over fishing effort, by area and stratum. These plots show the temporal and spatial distribution of monitoring effort relative to the different types of fishing effort for which those monitoring data are used to generate estimates.
    - Representativeness of trip characteristics: Consistency of trip characteristics for monitored and unmonitored portions of the stratum. These metrics are based, in part, on the availability of data for both monitored and unmonitored fishing activities; for example, data that are reported for all trips on landing reports. Attributes tested in this report include the following:
        - Trip duration (days).
        - Vessel length (feet).
        - The number of NMFS Areas visited during the trip.
        - The amount of landed catch (metric tons).
        - The number of species in the landed catch (also known as species richness).
        - The proportion of the total landed catch that was due to the most prevalent species (pMax, an inverse a measure of species diversity where an increase in pMax indicates a decline in diversity).
3. Adequacy of sample size: A well-designed sampling program will have a large enough sample size to reasonably ensure that the characteristics of the entire target population are represented in the data. In order to evaluate whether the sample size collected was adequate,

we examined the probability of having no monitored trips for each NMFS Area and stratum combination.

Although these metrics can identify places where observed results differ from expectations, it is ultimately a subjective decision as to whether or not these differences are substantial enough to have management implications. This holds true even for tests that have associated *p*-values. Additionally, our focus on landed catch is due to the fact that total catch is comprised of retained and discarded portions, and since discarded catch is not available from unmonitored trips, landed catch represents the only portion of the catch that is available from all trips.

3.5. Changes to This Report from Last Year

Changes to our analyses were necessary to properly address the changes to the deployment of observers caused by COVID-19. The necessary policy changes made throughout the year by NMFS created three separate time periods that needed to be considered. In the first time period, deployment was based on trips among all ports of departure, and followed the 2020 ADP. During the second time period, there is no expectation for partial observer coverage, due to the waivers being issued by NMFS at that time. During the third time period, there was an expectation of monitoring at a certain rate measured in trips across all ports, but the sampling frame was reduced to thirteen ports[15], and only included those trips that declared to use the same port for departure and arrival. Unfortunately, the information necessary to identify the group of trips belonging to the third time period sampling frame is not available in any database. While ODDS contains information on the anticipated port of departure, the actual port of departure is not known, and ODDS does not directly link to actual fishing activities such as those used in this report. Therefore, after review by the Fishery Monitoring Science Committee (FMSC), it was decided that we could not perform a statistical review of whether or not fisheries monitoring in the third time period met the expectations of the sampling design in terms of evaluating spatial bias. Consequently, this chapter does not include any maps nor accompanying spatial statistics. Nonetheless, the FMSC agreed that promotion of past analyses showing overlap in time and space between total fishing effort and monitored fishing effort was appropriate as originally proposed in Chapter 3 of the 2019 Annual Report.

The methods used in this analysis are similar to those employed in the gap analysis in Appendix C of the 2020 Draft Annual Deployment Plan and Appendix B of the 2019 Annual Report and are published in Ganz et al. (2020). Partial coverage fishing effort data from 2020 was used to quantify the degree to which data from monitored trips are available within specified spatiotemporal distances to unmonitored fishing trips. Prior versions of this analysis had quantified the degree of overlap in terms of an index. Here, we only use presence and absence of fishing effort and monitored fishing effort in each week, NMFS area, and stratum. More detailed versions of these plots with target species are planned to be available to stock assessment authors separate from this document. An additional change was made to the presentation of the

[15] While the revised 2020 deployment plan included 14 ports from which observers would be deployed, operationally the program was unable to deploy partial coverage observers from Akutan, as no lodging allowed for completion of a quarantine period in this port. Full coverage observers were deployed from Akutan without interruption.

likelihood of having no monitored trips within a NMFS Area and partial coverage stratum combination; they are now presented in their entirety as a histogram to show relative proportions and not as a line plot to show trends. Finally, we have included the trawl EM EFP (*EM TRW EFP* stratum) within three analyses in this chapter. Those analyses relate to effort prediction, sampling rate by stratum, and sampling rate by port. Evaluation of *EM TRW EFP* is not listed as a formal objective of this analysis in Section 3.3 due to the fact that it was a new venture in 2020. We have provided this subset of analyses for *EM TRW EFP* in the hopes that it might inform the program going forward.

3.6. Evaluation of Deployments in 2020

The deployment of observers into the 2020 Federal fisheries in Alaska is primarily evaluated at the level of the deployment stratum because each stratum is defined by a different sampling rate or by a different monitoring method (e.g., observers and EM). In this document, trips are considered successfully monitored in the *EM HAL* and *EM POT* strata if at least some video was reviewed from a trip, and in the *EM TRW EFP* strata if salmon were observed for shoreside. The rationale for defining monitored trips this way is that it is most similar to the way in which trips in other strata are considered observed (i.e., irrespective of whether or not haul information or usable species composition data were collected).

3.6.1. Evaluating Effort Predictions

Each year, the NMFS sets an annual budget for the Observer Program in terms of cost and observer days. The partial coverage observer day budget for 2020 was set at $3,660,124 and 2,500 days in the 2020 ADP, and the NMFS expected to spend $3,661,280 observing 2,513 days (NMFS 2019). The expected number of observer days is determined by the expected number of fishing days and the rate at which trips are selected for coverage. The number of fishing days expected to occur in 2020 was estimated using data on annual fishing effort from 2016 to 2019[16]. Based on simulations using trip durations from 2018 and 2019, the NMFS then set selection rates so that the average cost from simulations was equal to the available budget (NMFS 2019).

In 2020 there was slightly less partial coverage fishing effort than expected overall but differences between predicted and actual fishing effort differed dramatically between individual strata (Table 3-1). The actual fishing effort in *HAL* and *EM HAL* strata was lower than expected and that in the *POT* and *EM POT* strata was higher than expected. There has been a trend in recent years toward the increased adoption of pots, and this trend may have influenced these differences between actual and predicted effort within gear types.

The FMA paid for 1,229.5 observer days, which was 51.1 % lower than predicted by the average simulation (Fig. 3-1, top panel). At-sea partial coverage observers cost $2,729,487, which was 25.4% lower than expected (Fig. 3-1, bottom panel). The costs in Figure 3-1 include additional quarantine and plant days paid for in 2020 due to COVID-19, which partially explains why costs did not decrease proportionately with observer days. The other factor that influenced this

[16] Following methods in Ganz and Faunce (2019).

outcome is that the general observer waivers were put in place during the end of the fiscal year when we expected to purchase cheaper 'optional' days on the observer contract. As a result, no optional days were used in 2020 and all observed days were purchased at the higher guaranteed day rate. The number of actual paid partial coverage observer days was fewer than what was estimated in the 2020 ADP due in part to prediction error in fishing effort and to a larger degree the inability to deploy observers according to the ADP in response to COVID-19.

3.6.2. Performance of the Observer Declare and Deploy System in Trip-Selection

The random selection of observer and EM trip selection pool trips for monitoring is made by the ODDS. The ODDS generates a random number according to the predetermined rates and assigns each logged trip to either "selected to be monitored" (selected) or "not selected to be monitored" (not selected) categories.

Logged trips have different dispositions. When initially logged, trips are considered pending, and subsequently have two dispositions: closed or cancelled. A trip can be closed by selecting landing reports from a menu or manually entering the end of the trip information, or a trip can be cancelled. The vessel operator may change the dates of a logged trip regardless of selection status prior to or instead of cancellation. However, trips that have not been closed at the end of the calendar year are automatically cancelled by the ODDS to prevent 2020 ODDS trips from affecting the deployment rates set for the 2021 ADP. Trips that were selected to be monitored by ODDS and are subsequently cancelled trigger the next logged trip to automatically inherit the selected status. These trips are termed inherited trips.

The extent to which trip-selections are changed from the time they are entered can be determined by comparing the rate of trip observation expected from 1) random selection of all logged trips (initial random selection) and 2) random selection of remaining trips after cancellations, waivers, and inherited trips. In any case, the proportion of trips selected to be observed should fall within what would be expected given the binomial distribution (since each trip is either selected or not selected). The rates obtained (%, with associated *p*-value based on the binomial distribution) in the initial selection process were within expected ranges for all strata and time periods (Table 3-2). The final selection rate after trips were closed, cancelled, or waived were also within expected bounds for all strata and time periods. Final selection rates were not evaluated for the second time period within observed strata, due to the waivers being issued at that time. With the agency granting waivers, any expectations for coverage rates were nullified. The only stratum, time period, and point in the ODDS process that showed evidence of selection rates outside of expectations were the selection rates for the *TRW* stratum in the second time period after cancellations and after inherits (Table 3-2). The selection rates for *TRW* during this time were lower than expected, suggesting that selected trips were cancelled at a higher rate than trips that were not selected for coverage.

The lack of linkage between the ODDS and eLandings contributes to the differences between programmed selection rates in ODDS and trips that are ultimately observed. Currently, ODDS provides users with a list of Report IDs from eLandings from which to close their logged trips. However, these data are not validated or error checked, making them unreliable in their current

state. This linkage between the logged (ODDS) trip (with its selection probability) and its associated landing information is necessary to evaluate potential improvements in deployment efficiency within the partial coverage fleet.

3.6.3. Evaluation of Deployment Rates

This section compares the coverage rate achieved against the expected coverage rates. Data used in this evaluation are stored within the Catch Accounting System (CAS, managed by the AKRO), the Observer Program database (NORPAC, managed by the AFSC), and eLandings (under joint management by Alaska Department of Fish and Game - ADF&G; the International Pacific Halibut Commission - IPHC; and the NMFS). Separate rate evaluations are conducted depending on whether the unit of observer deployment was at-sea fishing trips or dockside deliveries of pollock.

At-sea Deployments

The 2020 Observer Program had 16 different deployment strata to be evaluated (Table 3-3). There was one full coverage observed stratum (*Full*) comprised of trips taken both by vessels that were required to have full coverage (e.g., AFA vessels) and those fishing in the BSAI that opted into full coverage. There was one full coverage trawl EM stratum (*EM TRW EFP*) comprised of trips taken by AFA vessels fishing for pollock. There were three partial coverage EM strata: *EM HAL*, *EM POT*, and *EM TRW EFP*. There were nine partial coverage observed strata, defined by gear and time period: *HAL*, *POT*, and *TRW* for each time period beginning January 1st, March 26th (waiver period), and July 1st. There were also two zero coverage strata: one zero coverage EM research stratum and one zero coverage stratum for jig vessels and vessels under 40 ft length overall.

Evaluations for the full coverage category and zero-selection pool are straightforward - either the coverage achieved was equal to 100% or 0%, respectively, or it was not. The program achieved 99.7% coverage in the *Full* observed stratum, and 100% coverage in the full coverage *EM TRW EFP* stratum (Table 3-3). The program achieved perfect compliance with both zero coverage strata (Table 3-3). Under the assumption that deployment was randomized, a 95% confidence interval computed from the realized coverage rates (under the assumption of a binomial distribution for observed trips) will contain the actual deployment rate 95% of the time. If expected coverage levels were within the 95% confidence intervals, then we conclude that realized and expected coverage rates were equal. Coverage rates were consistent with expected values in seven of the nine partial coverage strata for which they were evaluated. No statistical test was performed on observed strata during the second time period due to the fact that the issuance of waivers nullified any expected coverage rate. The two gear types that did not meet expected coverage rates were the *HAL* and *POT* strata during the third time period. For both of these strata, coverage rates were lower than expected (Table 3-3).

Unlike observed trips, the coverage rate for EM is based on information provided from the Pacific States Marine Fisheries Commission (PSMFC) that is available to analysts in the NORPAC database. In 2020, the median time between receipt and completion of review was

24 days for *EM HAL* and 60 days for *EM POT* (Fig. 3-2). This is compared to a median of 7 days during pre-implementation in 2016 (NMFS 2017, p. 87).

In combination across all strata, coverage levels, and fishery monitoring tools, 4,072 trips (44.8%) and 376 vessels (38.2%) were successfully monitored among all fishing in federal fisheries of Alaska in 2020 (Table 3-3).

Coverage Rates for Dockside Monitoring

Observers were assigned to monitor shoreside deliveries of pollock. The objective of this monitoring was to obtain a count of the number of salmon caught as bycatch and to obtain tissue samples for genetic analysis from these fish in each observed pollock delivery. The sampling design used for this objective in 2020 remained unchanged from that used since 2011 (Faunce 2015); all deliveries of pollock that were observed at sea were also observed dockside. In addition, this was the first year in which *EM TRW EFP* strata were present, which also had shoreside monitoring goals. While all BSAI pollock deliveries (from both observed and *EM TRW EFP* trips) are expected to be observed shoreside, this is not the case in the GOA (NMFS 2015), where pollock trips randomly selected for at-sea observer coverage are also expected to be sampled shoreside for salmon. For *EM TRW EFP* deliveries that occur in the GOA, 100% of the trips are expected to have EM for compliance monitoring and 30% are expected to be observed shoreside. For this analysis, pollock deliveries are defined as any delivery from a trawl catcher vessel where the predominant species is pollock in eLandings.

In 2020, 100% of BSAI walleye pollock deliveries were observed (Table 3-4, Table 3-5). In the GOA, 17.7% of deliveries from trips within the *TRW* stratum (Table 3-4), and 31.8% of deliveries from trips within the partial coverage *EM TRW EFP* stratum (Table 3-5) were observed shoreside for salmon. Although an expected shoreside coverage rate of 30% does exist for the *EM TRW EFP* stratum, there is no expected shoreside coverage rate for the *TRW* stratum, since observers are deployed into the *TRW* stratum as a whole and not the pollock fishery specifically. In order to keep results consistent between the two strata, we did not perform statistical tests in this report, although such tests could be performed as part of evaluations specific to the trawl EFP.

Bycatch estimates of Chinook salmon in the GOA are estimated using methods described in Cahalan et al. (2014). In the event that a delivery cannot be monitored (e.g., the case in a delivery to a tender or non-pollock delivery), then estimation of bycatch comes by applying salmon bycatch rates to landed catch. Estimates of stock of origin from salmon bycatch are produced by the AFSC's Auke Bay Laboratories (e.g., Guthrie et al. 2019).

3.7. Sample Quality

3.7.1. Temporal Patterns in Trip-Selection

The cumulative number of fishing trips in each stratum was multiplied by the stratum-specific selection rate to obtain the expected number of observed trips. Under the assumption that there is no temporal bias in observer coverage, the realized number of monitored trips should be within

the expected range for the entire year. If the realized number of monitored trips does stray outside of expectations, it is especially problematic if that deviation has an obvious trend across time (i.e., continuously above or below the expected range for a large portion of the year). The relative advantage of EM compared to observers in a COVID-19 environment was evident by the fact that no temporal disruptions to fisheries monitoring occurred for the EM strata (Fig. 3-3). In comparison, observer deployment into the *HAL* and *POT* strata was nearly zero during the waiver period (during which there was no statistical expectation for the monitoring rate), and substantially below expected rates for much of the third time period (Fig. 3-3). Deployment of observers into the *TRW* stratum, which did not receive as many waivers, was less affected (Fig. 3-3).

3.7.2. Spatial Patterns in Trip-Selection

Under a strictly random selection of trips and with a large enough sample size, the spatial distribution of monitored trips should reflect the spatial distribution of all trips. In prior years, this was evaluated by testing whether the actual number of monitored trips within a given stratum and NMFS area met expectations given the stratum's realized monitoring rate and the hypergeometric distribution. However, the FMSC thinks that there is no realistic expectation for the spatial distribution of observed trips in 2020, given the spatial changes that port-based deployment introduced in the third time period. To represent the spatiotemporal availability of monitoring data within partial coverage, we instead provided figures to graphically represent when fishing occurred (split by week) within each stratum and NMFS area. Figures 3-4, 3-5, and 3-6 show the availability of observer monitoring data relative to fishing effort in the observer and zero-coverage pools that fished with hook-and-line, pot, and trawl gear, respectively. Figures 3-7 and 3-8 show the availability of EM and observer monitoring data relative to fishing effort within the fixed-gear EM strata that fished with hook-and-line and pot gear, respectively. Concentrations of fishing effort were scaled relative to the week with the highest number of trips within each pool.

3.7.3. Trip Metrics

This section analyses whether monitored trips are similar to unmonitored trips using a permutation test (a.k.a., randomization test). This test evaluates the question "How likely is the difference we found if these two groups have the same distribution (in the metric we are comparing)?" Permutation tests compare the actual difference found between two groups to the distribution of many differences derived by randomizing the labels defining the two groups (e.g., monitored and unmonitored). Difference values in the permutation test are calculated by subtracting the mean metric value for the "No" condition from the mean metric value for the "Yes" condition. For example, the difference between vessel lengths in a permutation test for a monitoring effect is the mean value for unmonitored trips subtracted from the mean value for all monitored trips. If the resulting value is negative, it means that monitored trips were taken by shorter vessels, on average, than unmonitored trips. If the result is statistically significant, it suggests that the difference is unlikely to be from random chance. By randomizing group assignments, the combined distribution of randomized differences represents the sampling distribution under the null hypothesis that the two groups are equal. In this report, 1,000

randomized trials were run for the permutation test. The *p*-value from the test is calculated as the number of randomized trials with greater absolute differences than the actual difference divided by the number of randomized trials. Similar to the other statistical tests used in this report, low *p*-values (< 0.05) indicate unlikely events under the hypothesis of equality and are therefore considered evidence against that hypothesis. A Bonferroni adjustment is applied to these *p*-values by multiplying original *p*-values by the number of metrics being tested (six in this case). Because of the fact that multiple tests being performed within each stratum increases the chance of finding a significant result by random chance, this adjustment controls for this reality by increasing the *p*-value in proportion to the number of tests being performed. These adjusted *p*-values are then compared to the 0.05 significance level. In an attempt to improve clarity, although five values are calculated in the test; 1) the difference between groups, 2) the mean difference between groups from randomized trials, 3) #1 expressed as a percentage of the mean value of the metric being tested, 4) #2 expressed as a percentage of the mean value of the metric being tested, and 5) the *p*-value of the test, only values 1), 3), and 5) are presented.

Six trip metrics were examined in the permutation test. These metrics were as follows: the number of NMFS Areas visited in a trip, trip duration (days), the weight of the landed catch (t), the vessel length (ft), the number of species in the landed catch, and the proportion (0 to 1) of the total catch that is made up of the most predominant species (pMax). The metric 'vessel length' is used to help interpret the results from 'weight of landed catch' since fishing power is positively correlated to vessel length. Specifically, differences in weight *and* length are interpreted as a failure to achieve a random sample of vessels of different sizes, whereas differences in weight only lend more evidence that there was a monitoring effect. The number of species within the landed portion of the catch is a measure of species richness. Our pMax metric follows the concepts behind Hill's diversity number N1 that depicts the number of abundant species (Hill 1973) and is a measure of how "pure" catch is since a value of one would indicate that only the predominant (and presumed desirable) species was landed.

Were monitored trips similar to unmonitored trips?

The sample sizes available and the results of permutation tests are presented in Table 3-6. A visual depiction of the results of permutation tests is given in Figure 3-9 for illustration purposes. Of all metric and stratum combinations tested, one had a low *p*-value: observed trips in the *HAL* stratum were 23.3% (1.28 days) shorter in duration than unobserved trips.

Although not significant in other strata, the days fished metric was always shorter for monitored trips than for unmonitored trips, with differences ranging from less than 1% in the *EM HAL* stratum to over 12% in the *EM POT* stratum (Table 3-6). Monitored trips landed less catch than unmonitored trips in all but the *EM HAL* stratum, although the results were not statistically significant in any stratum. The administration of numerous waivers and other changes to fishery monitoring in 2020 likely influenced the monitoring effects on the remaining monitored fleet - where monitoring was accomplished, it was representative of unmonitored trips.

Gear, tender, and observed status combinations

One of the analyses done by the permutation test is to compare trip lengths (in days) between monitored and unmonitored trips and determine whether there were significant differences. However, these permutation tests do not visually map the data for monitored and tendered states together. To accomplish this, a plot of the trip durations for these states is included as Figure 3-10. These plots illustrate that *HAL* non-tendered trips were shorter in duration when observed, which was also seen in permutation tests.

3.8. Adequacy of the Sample Size

In a well-designed sampling program, the monitoring rate should be large enough to reasonably ensure that the range of fishing activities and characteristics are represented in the sample data. The Catch Accounting System post-stratifies data into groups of fishing activities with similar trip characteristics such as gear, trip targets, and NMFS Area (Cahalan et al. 2014). At low numbers of trips and low sampling rates, the probability of no monitoring data within a particular post-stratum is increased and may result in expansions of bycatch rates from one type of fishing activity against landings for a different type of fishing activity. This will result in biased estimates of bycatch. For this reason, it is important to have a large enough sample (monitored trips and vessels) to have a reasonable expectation of monitoring all types of fishing.

Over the course of an entire year, some NMFS Area and stratum combinations have low fishing effort and as a result have a relatively high probability of being missed by the simple random sampling represented by observer deployments and EM. However, most NMFS Area and stratum combinations had a 0-5% chance of containing no monitored trips in 2020 (Fig. 3-11) In the case of the *TRW* stratum, all NMFS Areas had a 0-5% chance of containing no monitored trips. The presence of NMFS Areas with a greater than 50% chance of containing no monitored trips is most common in the *HAL* and *POT* strata (Fig. 3-11).

3.9. Responses to Council and SSC Comments

The SSC has requested that a specific section with responses to SSC comments be provided in the written report, as is done for SAFE documents. Normally, this section would address FMSC responses (in italics) to comments relative to this chapter made by the Council and the SSC after the presentation of the 2019 Annual Report during the June 2020 Council meeting. However, the 2019 Annual Report was not released at that meeting, and instead the deployment performance review was published separately (Ganz et al. 2020). Therefore, there is nothing to respond to in this section.

3.10. FMSC Recommendations to Improve Data Quality

3.10.1. Recommendations from the 2019 Annual Deployment Review

The Fishery Monitoring Science Committee (formerly the Observer Science Committee) made the following recommendations in its 2019 review of observer deployment (Ganz et al. 2020) to be considered in developing the 2021 ADP. Following each recommendation is the italicized outcome of that recommendation.

The Fishery Monitoring Science Committee's Recommendations to improve the 2021 ADP were as follows:

1. The ADP should fully integrate EM and observer deployment into one fishery monitoring program. This recommendation echoes the SSC recommendation made at their June 2019 meeting, and is based on the recognition that EM and observers are two tools at the disposal of the NMFS to monitor fisheries and each has its advantages and disadvantages. Issues due to incomplete integration of fishery monitoring tools occurred in 2019 when only EM trips were monitored in the pot gear Pacific cod Central Gulf (Area 630) fishery, introducing a data gap for the GOA Pacific cod stock assessment. In 2020, observer coverage has been reduced further as a result of COVID-19 precautions. *NMFS plans to pause on incremental changes and instead draft a more comprehensive ADP sampling plan to address this issue in future years*.

2. We continue to recommend that NMFS link the ODDS and eLandings database such that fishing trips can be uniquely identified to support the analyses presented to the Council. The analyses contained in the Annual Report attempt to identify fishing trips, which is the unit of measurement for deployment. However, there are some instances when realized deployments do not match intended deployments. In some cases, it may be that there were no differences, but the accounting of trips between ODDS and eLandings data are incongruent. *No progress was made on this issue.*

3.10.2. Recommendations to Improve Data Quality and Guide the 2022 ADP

1. We recommend that all ODDS trips be closed using the existing pull down menu that lists eLandings report numbers associated with the vessel closing the trip. This recommendation will serve to strengthen the existing linkage between ODDS and eLandings and enable analyses of potential changes to fisheries monitoring deployment desired by the Council.

2. The sampling design for the 2022 ADP should use trip as the primary sampling unit and should not be constrained by port of departure or landing unless such a constraint is necessary for health and safety reasons.

Table 3-1. -- Comparison between predicted and actual trip days for partial coverage strata in 2020. Predicted values come from the 2020 Annual Deployment Plan.

	Trip days		Difference	
Strata	**Predicted**	**Actual**	**Actual**	**Percent**
HAL	9,728	8,019	-1,709	-17.6
POT	2,283	3,768	1,485	65.0
TRW	3,406	2,607	-799	-23.5
EM HAL	4,010	3,262	-748	-18.7
EM POT	528	1,043	515	97.5
EM TRW EFP	1,335	1,200	-135	-10.1
Total	21,290	19,899	-1,391	-6.5

Table 3-2. -- Number of logged trips in each partial coverage stratum that were selected using the initial random number generator (Initial Random Selection) and those that remained after user manipulation (After Cancellations). The relative impact of inherits and waivers in trip-selection is also shown (With Inherits, After Waivers). Note that observer strata were split into three separate time periods to reflect when waivers were put in place and when ODDS selection rates were adjusted to account for changes to the sample frame from port-based trip deployment

Strata	Trip disposition	Selected trips	Total trips	Actual (%)	Programmed (%)	*p*-value
Fixed-gear EM strata : full year						
EM HAL	Initial Random Selection, *a*	212	682	31.09	30.00	0.531
	After Cancellations, *b* (*a*-*b*)	203	649	31.28	30.00	0.493
	With Inherits, *c* (*a*-*b*+*c*)	217	649	33.44	30.00	0.059
	After Waivers, *d* (*a*-*b*+*c*-*d*)	215	649	33.13	30.00	0.087
EM POT	Initial Random Selection, *a*	56	178	31.46	30.00	0.683
	After Cancellations, *b* (*a*-*b*)	52	164	31.71	30.00	0.670
	With Inherits, *c* (*a*-*b*+*c*)	53	164	32.32	30.00	0.551
	After Waivers, *d* (*a*-*b*+*c*-*d*)	53	164	32.32	30.00	0.551
Observer strata : Jan. 1 - Mar. 25						
HAL	Initial Random Selection, *a*	11	107	10.28	15.40	0.179
	After Cancellations, *b* (*a*-*b*)	11	103	10.68	15.40	0.219
	With Inherits, *c* (*a*-*b*+*c*)	14	103	13.59	15.40	0.684
	After Waivers, *d* (*a*-*b*+*c*-*d*)	13	103	12.62	15.40	0.497
POT	Initial Random Selection, *a*	25	196	12.76	15.23	0.372
	After Cancellations, *b* (*a*-*b*)	16	151	10.60	15.23	0.140
	With Inherits, *c* (*a*-*b*+*c*)	23	151	15.23	15.23	1.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	23	151	15.23	15.23	1.000
TRW	Initial Random Selection, *a*	79	440	17.95	19.59	0.435
	After Cancellations, *b* (*a*-*b*)	75	390	19.23	19.59	0.899
	With Inherits, *c* (*a*-*b*+*c*)	86	390	22.05	19.59	0.225

	After Waivers, *d* (*a*-*b*+*c*-*d*)	86	390	22.05	19.59	0.225
Observer strata : Mar. 26 - Jun. 30						
HAL	Initial Random Selection, *a*	99	620	15.97	15.40	0.697
	After Cancellations, *b* (*a*-*b*)	74	529	13.99	15.40	0.399
	With Inherits, *c* (*a*-*b*+*c*)	75	529	14.18	15.40	0.470
	After Waivers, *d* (*a*-*b*+*c*-*d*)	5	529	0.95	15.40	
POT	Initial Random Selection, *a*	22	145	15.17	15.23	1.000
	After Cancellations, *b* (*a*-*b*)	18	128	14.06	15.23	0.806
	With Inherits, *c* (*a*-*b*+*c*)	19	128	14.84	15.23	1.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	5	128	3.91	15.23	
TRW	Initial Random Selection, *a*	36	200	18.00	19.59	0.656
	After Cancellations, *b* (*a*-*b*)	20	170	11.76	19.59	0.009*
	With Inherits, *c* (*a*-*b*+*c*)	22	170	12.94	19.59	0.026*
	After Waivers, *d* (*a*-*b*+*c*-*d*)	16	170	9.41	19.59	
Observer strata : Jul. 1 - Dec. 31						
HAL	Initial Random Selection, *a*	202	870	23.22	22.54	0.626
	After Cancellations, *b* (*a*-*b*)	143	635	22.52	22.54	1.000
	With Inherits, *c* (*a*-*b*+*c*)	159	635	25.04	22.54	0.141
	After Waivers, *d* (*a*-*b*+*c*-*d*)	87	635	13.70	15.40	0.249
POT	Initial Random Selection, *a*	79	368	21.47	22.54	0.663
	After Cancellations, *b* (*a*-*b*)	55	282	19.50	22.54	0.254
	With Inherits, *c* (*a*-*b*+*c*)	60	282	21.28	22.54	0.669
	After Waivers, *d* (*a*-*b*+*c*-*d*)	33	282	11.70	15.23	0.115
TRW	Initial Random Selection, *a*	70	372	18.82	19.59	0.744
	After Cancellations, *b* (*a*-*b*)	56	303	18.48	19.59	0.665
	With Inherits, *c* (*a*-*b*+*c*)	63	303	20.79	19.59	0.612
	After Waivers, *d* (*a*-*b*+*c*-*d*)	53	303	17.49	19.59	0.386

Table 3-3. -- Number of total vessels (V), sampled vessels (*v*), total trips (N), and sampled trips (*n*) for each stratum in 2020. The coverage and 95% confidence interval columns are expressed as percentages of the total number of trips taken within each stratum.

					Coverage		95% Confidence		
Strata	*V*	*v*	*N*	*n*	Expected	Realized	Lower	Upper	Meets expected?
Full coverage: Jan. 1 - Dec. 31									
Full	143	143	2,864	2,856	100.0	99.7			
EM TRW EFP	21	21	494	494	100.0	100.0			
Full Coverage Total	155	155	3,358	3,347		99.7			
Partial coverage EM: Jan. 1 - Dec. 31									
EM HAL	126	98	643	193	30.0	30.0	26.5	33.7	Yes
EM POT	30	24	194	60	30.0	30.9	24.5	37.9	Yes
EM TRW EFP	31	26	477	153	30.0	32.1	27.9	36.5	Yes
Partial coverage observed: Jan. 1 - Mar. 25									
HAL	50	10	82	11	15.4	13.4	6.9	22.7	Yes
POT	64	22	161	25	15.2	15.5	10.3	22.1	Yes
TRW	45	34	392	88	19.6	22.4	18.4	26.9	Yes
Partial coverage observed: Mar. 26 - Jun. 30									
HAL	180	5	547	6	15.4	1.1			
POT	38	3	152	5	15.2	3.3			
TRW	20	8	171	16	19.6	9.4			
Partial coverage observed: Jul. 1 - Dec. 31									
HAL	239	54	849	87	15.4	10.2	8.3	12.5	No
POT	80	16	295	25	15.2	8.5	5.6	12.3	No
TRW	29	24	347	56	19.6	16.1	12.4	20.4	Yes
Gear-based Total	556	259	4,310	725		16.8			
Zero coverage: Jan. 1 - Dec. 31									
Zero Coverage	320	0	1,403	0	0.0	0.0			
Zero EM Research	2	0	22	0	0.0	0.0			
Total	**985**	**376**	**9,093**	**4,072**		**44.8% Trips; 38.2% Vessels**			

Table 3-4. -- The number of pollock deliveries made by vessels in the *Full* and *TRW* strata, separated by port and coverage category. Trips that delivered to a tender have been excluded. Observed deliveries denote deliveries that were observed shoreside for salmon.

FMP	Coverage category	Port	Total deliveries (*N*)	Observed deliveries (*n*)	% Observed
Bering Sea	Full	Akutan	610	610	100.0
		Dutch Hbr.	1,056	1,056	100.0
		King Cove	51	51	100.0
Total	Full		1,717	1,717	100.0
Gulf of Alaska	Partial	Akutan	21	0	0.0
		King Cove	6	0	0.0
		Kodiak	521	100	19.2
		Sand Point	69	9	13.0
Total	Partial		617	109	17.7

Table 3-5. -- The number of pollock deliveries made by vessels in the *EM TRW EFP* strata, separated by port and coverage category. Trips that delivered to a tender have been excluded. Observed deliveries denote deliveries that were observed shoreside for salmon.

FMP	Coverage category	Port	Total deliveries (*N*)	Observed deliveries (*n*)	% Observed
Bering Sea	Full	Akutan	282	282	100.0
		Dutch Hbr.	177	177	100.0
		King Cove	34	34	100.0
Total	Full		493	493	100.0
Gulf of Alaska	Partial	Akutan	29	8	27.6
		King Cove	2	1	50.0
		Kodiak	269	84	31.2
		Sand Point	172	57	33.1
Total	Partial		472	150	31.8

Table 3-6. -- Results of permutation tests between monitored and unmonitored trips in the 2020 trip-selection strata. OD: Observed difference (monitored - unmonitored).

Strata	Monitored	Unmonitored	Metric	NMFS areas	Days fished	Vessel length (ft)	Species landed	pMax species	Landed catch (t)
			OD	0.009	-1.276	-0.680	0.247	-0.018	-1.083
HAL	104	1,374	OD (%)	0.766	-23.287	-1.240	6.840	-2.011	-16.401
			p-value	1.000	< 0.001*	1.000	1.000	1.000	0.438
			OD	0.013	-0.001	1.845	0.262	-0.010	0.165
EM HAL	193	450	OD (%)	1.165	-0.016	3.546	6.871	-1.081	2.506
			p-value	1.000	1.000	0.186	0.816	1.000	1.000
			OD	-0.058	-0.617	-1.433	0.003	0.003	-2.349
POT	55	553	OD (%)	-5.271	-9.864	-2.079	0.125	0.297	-8.006
			p-value	1.000	1.000	1.000	1.000	1.000	1.000
			OD	-0.058	-0.714	-0.478	0.053	-0.003	-0.171
EM POT	60	134	OD (%)	-5.394	-12.751	-0.671	2.114	-0.355	-0.897
			p-value	1.000	0.276	1.000	1.000	1.000	1.000
			OD	0.011	-0.147	1.222	-0.783	0.008	-2.904
TRW	160	750	OD (%)	1.004	-5.082	1.438	-10.288	0.931	-2.974
			p-value	1.000	0.924	1.000	0.360	1.000	1.000

Figure 3-1. -- Total number of observer sea days purchased (top panel) and total cost of observing those sea days (bottom panel). Vertical bars signify the range of potential outcomes predicted by the 2020 Annual Deployment Plan. Dashed lines signify available budget. Solid lines signify what actually occurred in 2020.

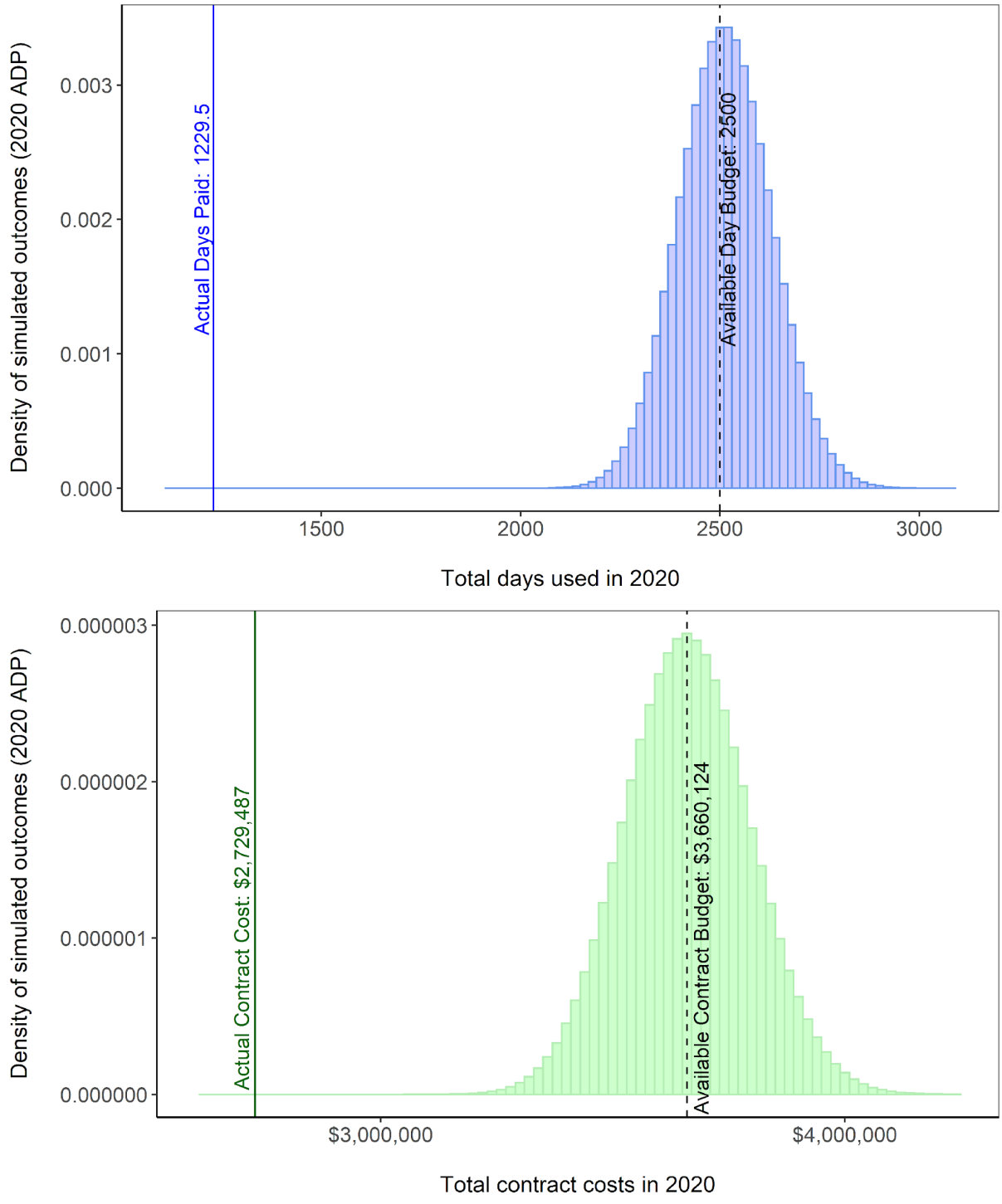


Figure 3-2. -- Histogram of days taken for fixed gear EM data review by stratum. Columns are not additive, and instead represent two different ways of measuring review time, starting from either the end of the trip or from the date at which the hard drive was received.

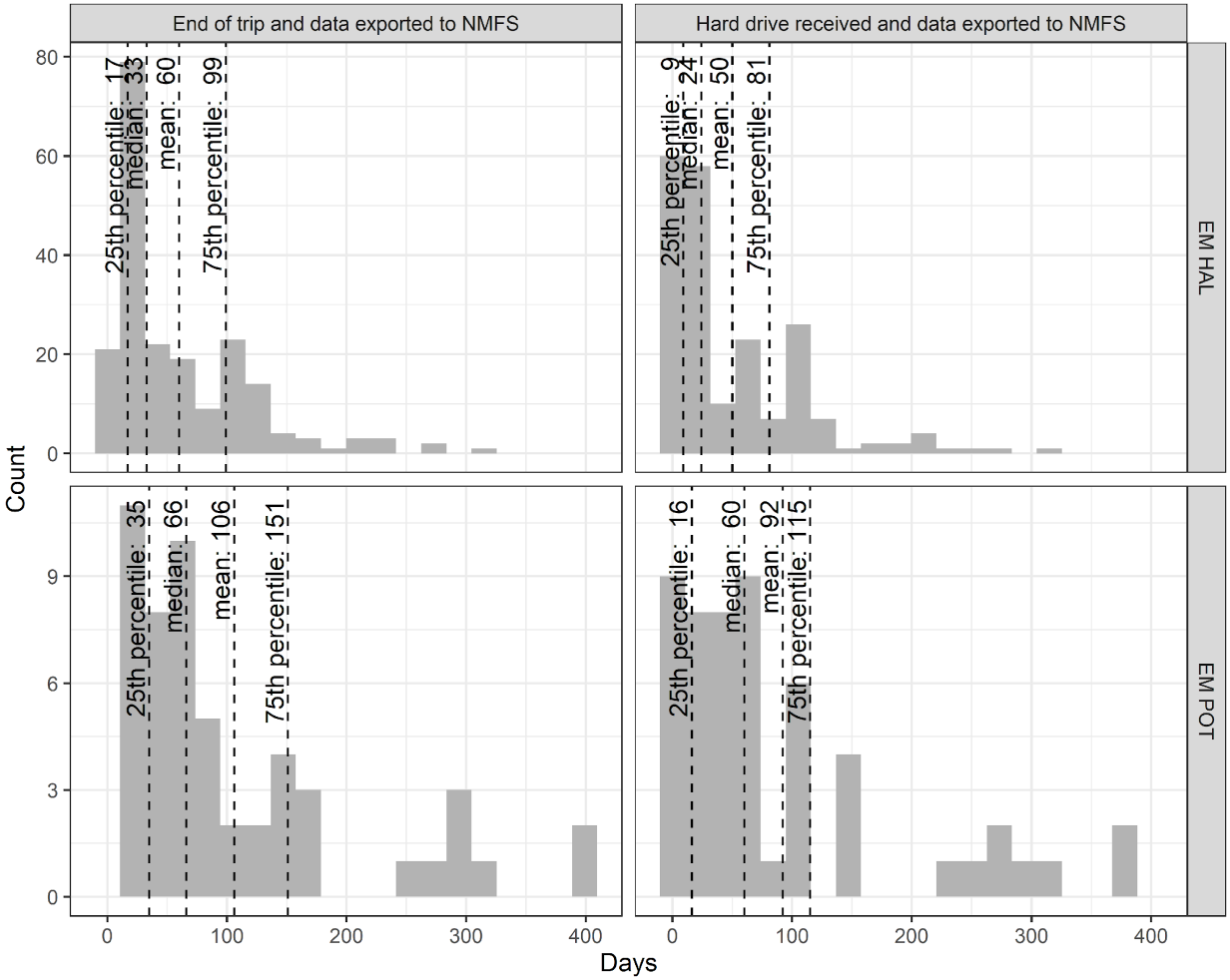


Figure 3-3. -- Cumulative number of trips monitored during 2020 (black line) compared to the expected range of observed trips (shaded ribbon) given fishing effort and sampling rates. Dates where the monitored number of trips is outside of expected (less or more than the range) are depicted as tick marks on the horizontal x-axis. The results of tests that the observed rate derived from a binomial distribution sampled at the selection rate are denoted as *p*-values. Dashed vertical lines and shaded rectangles denote the period when waivers were being issued for observer coverage due to COVID-19. During the waiver period, there was no expected number of observed trips. The EM strata were not affected by the waiver period, and so the expected numbers of monitored trips in those strata are uninterrupted.

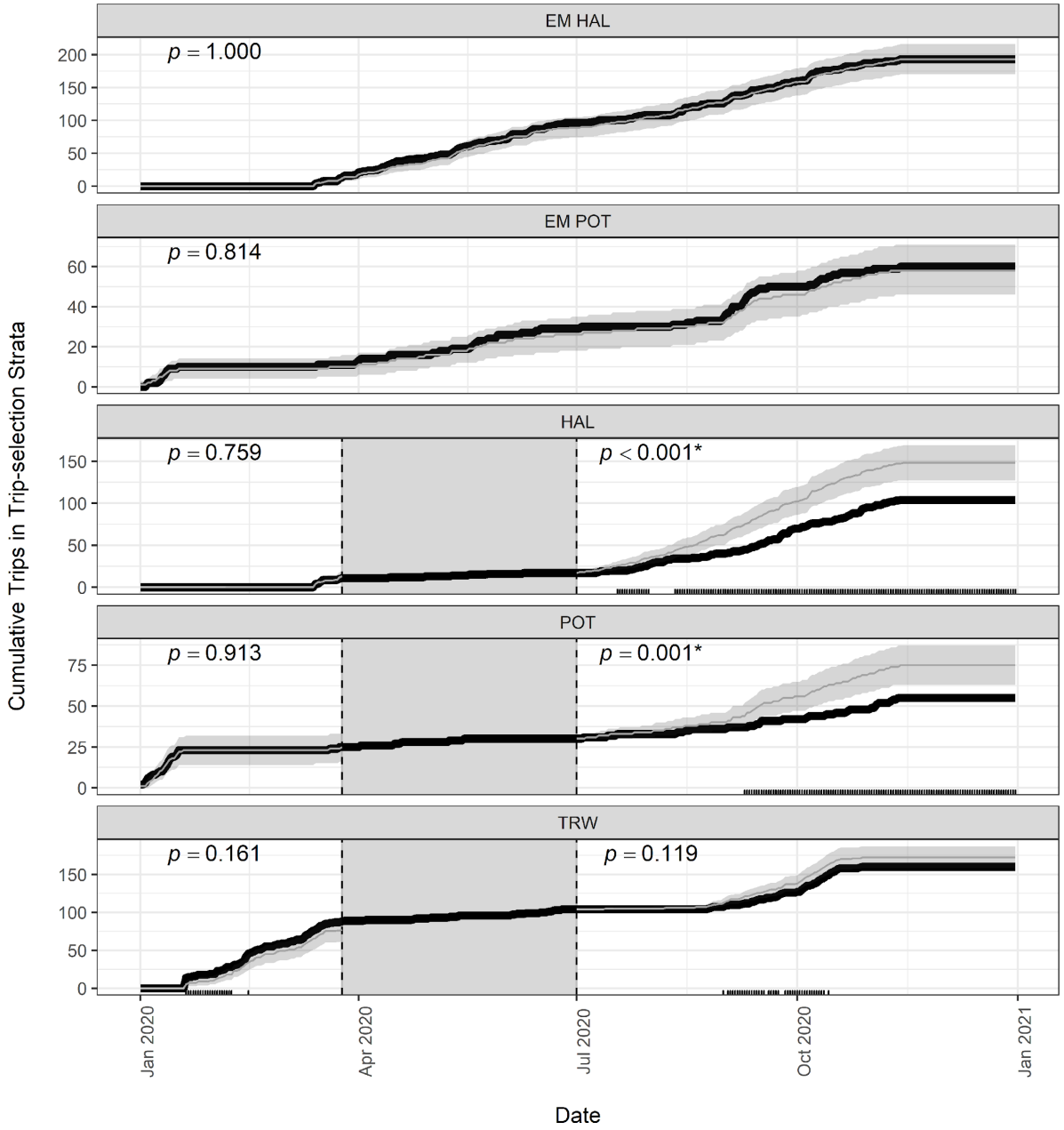


Figure 3-4. -- Relative concentrations of fishing effort and monitoring coverage for the observer *HAL* stratum (blue) and *Zero Coverage* stratum trips that used hook-and-line gear (goldenrod) for each week of 2020. Areas with fewer than three distinct fishing vessels were obscured and replaced with proportions of trips that were monitored. Vertical dashed lines depict different time periods of 2020.

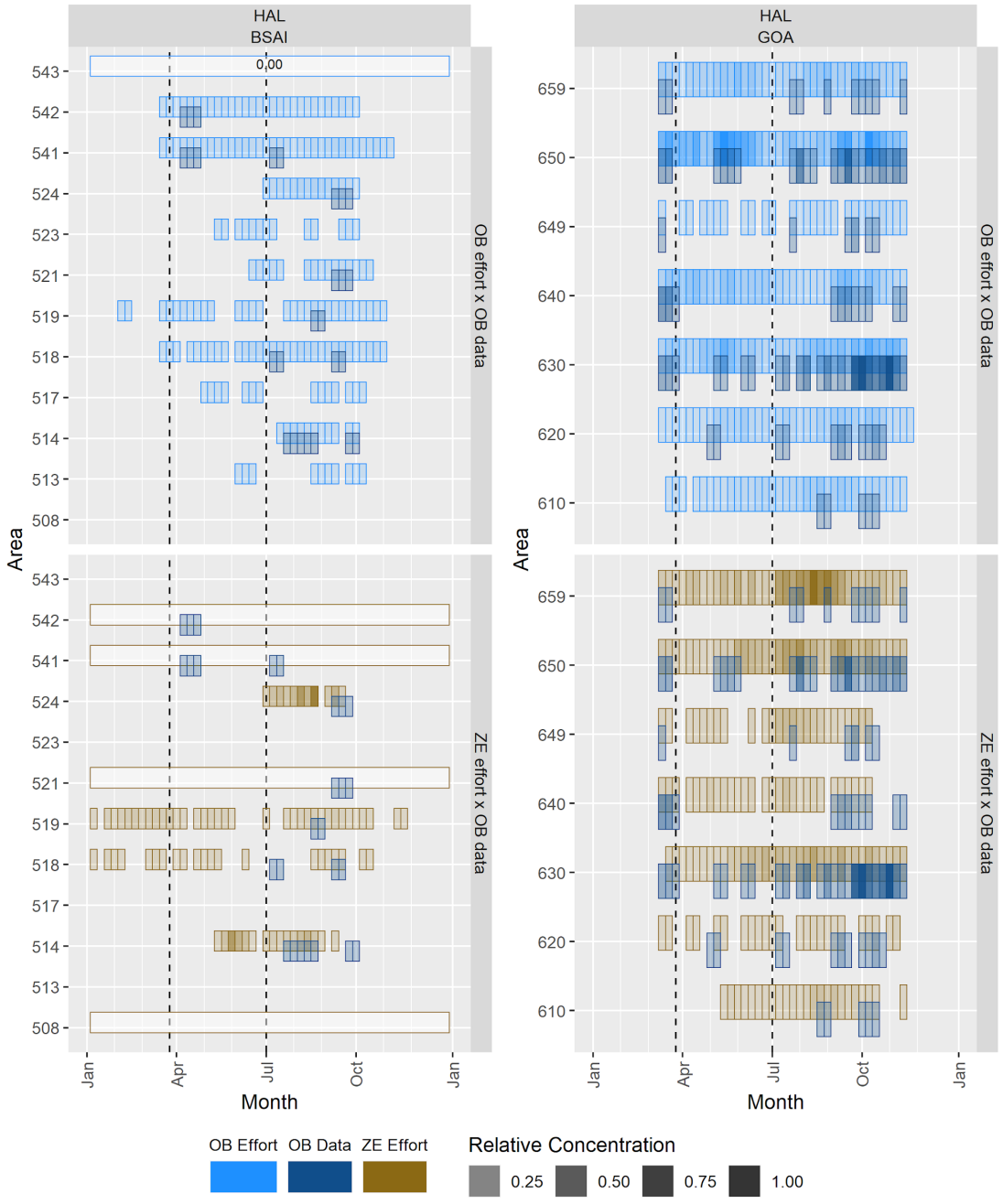


Figure 3-5. -- Relative concentrations of fishing effort and monitoring coverage for the observer *POT* stratum (blue) and *Zero Coverage* stratum trips that used pot gear (goldenrod) for each week of 2020. Areas with fewer than three distinct fishing vessels were obscured and replaced with proportions of trips that were monitored. Vertical dashed lines depict different time periods of 2020.

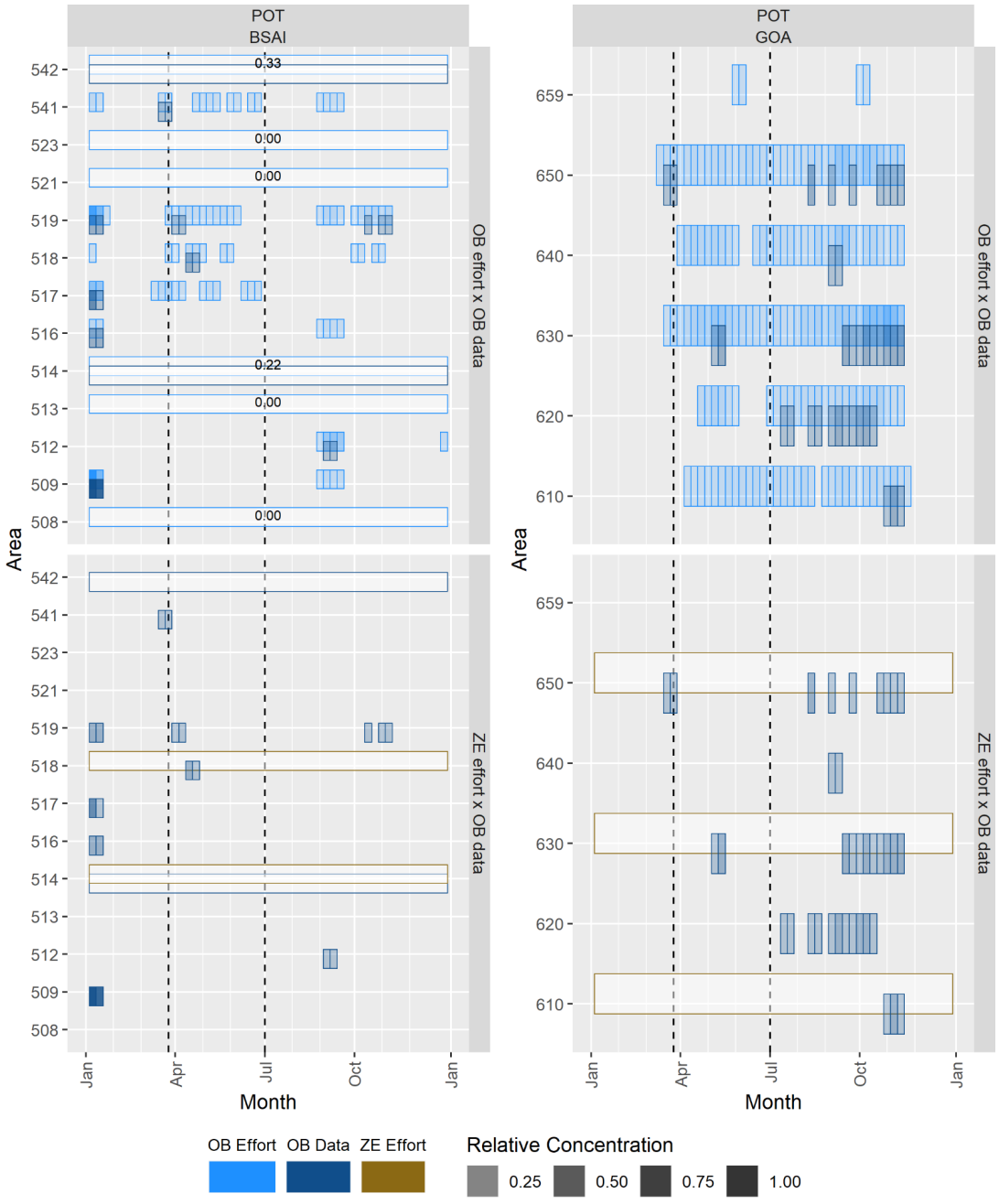


Figure 3-6. -- Relative concentrations of fishing effort and monitoring coverage for the observer *TRW* stratum for each week of 2020. Areas with fewer than three distinct fishing vessels were obscured and replaced with proportions of trips that were monitored. Vertical dashed lines depict different time periods of 2020.

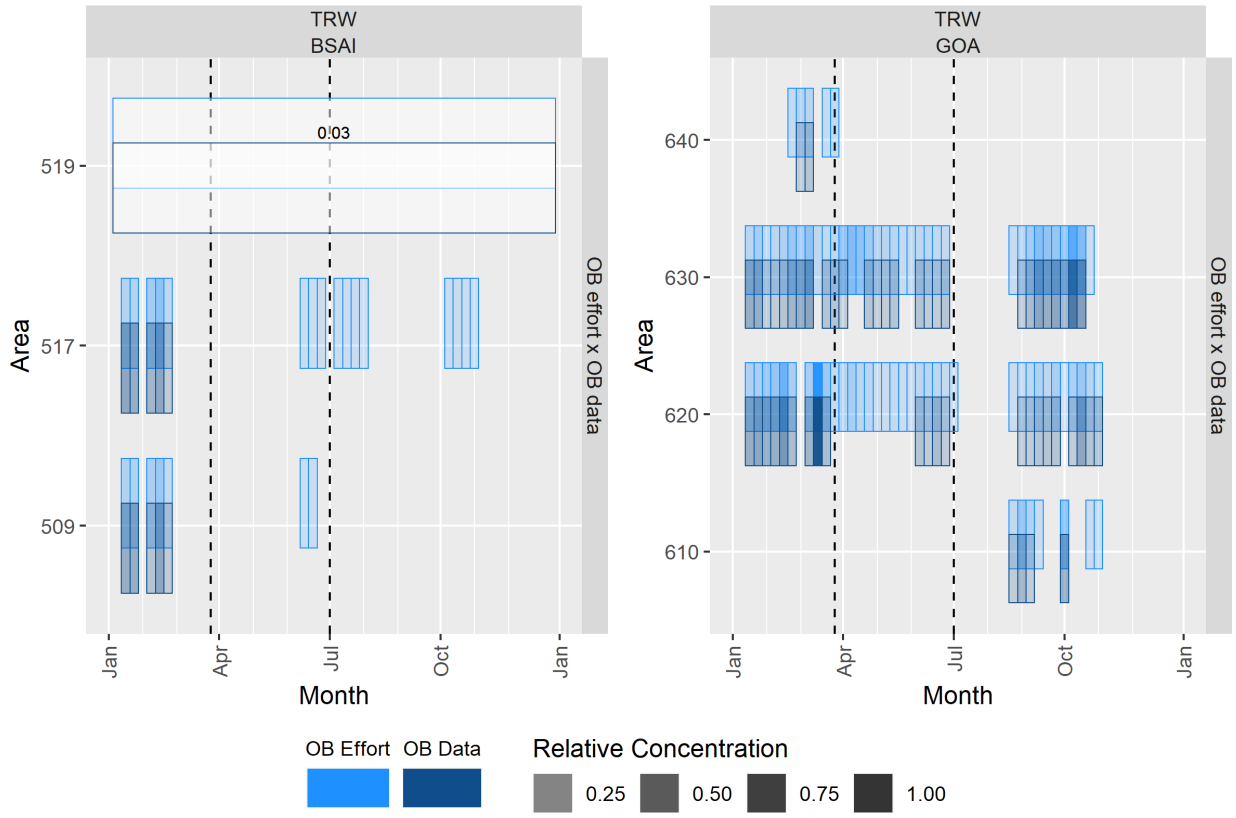


Figure 3-7. -- Relative concentrations of fishing effort and monitoring coverage for the *EM HAL* stratum (green) and observer *HAL* stratum (blue) for each week of 2020. Areas with fewer than three distinct fishing vessels were obscured and replaced with proportions of trips that were monitored. Vertical dashed lines depict different time periods of 2020.

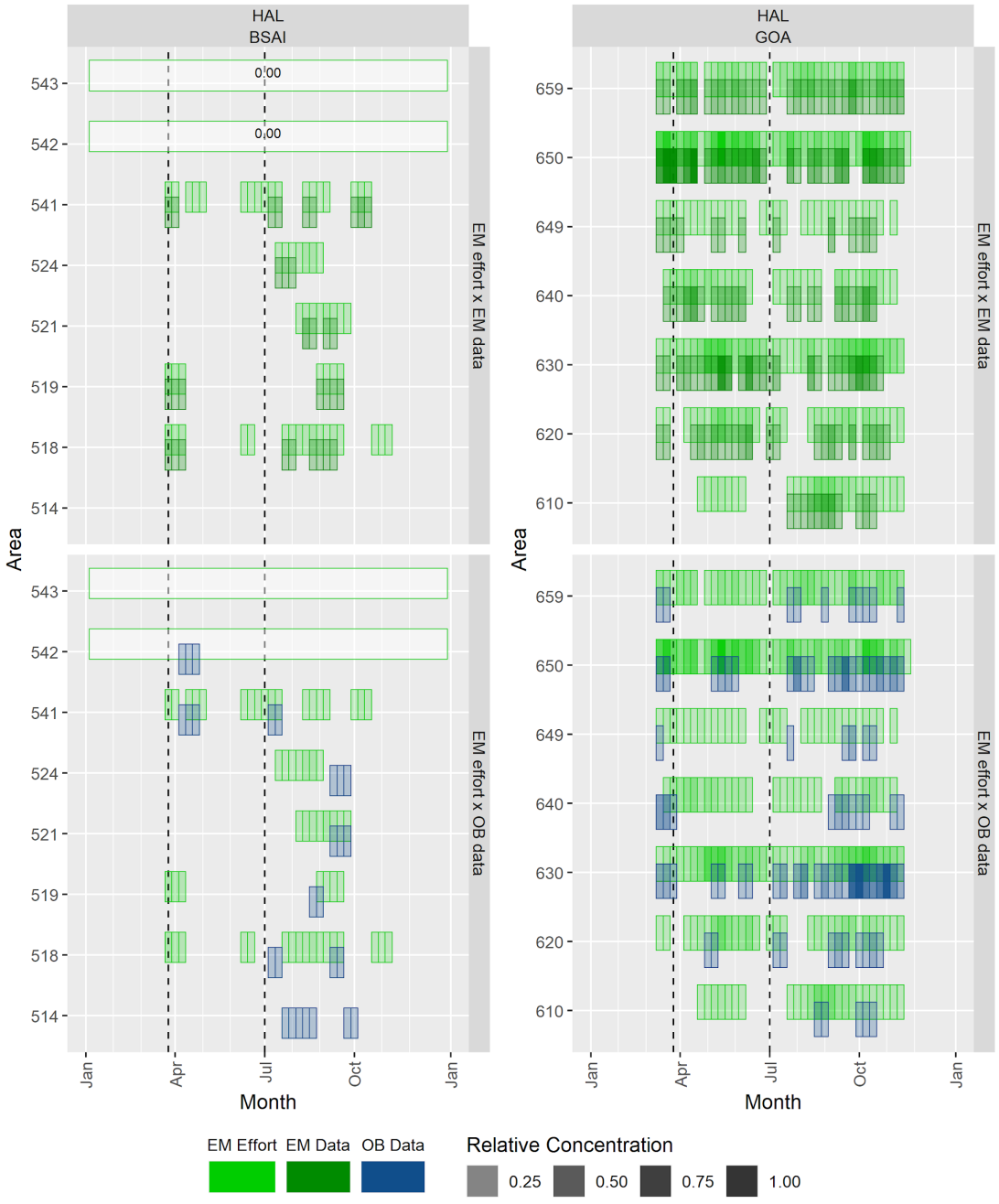


Figure 3-8. -- Relative concentrations of fishing effort and monitoring coverage for the *EM POT* stratum (green) and observer *POT* stratum (blue) for each week of 2020. Areas with fewer than three distinct fishing vessels were obscured and replaced with proportions of trips that were monitored. Vertical dashed lines depict different time periods of 2020.

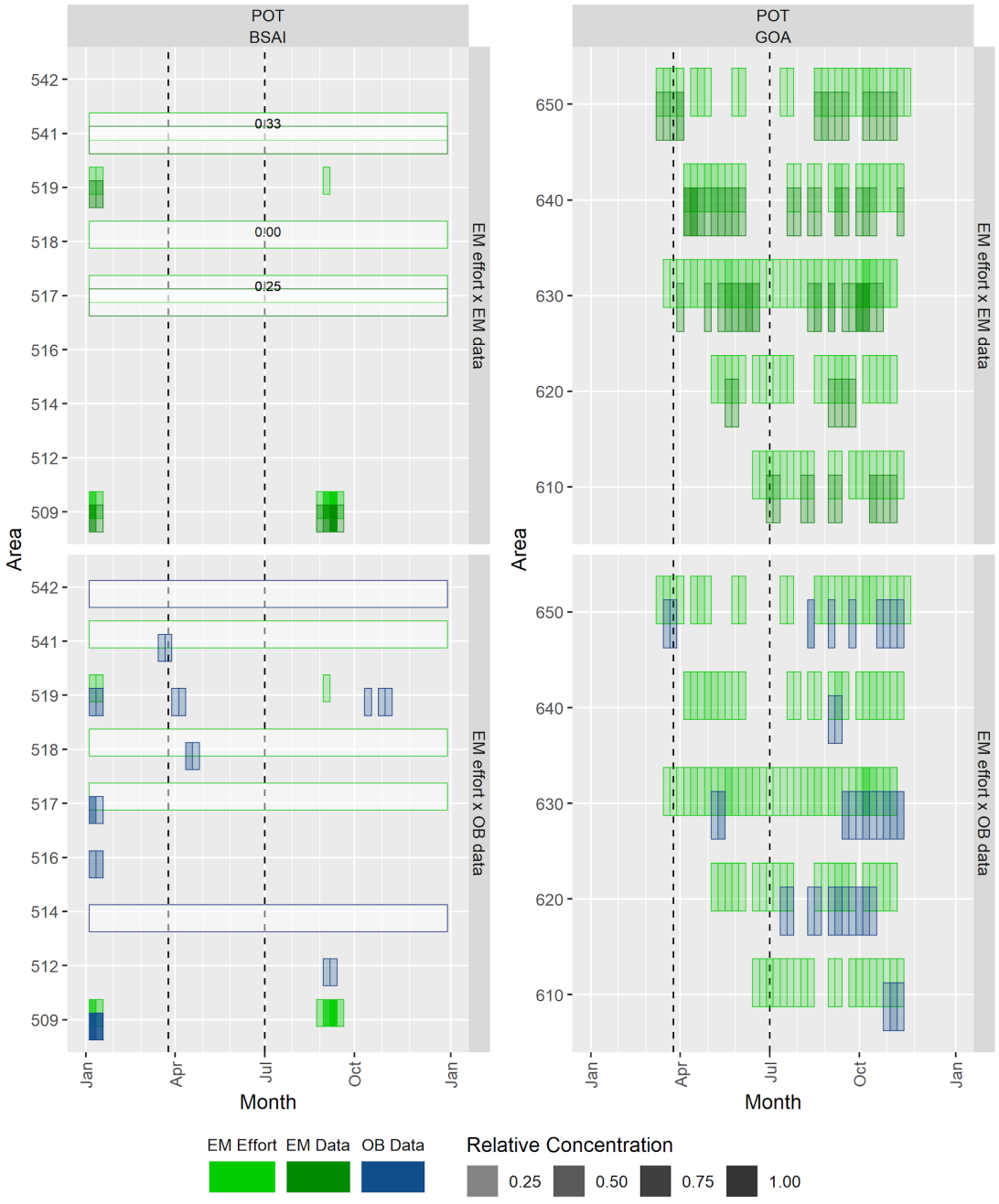


Figure 3-9. -- Results from permutation tests depicting percent differences between monitored and unmonitored trips by strata in the partial coverage category. Grey bars depict the distribution of differences between monitored and unmonitored trips when the assignment of monitoring status has been randomized (this represents the sampling distribution under the null hypothesis that monitored and unmonitored trips are the same). The vertical red solid line denotes the actual difference between monitored and unmonitored trips. Values on the x-axis have been scaled to reflect the relative (%) differences in each metric. The p-value for each test is denoted in the upper left corner. Low p-values are reason to reject the null hypothesis and conclude that there is a monitoring effect.

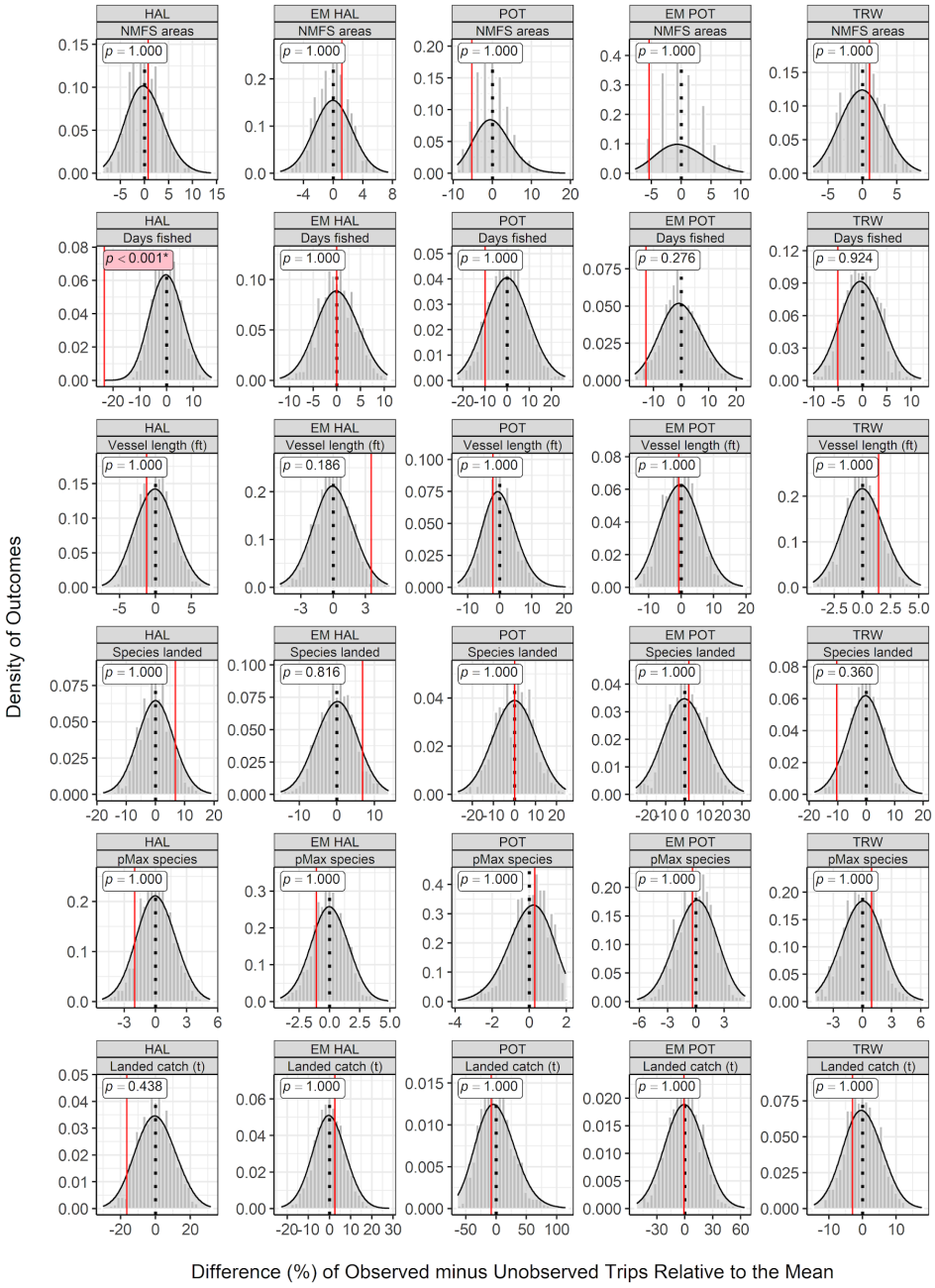


Figure 3-10. -- Distribution of trip durations for vessels in the partial coverage category by stratum and monitoring status. Monitored trips are depicted as transparent white bars overtop of solid black bars for unmonitored trips. Trip durations where both monitored and unmonitored status exist are depicted in gray (This is not the same as a stacked bar chart, in which the height of the bar would reflect monitored and unmonitored on top of one another, this plot has each monitoring status in front of the other).

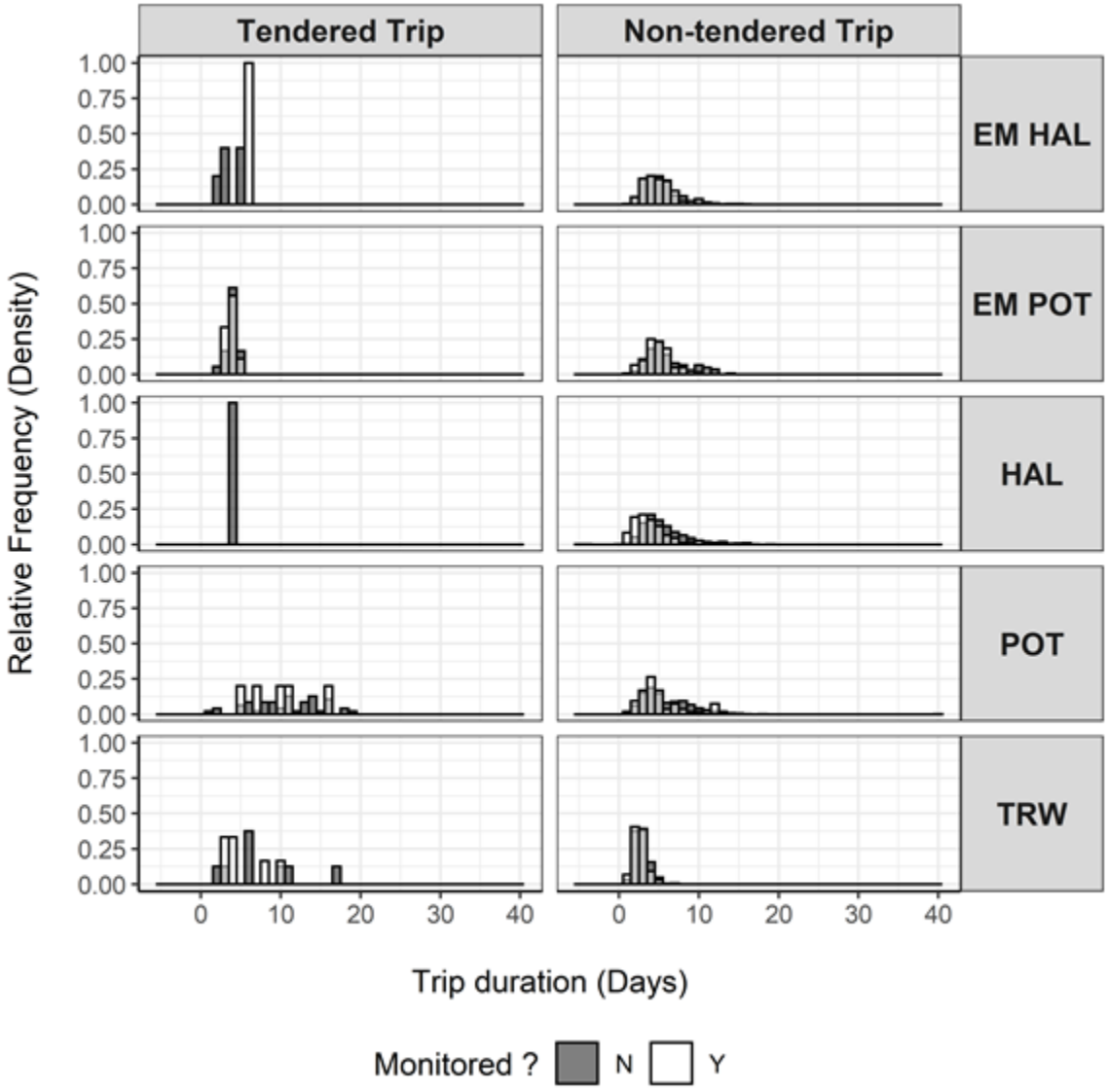
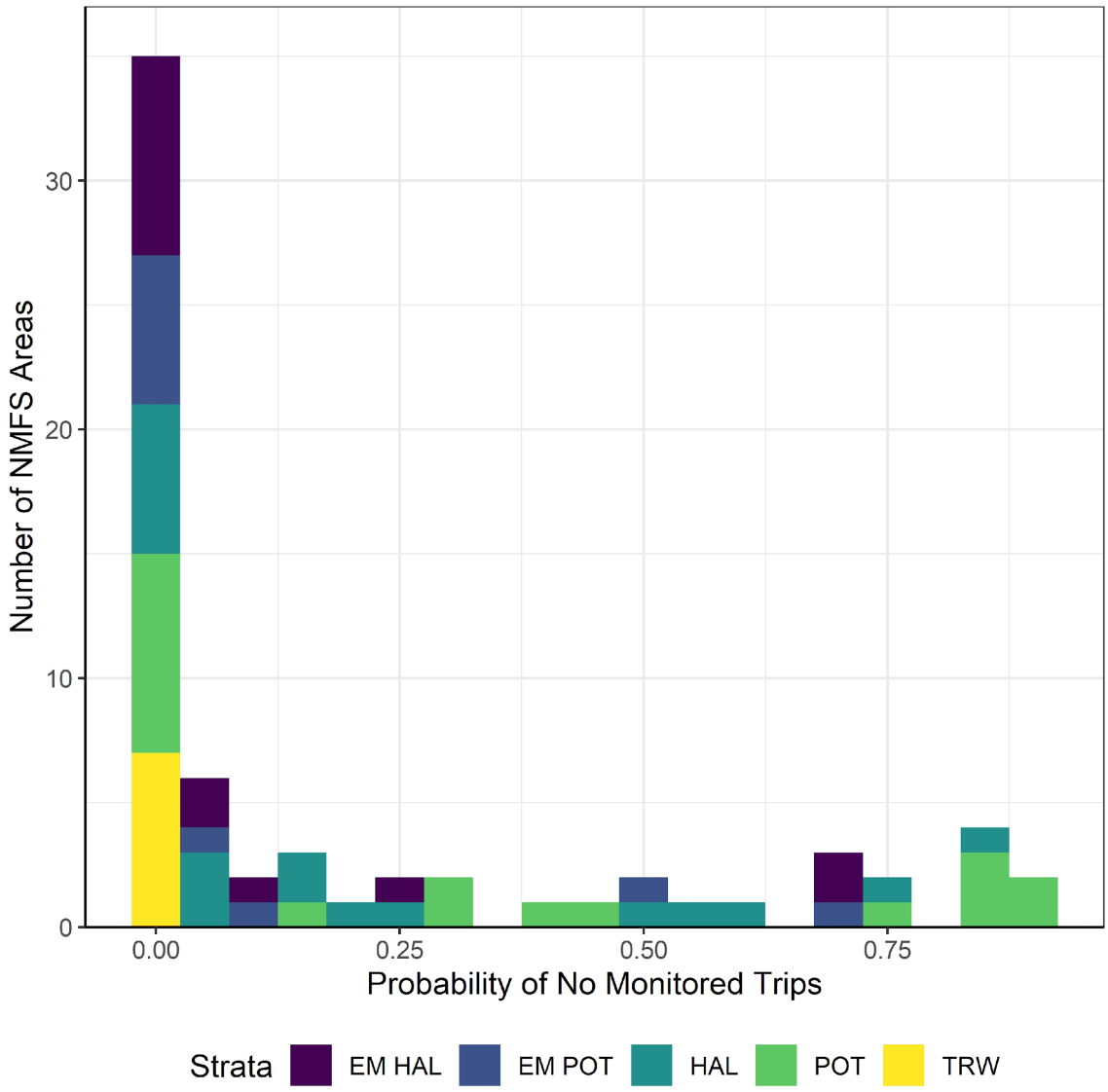


Figure 3-11. -- The number of NMFS Areas within each stratum that have a given probability of having no monitored trips in 2020.



4. Descriptive Information

4.1. Number of Trips and Vessels by FMP Area, Strata, Gear and Vessel Length

In Chapter 3, Table 3-3 provides trip and vessel counts based on coverage type and strata. However, the Council has previously requested a summary of trip and vessel counts based on criteria which are not, or are no longer, considered when deploying observers on trips (e.g., FMP area and vessel length). Table 4-1 and Table 4-2 provide a summary of the number of vessels and trips by FMP area, strata, gear type, and vessel length category within the full and partial coverage categories. Trips are summarized as the number of monitored trips and the total number of trips. Monitored trips reflect either trips with an observer, EM fixed gear trips if at least some video was reviewed, or EM trawl trips where salmon and Pacific halibut were observed at the shoreside plant. The rationale for defining monitored trips for EM fixed gear or EM trawl trips this way is that it is most similar to the way in which trips in other strata are considered observed (i.e., irrespective of whether or not haul information or usable species composition data were collected).

Vessels and trips may be counted more than once in a vessel length category in Table 4-1 and Table 4-2 if a vessel is in more than one stratum, fishes in more than one FMP area, or utilizes more than one gear type on a trip or within the year. The table rows titled "BSAI Subtotal", "GOA Subtotal", and "Total Unique" include the number of unique vessels and unique trips in each vessel length category where each vessel or trip is counted only once, in each of the FMP areas or overall, respectively.

4.2. Total Catch and Discards and Amount of Catch Observed

The ADP does not assign observers or EM coverage by fisheries (because the fishery is not able to be defined before fishing occurs), instead observers or EM are deployed to trips and vessels across all fisheries. However, there has been interest in comparing observer and EM coverage across resulting fisheries, so this section includes summaries of monitored and total catch by area, gear type, and sector. The total catch of groundfish and halibut (retained and discarded) was summarized from the NMFS Catch Accounting System (CAS) in Table 4-3 and Table 4-4 for 2020. These tables allow for comparisons of the metric of catch weight derived from CAS. Catch estimation methods are described in detail in Cahalan et al. (2014).

It is important to note that the proportion of catch weight monitored for a subset of fishing activity (i.e., a fishery) should not *a priori* be expected to equal the deployment rates (proportion of trips selected for observer or EM coverage) specified in the ADP. In particular, if there are differences in fishing characteristics between the subsets of fishing activity, specifically differences in catch weights (or discard rates) per trip, those differences will be reflected in the relative proportions of catch monitored. For example, within the partial coverage trawl stratum, trips in the pollock fishery will have very different total catch weights and discard characteristics than trips in flatfish fisheries. In addition, there are several other factors that will contribute to the apparent inconsistencies between proportion of catch monitored, the proportion of trips

monitored, and the deployment rate specified in the ADP. These include the actual number of trips selected (sample size), variability in deployment due to random chance, the ratio of number of trips in each of the fisheries, and lack of independence between the coverage rates within a sampling stratum[17].

In Table 4-3 and Table 4-4, the table columns titled "Monitored" indicate catch that occurred on trips where an observer was present, on EM fixed gear trips for which some video was reviewed, or on EM trawl trips where salmon or Pacific halibut were observed at the shoreside plant. The columns titled "Total" represents estimates of all catch from all trips regardless of whether it was monitored. The rows title "Retained" indicate catch that was offloaded (minus dockside discard). The rows titled "Discard" are estimated at-sea discard.

All catch and discard information, including halibut, summarized in these tables are in round weight metric tons. If species were landed in a condition other than round weight, then standard product recovery rates (PRRs) were used to obtain round weight. Halibut that were landed in ice and slime were additionally corrected for ice and slime using a standard 2% correction. Additional retained and discard catch information, broken down by species for the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI), are available online for 2020 as well as prior years[18].

Discarded Pacific halibut in the IFQ fishery

Caution should be exercised when interpreting the results for halibut in the halibut IFQ fishery in Table 4-3 and Table 4-4. For longline catch, the estimated weight of each species caught is the product of the estimated number of fish, the mean weight per fish, and the proportion of the catch that is discarded. While these methods provide unbiased estimates of total catch, the estimate of at-sea discards relies on the assumption that the proportion of the number of discarded is equal to the proportion of the weight discarded. The Pacific halibut fishery is the only federally managed groundfish fishery with a regulatory minimum size limit (32 in) and this creates a unique data collection issue for observers who collect data from the unsorted (retained and discarded) catch without inferring which fish would be discarded by the vessel. As a result, the mean weight per fish that is calculated from the observer's sample of combined discarded and retained fish overestimates the mean weight of discarded fish and underestimates the weight of retained fish. Hence the proportion of the number of halibut retained (reported in observer data) does not equal the proportion of halibut weight retained, resulting in overestimates of halibut discard within the directed fishery.

To correct for this bias, NMFS is developing an analytic (modeled) method to adjust for this bias by adjusting the percentage of halibut retained to reflect the differences in mean weight for retained (and discarded) halibut. A NOAA Technical Memorandum describing the change is currently going through final review. This solution has been implemented for 2021, and future

[17] More trips monitored in one subpopulation (fishery) equates to fewer monitored trips in the other subpopulations since all the trips across the different subpopulations must add to the total number of trips selected.
[18] Available online at: Monitored Catch Tables.

years, and the same correction is being implemented for previous years, back to 2013. The change was not available in time to incorporate into the CAS and be reflected in the tables for this report, however. Corrections for the bias will be included in the North Pacific Observer Program 2021 Annual Report.

4.3. Electronic Monitoring Video Review

This section provides metrics on the results of the EM video review, including information on reliability and image quality. During 2020, video that was collected from vessels participating in the fixed-gear, regulated EM program was sent to the Pacific States Marine Fisheries Commission (PSMFC) for incorporation into the CAS for catch estimation to support inseason management of the fisheries. Video collected from pollock trawl vessels participating in the EM Exempted Fishing Permit was sent to either PSMFC or Saltwater, Inc., for review.

4.3.1 EM Data from fixed gear vessels

NMFS approved 169 vessels in the 2020 EM selection pool. Of these, 131 vessels fished at least 1 trip but not all vessels were randomly selected to turn on their EM system. In 2020, EM data was collected from 105 unique vessels on a total of 253 trips (193 hook-and-line trips and 60 pot trips). PSMFC completed reviews of hard drives that contained 11,491 hauls (e.g., sensor and video completeness). Of the 11,491 hauls, 3,814 were further reviewed for catch. Catch was defined as anything seen by an EM reviewer, excluding free-moving marine birds and mammals alongside the vessel. Video reviewers were trained by a PSMFC staffer working with the North Pacific Observer Program on Alaska species reporting conventions. The reviewers were instructed to record species to the lowest identifiable taxonomic level or grouping as required by the Alaska Region. In 2020, there were fewer overall trips, which could be a result of Pacific cod closures and also possibly due to COVID-19 impacts on fishing efforts. Although there were minor issues due to COVID-19, such as some loss and/or reduction of servicing due to travel and quarantining of the EM service providers, the fixed gear EM program operated largely as expected. The PSMFC report is included in Appendix A.

Video and Sensor Completeness

During an EM trip there can be times when either the sensors or video data are not captured and there are gaps in the EM information. Video reviewers at PSMFC assessed the completeness of the video and sensor data during each trip and haul. The 2020 results are presented in Appendix Table A-3 and key findings include the following:

- Sensor data was complete on 93% of the trips for 2020, a slight decrease from 94% of the trips in 2019.
- Video was complete for 80% of the trips for 2020, compared to 86% in 2019 and 68% in 2018. However, the majority of the incomplete video did not impact the ability of reviewers to quantify the catch because the gap in the video occurred before or after fishing hooks/gear were brought onboard. In 2020, 93% of hauls sampled had complete video during the entire period when catch was brought onboard and sorted.

- Of the trips that had video gaps during fishing activity, most often the gaps resulted from video ending before catch handling ended, one or more cameras not working, video starting after catch handling had begun, or from intermittent gaps in video coverage. These issues suggest technical problems relating to the set-up of the EM system or ageing components of the EM system that cause technical issues. In general, video data was more likely to be incomplete on the first trip that a boat took with an EM system or with a new gear type (e.g., longline/slinky/string pots).

Image Quality

Of the 3,814 hauls reviewed in 2020, 73.37% of video was high-quality, 20.03% was medium-quality, and 6.2% was low-quality or unusable. For comparison, in 2019, 67.7% of video was high-quality, 27.75% was medium-quality, and 4.5% was low-quality or unusable. Common reasons for medium- and low-quality video were water spots, poor camera angles, night lighting, dirty cameras, glare, and intermittent gaps in the video.

Video Review Rates

The time needed for video review varies among Pacific halibut, sablefish, and Pacific cod fisheries and also depends on the fishing gear. Appendix Table A-5 provides review rates in 2020 and they are summarized here:

- Video review rates for trips targeting Pacific halibut and sablefish ranged from 0.42 to 0.66 minutes of review per minute of video. Review rates for fixed longline and snap gear in the halibut fishery are similar (about 0.6 minutes of review per minutes of video). Sablefish longline review rates for string pots and fixed longline are similar (0.66 and 0.68) while sablefish snap longline review is a little faster (0.42).

- Video review rates in the Pacific cod target fisheries are slower. When pots were used to fish for Pacific cod, the review rates close to real time (e.g., 1 hour of catch handling could be reviewed in ~1 hour). The review rates for longline was double (2.22). However, note that there were only five longline hauls reviewed in the Pacific cod fishery in 2020, since the majority of the fishery was shut down for 2020.

Types of EM Problems Logged

If problems exist during video review, they are logged in an EM ODDS Service Provider application (EMSP ODDS application) as well as in the data review program used by PSMFC on a trip and haul basis. Every logged issue in the EMSP ODDS application results in an automated email to the associated vessel with instructions on how to fix the problem. For every logged issue, the EM Service Provider contacts the vessel to resolve the issue, including phone calls or site visits if needed. Logged issues may result in trip logging limitations, a waiting period of 72 hours if appropriate, notifications by email, contact by the EM Service Provider, OLE contact or actions, and/or removal from the EM program.

- 155 EM selected trips had associated problems that were logged during video review.
- 113 selected longline trips and 42 pot trips had associated logged problems during video review.

EM Video Review - Logged Problems: In 2020, there were 20 total issue types that could be logged for an EM trip by video reviewers. Issue types are at the trip level, not haul level. One trip issue may impact all or some hauls in a trip. Logged issues range from equipment problems to not following Vessel Monitoring Plans (VMP). Logged issues often cause data loss or data degradation due to lower quality data.

- The most commonly logged issue was 'Catch handling inconsistent with VMP' and occurred on 61 trips. This issue occurred on 37 out of 207 (17.4%) of EM selected longline trips and occurred on 24 out of 52 (46%) of EM selected pot gear trips. This includes all pot gear, both single pots and longline/slinky/string pots.
- Other system problems occurred 48 total times for EM selected trips. This is a catch-all category for issues that do not fit within other issue types.
- Other issues that had ≥ 10 issues logged included: dirty camera lens; logbook not submitted; camera repositioning required, and streamer line camera issues.

EM Service Providers Logged Issues: These issues are not associated with specific trips as they occur prior to a trip or on non-selected EM trips. Logged issues by the EM Service Provider are equipment issues identified by the EM Service Provider or vessel operator and are expected to be resolved prior to the start of an EM selected trip. Additionally, the EM Service Provider is required to serve as the primary point of contact to a vessel when a video review problem is logged.

In 2020, there were 25 total trips with issues that were logged by the EM Service Providers. Logged issues included deck/discard camera, hauling camera, bird streamer line camera, camera out of focus, GPS unit malfunction, hard drive data is incomplete, hydraulic sensor, and other system problems.

Logged issues by the EM Service Provider and/or vessels are an important step to make sure issues are addressed before the fishing trip and are a critical step to ensuring data quality. As the EM program matures, it is expected that rates of logged issues by the EM Service Provider and/or vessels will increase as vessels gain familiarity with EM systems.

EM Issues Specific to Pot Vessels

Species and counts of catch were recorded for a subset of hauls for single pot gear and longline gear. For single pot gear, catch was reviewed for every third haul (each pot is a haul for single pots). The pot gear type involving longline/slinky/string pots was reviewed in its entirety for an individual string. The review rate in the pot fishery was close to real time (e.g., 1 hour of catch handling could be reviewed in just under an hour) or longer and the following observations were made:

- Review is time consuming when large amounts of bycatch exists.
- Longline/slinky/string pot gear is being used more frequently and has impacted review. This type of pot gear is not considered a separate gear type in Alaska. In the fixed gear EM program, longline/slinky/string pots are considered pot gear.
- New entrants to pot fishery due to longline/slinky/string pots caused data loss and degradation as they were not fully aware of how catch handling differed from previous longline experience and that another VMP is required for pot fishing. The addition of pot gear likely requires another camera and following different catch handling rules. This resulted in a time lag of pot data review.
- More negative data quality impacts are possible in higher bycatch pot fisheries (e.g., Pacific cod) as it is harder to count high numbers of items quickly. This can result in lower ratings for data quality, image quality, and video completeness.
- Catch handling that is inconsistent with VMP is a common problem with pot gear (46% of trips). Crew catch handling is impacted as crew must clear each pot and process catch prior to the next pot coming onboard. Organisms also must be handled in such a way that allows a view and/or count by the video reviewer. This may slow fishing efforts but must be done to comply with VMP.
- Bias might exist towards pots with lower catch if reviewers move past pots where organisms cannot be counted and only review pots that can be counted. Once a pot is successfully counted, the intended sample frame is resumed. NMFS is working to support additional reviewers to decrease the review time lag and to allow for longer review time needed by pot gear.

Ways to Improve EM Data Quality

NMFS and OLE are using the information from the logged issues and data quality impacts to find ways to work with the industry to improve EM data. Some of these activities were started in 2020 and will continue:

- Develop and utilize outreach letters for vessels with most issues and/or highest rates of issues. This was added to the VMP approval process, starting in 2021. These issues involve a small number of vessels but have a large impact on data quality. These trips are also very time consuming for reviewers, which is expensive and takes their time away from reviewing other hard drives.
- Resolving issues with set-up of the EM system (e.g., bad camera angles) and improved crew behaviors, such as wiping water spots and cleaning dirty cameras could lower the percentage of hauls with reduced image quality.
- OLE will increase compliance assistance.

- Potentially focus EM eligibility on vessels with more fishing effort. Vessels that do very few trips tend to have outstanding issues that are not addressed, and the same issues can persist to the next year. In 2020, 38 vessels that had EM system did not fish, and these EM systems were not available to other vessels that might want to join the EM pool.
- Continue to increase outreach for vessels with new gear types (longline/slinky/string pots).

Improvements to Marine Mammal Data

In 2019, there was no method of separating depredation by sand fleas from depredation by marine mammals. At the start of the fixed gear EM program, this level of granularity was not thought possible. However, video reviewers are now able to differentiate depredation caused by sand fleas or potentially a marine mammal. This issue was fixed in early 2020 with additional gear performance codes to show what predated upon catch whenever possible.

4.3.2 Trawl EM

An Exempted Fishing Permit (EFP) was issued in January 2020 to evaluate the efficacy of electronic monitoring systems and shoreside observers for pollock catcher vessels (CVs) using pelagic trawl gear in the eastern Bering Sea (BS) and Gulf of Alaska (GOA). 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. There were 41 participating catcher vessels in 2020, and the project expanded to include an additional 29 catcher vessels in 2021. The EFP includes catcher vessels in the partial and full coverage categories. See Section 3 for specifics on monitoring and shoreside observer coverage for participating vessels in the EFP.

The Trawl EM Committee met virtually on 17 September 2020 to discuss EFP updates and proposed changes for 2021. EFP project leads noted that COVID-19 restrictions such as closed campuses and quarantine requirements had increased the cost of observers for shoreside monitoring. Under COVID-19 quarantine restrictions, the logistics and extra cost of ensuring observers are available to monitor EM EFP offloads has significantly exceeded originally estimated amounts. The permit holders also noted that the EFP was working better for pollock harvested under the American Fisheries Act than for the GOA pollock fishery, largely because of the unpredictability of the race for fish in the GOA.

4.4. Observer Training and Debriefing

As seen all over the world, 2020 provided many challenges operationally for observers, observer providers, the commercial fishing industry, and NMFS. Despite significant changes in response to the pandemic, the Observer Program was able to maintain approximately 90% of the normal observer coverage and enabled the continued execution of federal commercial off Alaska, supporting the fishing communities and the U.S. economy. In 2020, observers collected data on board 259 fixed gear and trawl vessels and at 11 processing facilities for a total of 40,838

observer days (39,153 full coverage days on vessels and in plants; and 1,685 partial coverage days on vessels and plants)[19].

During the 2020 fishing year, approximately 373 individual observers were trained, briefed, and equipped for deployment to vessels and processing facilities operating in the BSAI and GOA groundfish and halibut fisheries. Through a diligent and collaborative effort, the Program persevered and managed to reengineer the majority of operations to use a virtual environment for most training and briefing after 16 March 2020. The newly developed Apex application, the Observer Training System (OTS), allowed for the integration of homework, in-class assignments, and tests into an online environment and was a key component to the rapid transition to virtual training. Alterations in observer training and debriefing (data quality control) are highlighted in the AFSC's FMA 2020 Highlights, found at: https://www.fisheries.noaa.gov/resource/educational-materials/alaska-fisheries-science-centers-fisheries-monitoring-and-analysis.

New observer candidates are typically required to complete a 3-week training class with 120 hours of scheduled class time and additional training by FMA staff as necessary. The FMA Division conducted training for 134 new observers to deploy in 2020 in addition to the 239 prior observers who attended a briefing of some type (Table 4-5). Portions of FMA's 3-week observer training class were attended by observer providers, FMA staff, NMFS staff from observer programs in other regions, and NOAA Fisheries Office of Law Enforcement. The newly developed virtual platform and curriculum was used as a model for other observer programs nationally as they started to reimagine their operations in a virtual environment.

During their first two deployments, observers are required to complete a mid-cruise debriefing while still in the field. This mid-cruise debriefing provides the opportunity for both the observer and FMA staff to assess the data collected up to that point, methods used, challenges encountered, and discuss future vessel assignments. After successfully completing two contracts, mid-cruise debriefings are only required on an individual basis if recommended by FMA staff. Traditionally, mid-cruise debriefings can be completed in person, over the phone, electronically, or via fax and hybridized mid-cruise protocols were developed in 2020 due to limitations on observer movements on and off vessels and in and out of processing plants. This year there were 6 mid-cruise debriefings in Anchorage, 149 in Dutch Harbor, three in Kodiak, and 27 in Seattle. Completing these hybridized mid-cruises required extensive coordination and communication between field staff, observers, observer providers, and industry members to ensure the observers received the valuable feedback the mid-cruise debriefings provided.

As COVID-19 restrictions began to take effect, the cohort of A-season 2020 observers were starting to come out of the field, so a rapid transition to a virtual debriefing environment was also necessary. After each deployment, observers must meet with an FMA staff member for a debriefing interview. During the debriefing process, sampling and data recording methods are reviewed and, after a thorough data quality check, the data are finalized. Twenty-one FMA staff

[19] Note that observer days are calculated differently from invoiced days. Observer days represent any amount of time an observer is on a vessel as part of their deployment which may be inclusive of non-fishing and standby days.

members completed 105 debriefings in Anchorage, and 469 debriefings in Seattle; the majority of these were completed virtually. Many observers deploy multiple times throughout the year and debrief after each contract, followed by a briefing for redeployment. Since observers are required to attend more than one briefing annually, the total number of briefings and debriefings for 2020 does not represent a count of individual observers.

Depending on their performance and assessment during debriefing, observers must attend a 1-day, 2-day, an annual briefing, or a fish and crab identification briefing. In rare cases when an observer has demonstrated major deficiencies in meeting program expectations, they may be required to retake the 3-week training. Regardless of their required training as the result of debriefing, all returning observers must attend an annual briefing class prior to their first deployment each calendar year. These briefings provide observers with annual reminders on safe practices on fishing vessels and at processing plants, updates regarding their responsibilities for the current fishing season inclusive of programmatic and sampling updates, office of law enforcement training, seabird data collection, and U. S. Coast Guard safety lectures and discussions. Additionally, observers are required to demonstrate their understanding and proficiency by passing the annual briefing exam, a seabird identification test, and successfully completing various in-class activities. In addition to all these updates, in 2020 specifically, curriculum focused on Pacific halibut deck-sorting regulatory program, pollock trawl EM EFP, and COVID-19 updates. Additionally, specialized briefings, upon request by the provider, were held for observers deploying to plants participating on the trawl EM/EFP.

It should be noted that an assortment of measures taken by the program to minimize movement of observers in the field and limit potential transmission of COVID-19 resulted in fewer classes and fewer observer deployments than historical numbers. Additionally, as the training platform and classes were being restructured for the virtual environment, some training requirements were waived until the required training modules became available. One example was the fish and crab identification training. Until this could be offered virtually starting in November 2020, waivers were issued to allow for continuity of observer deployments and protecting Alaska fishing communities.

Despite the challenges presented by the global pandemic, the end result of 2020 for debriefing and training was an extremely successful and productive year for the FMA Division. Unlike other national programs, the FMA Division was able to maintain continuity of operations and in collaboration with observer providers and industry, and endeavored for the safe deployments of observers.

4.5. Outreach

While communication is a universal component of our operations between the AFSC, AKR, OLE, the NPFMC, and industry constituents, we wanted to highlight significant situations with elevated communications, the majority of which were completed virtually in 2020 due to the COVID-19 pandemic.

Throughout this year, extensive coordination and collaboration occurred between the FMA, AKRO, Alaska Groundfish Data Bank, United Catcher Boats, Aleutian East Borough, and observer providers regarding the management and implementation of the 2020 Exempted Fishing Permit for electronic monitoring in the Bering Sea and Gulf of Alaska pollock fisheries for catcher vessels using pelagic trawl gear. This project required extensive staff time and effort to oversee the observer data collections, data management, and flow of data processing. More extensive details for this project are outlined in Section 4.3.3 of this document.

Observer providers are vital in the contribution to the management and successful deployment of observers in the Alaska fisheries. This proved even more so once the pandemic hit and their ability to track the evolving mandates in Alaska and Washington was pivotal to supplying observers and ensuring their safety for North Pacific deployments. On an annual basis, FMA meets with the observer providers in the fall. Historically these meetings have focused on program policies, OLE matter, recruitment and retention of observers, etc. This year's meeting focus was directed specifically towards the operational challenges of 2020 and what would be needed to successfully and safely deploy observers in 2021.

Lastly, in recognition of the important role observers play in fisheries management and the added challenges to deploy as an observer during the COVID pandemic, the Council provided a letter of recognition and a customized coffee mug to all observers that deployed in 2020. Council, FMA, and observer provider staff collaborated to distribute these mugs to the 297 observers that were deployed during the pandemic in 2020.

Table 4-1. -- Number of vessels (V), total trips (N), monitored trips (n)*, and percent of trips monitored (%) in 2020 in the BSAI by strata, gear type (hook-and-line (HAL), non-pelagic trawl (NPT), pelagic trawl (PTR), pot, and jig), and vessel length category (based on length overall, in feet) for the full and partial coverage categories.

			Vessel length category											
			< 40'				40-57.4'				≥ 57.5'			
Area	**Strata**	**Gear**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**
BSAI	Full**	HAL					1	8	1	12.5	21	161	161	100.0
	Full	NPT									47	515	515	100.0
	Full	POT									5	30	30	100.0
	Full	PTR									72	1,922	1,921	99.9
	EM TRW EFP (Full)	PTR									21	494	494	100.0
	EM HAL	HAL					8	27	10	37.0	5	12	6	50.0
	EM HAL	POT					1	3	1	33.3				
	EM POT	HAL					1	1						
	EM POT	POT					1	1			11	59	19	32.2
	HAL	HAL					16	84	8	9.5	23	68	2	2.9
	POT	POT					9	40	6	15.0	60	217	27	12.4
	TRW	NPT									20	97	19	19.6
	Zero	HAL	37	303										
	Zero	JIG	1	5			2	2						
	Zero	POT	2	3										
	BSAI Subtotal		37	305			28	162	25	15.4	236	3,560	3,179	89.3

* Monitored reflect either trips with an observer, EM fixed gear trips for which some video was reviewed, or EM trawl trips where observers sampled shoreside.

** Full coverage in this table includes vessels in both the Regulatory and Voluntary Full Coverage strata.

Table 4-2. -- Number of vessels (V), total trips (N), monitored trips (n)*, and percent of trips monitored (%) in 2020 in the GOA and overall, by strata, gear type (hook-and-line (HAL), non-pelagic trawl (NPT), pelagic trawl (PTR), pot, and jig), and vessel length category (based on length overall, in feet) for the full and partial coverage categories.

			Vessel length category											
			< 40'				40-57.4'				≥ 57.5'			
Area	**Strata**	**Gear**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**
	Full**	HAL									3	4	4	100.0
	Full	NPT									33	132	132	100.0
	Full	POT									1	5	5	100.0
	Full	PTR									27	129	129	100.0
	EM HAL	HAL					88	426	122	28.6	37	187	60	32.1
	EM HAL	POT					5	9	3	33.3	9	20	11	55.0
	EM POT	HAL					8	14	4	28.6	7	15	5	33.3
	EM POT	POT					10	48	15	31.2	14	87	26	29.9
	EM TRW EFP (Partial)	PTR									31	477	153	32.1
	HAL	HAL					186	852	63	7.4	109	504	32	6.3
GOA	HAL	POT					8	15	2	13.3	19	51	3	5.9
	POT	HAL					5	12	3	25.0	14	25		
	POT	POT					18	90	10	11.1	47	261	12	4.6
	TRW	NPT									23	323	51	15.8
	TRW	PTR					1	6	1	16.7	35	513	95	18.5
	Zero	HAL	283	1,067										
	Zero	JIG	2	7			8	25						
	Zero	POT	2	8										
	Zero EM Research	HAL					2	21						
	Zero EM Research	POT					1	11						
	GOA Subtotal		284	1,082			283	1,469	211	14.4	226	2,564	663	25.9
Total Unique			310	1,376			292	1,610	233	14.5	383	6,102	3,837	62.9

* Monitored reflect either trips with an observer, EM fixed gear trips for which some video was reviewed, or EM trawl trips where observers sampled shoreside.

** Full coverage in this table includes vessels in both the Regulatory and Voluntary Full Coverage strata.

Table 4-3. -- Monitored catch* (metric tons), total catch, and percent monitored (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2020 in the Gulf of Alaska. Empty cells indicate that no catch occurred.

		Catcher/Processor			Catcher vessel			Catcher vessel: rockfish program			Gear total		
Gear	**Catch**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**
Hook-and-Line	**Retained**	254	349	**73%**	1,680	13,444	**12%**				1,934	13,793	**14%**
	Discard	21	34	**63%**	1,148	9,482	**12%**				1,170	9,516	**12%**
Jig	**Retained**				0	18	**0%**				0	18	**0%**
	Discard												
Non-Pelagic Trawl	**Retained**	24,051	24,051	**100%**	2,820	25,787	**11%**	4,272	4,272	**100%**	31,143	54,110	**58%**
	Discard	3,169	3,169	**100%**	622	3,552	**18%**	393	393	**100%**	4,183	7,114	**59%**
Pot	**Retained**	80	80	**100%**	526	4,613	**11%**				606	4,692	**13%**
	Discard	1	1	**100%**	39	284	**14%**				40	285	**14%**
Pelagic Trawl	**Retained**	821	821	**100%**	24,825	100,705	**25%**	10,393	10,393	**100%**	36,039	111,919	**32%**
	Discard	5	5	**100%**	132	596	**22%**	117	117	**100%**	254	718	**35%**

* Monitored reflect either trips with an observer, EM fixed gear trips for which some video was reviewed, or EM trawl trips where observers sampled shoreside.

Table 4-4. -- Monitored catch* (metric tons), total catch, and percent monitored (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2020 in the Bering Sea/Aleutian Islands. Empty cells indicate that no catch occurred.

		Catcher/Processor			Mothership			Catcher vessel			Gear total		
Gear	**Catch**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**	**Monitored**	**Total**	**%**
Hook-and-Line	**Retained**	84,934	84,950	**100%**				236	2,783	**8%**	85,170	87,732	**97%**
	Discard	12,716	12,719	**100%**				207	1,831	**11%**	12,923	14,551	**89%**
Jig	**Retained**							0	10	**0%**	0	10	**0%**
	Discard												
Non-Pelagic Trawl	**Retained**	322,076	322,259	**100%**	40,687	40,687	**100%**	13,167	19,505	**68%**	375,930	382,451	**98%**
	Discard	26,700	26,723	**100%**	3,485	3,485	**100%**	352	489	**72%**	30,537	30,696	**99%**
Pot	**Retained**	3,764	3,764	**100%**				2,095	16,906	**12%**	5,859	20,670	**28%**
	Discard	122	122	**100%**				58	331	**18%**	180	453	**40%**
Pelagic Trawl	**Retained**	601,999	604,018	**100%**	122,692	122,692	**100%**	608,445	608,695	**100%**	1,333,136	1,335,405	**100%**
	Discard	3,167	3,168	**100%**	2,331	2,331	**100%**	1,755	1,755	**100%**	7,253	7,254	**100%**

*Monitored catch is from trips with an observer, EM fixed gear trips for which some video was reviewed, or EM trawl trips were salmon were observed shoreside.

Table 4-5. -- Number of observer training classes and number of observers trained/briefed from 20 November 2019 to 10 November 2020.

Training classes	Number of classes	Number of observers trained/briefed
3 week training	7	132
3-day annual	23	243
2-day briefing	3	5
1-day briefing	35	218
Lead Level 2	8	33
Fish and Crab ID Training	9	56
Total	**85**	**687**

5. Compliance and Enforcement

This chapter provides a review of the collaborative efforts between NOAA's Office of Law Enforcement Alaska Division (OLE), the Fisheries Monitoring and Analysis Division of the Alaska Fisheries Science Center (FMA), the fishing industry, and other partners in 2020. It includes a summary of the partners involved in law enforcement, a novel analysis of potential violations collected from fishery observers (observers), compliance assistance and outreach efforts, and enforcement actions.

This chapter is broadly organized into separate sections that describe the partners (Section 5.1), then focus on a simple reporting of the results (Section 5.2), a more thorough description of OLE response (Section 5.3), Considerations for Enforcement (Section 5.4), Outreach and Compliance (5.5), and Enforcement Actions (5.6).

Terminology

- Complaint: A report of a potential violation. Complaints can be reported to enforcement at any time. Complaints might come from observers, Observer Program, industry, or members of the community. When a complaint is reported by an observer, it is typically documented in a statement.
- Statement: A document where an observer will report potential violations to the Observer Program, typically during debriefing. There are multiple statement headings used to categorize potential violations. A single statement may report multiple occurrences of the same potential violation or may report different violation types falling under the same category. A statement is sometimes referred to as an observer affidavit.
- Occurrence: A specific instance of a potential violation within a statement. A statement may consist of one or many occurrences.
- Incident: OLE logs enforcement responses as Incidents into an electronic case management database. Multiple statements may be investigated under a single incident number. Not all statements result in incidents and not all incidents are forwarded for investigation, (some incidents contain no violation and many are recorded for information only). An incident that is forwarded for investigation is referred to as an "investigation" or a "case".
- Investigation: An inquiry conducted by OLE agents and officers to determine if a violation has occurred.
- Case: The conclusion of an investigation that may result in enforcement action.
- Enforcement action: The enforcement result of a case which holds the violator accountable. Levels of enforcement action include Compliance Assistance, Written Warning, Summary Settlement (monetary penalty), Notice of Violation and Assessment by NOAA General Counsel Enforcement Section, or criminal prosecution.

5.1. Enforcement and Partners in Alaska

Three are three entities that work together to accomplish fisheries enforcement in Alaska: NOAA Office of Law Enforcement, U.S. Coast Guard, and the State of Alaska Wildlife Troopers (AWT). Each of these agencies has a role relative to enforcement of regulations regarding observers and fisheries monitoring.

NOAA Office of Law Enforcement

The NOAA OLE mission is to protect marine wildlife and habitat by enforcing domestic laws and supporting international treaty requirements designed to ensure global resources are available for future generations. Central to this mission is the OLE role in protecting observers and their ability to collect scientific data used to manage marine resources. Reports of rape, assault, sexual harassment, interference/sample bias, intimidation, coercion, hostile work environment and safety are among the highest OLE investigative priorities[20].

OLE maintains a strong partnership with FMA. OLE Agents and Officers collaborate frequently with FMA to provide outreach, education, and compliance assistance to industry and stakeholders. Agents and officers in the field respond to industry questions about fishery monitoring requirements and participate in outreach meetings to discuss fishery management programs. OLE also assists FMA by providing training to observers, discussing compliance concerns with debriefers, and collaborating in analyzing violation trends.

OLE dedicates a full-time liaison contractor in Seattle to support the reporting of potential regulatory violations by observers trained and debriefed by FMA. The liaison receives and organizes compliance statements; compiles the compliance statements and relevant observer data for investigation; provides resources and support to observers who have been victimized; assists in developing and editing manuals, reports, and training materials; provides assistance to FMA staff and observers in identifying and documenting potential violations; and provides observer related administrative and investigative support to agents and officers.

OLE maintains a full-time liaison Special Agent. The liaison Special Agent provides training to observers during their initial 3-week training course on compliance monitoring, observer victim crimes, and OLE's risk reduction strategy. The Special Agent also works with the liaison contractor to provide regulatory updates to FMA staff. The Special Agent also meets with industry groups and vessel companies to advise them of regulatory requirements and to discuss best practices to ensure compliance. Additionally, the Special Agent provides resources and support to observers who may have been victimized, investigates victim crimes and other complex and high priority observer related complaints, and assists other OLE agents and officers or enforcement partners in observer related cases. Other duties include collaboration with FMA staff to detect and analyze violation trends to aid development of observer training and outreach to industry and to guiding enforcement operations.

[20] https://www.fisheries.noaa.gov/resource/document/enforcement-priorities-fiscal-years-2018-2022.

U.S. Coast Guard

It is a high USCG priority to promote compliance with observer regulations to ensure that observers can effectively and accurately collect and report unbiased data. During at-sea boardings, the USCG seeks to detect and deter violations such as failure to carry an observer, observer harassment, observer gear tampering, and presorting of catch or otherwise biasing observer samples.

During USCG boardings where observers are present, boarding officers may discreetly invite observers to discuss concerns about their work environment or ability to perform duties. All reports of suspected offenses are passed to the OLE. Reports from observers describing harassment, intimidation, and safety issues are of particular concern.

FMA reports observer statements of potential safety violations directly to the USCG for review on a case-by-case basis. NMFS regulations establish national safety standards for commercial fishing vessels carrying observers. These regulations require that any commercial fishing vessel, not otherwise inspected, must pass a USCG dockside safety examination before carrying an observer. Observers also conduct an independent review of major safety items upon boarding a vessel.

The USCG may receive requests to assist the OLE or FMA to help evaluate safety concerns. In coordination with OLE and/or the FMA the USCG may attempt to locate the vessel and conduct a commercial fishing vessel safety boarding at-sea or dockside. A USCG commercial fishing vessel safety examiner may require actions by the vessel operator to correct safety deficiencies prior to embarking with an observer.

Alaska Wildlife Troopers

OLE and the AWT collaborate under a Joint Enforcement Agreement which provides AWT with the authority to enforce observer and observer data protections under the Magnuson-Stevens Act. OLE and AWT work together to investigate observer complaints and to conduct patrols and at-sea or dockside boardings.

In 2020, OLE Enforcement Officers deployed to the Patrol Vessel *Stimson* for two multi-week patrols from Kodiak to the Aleutians. In addition to enforcement, the Stimson team provided outreach and education on federal and state regulations.

AWT independently investigated five observer related cases. One case resulted in the issuance of a Summary Settlement (monetary penalty), two cases are pending enforcement action, and two remain under investigation.

5.2. Reports of Potential Violations

This is an analysis of potential violations as reported by observers in 2020. This section is focused on reporting the results and not on interpreting them. More detail is provided in Section 5.3.

Fisheries Observer monitoring and compliance roles are identified in the Magnuson-Stevens Act and implemented in regulations. Prior to deployment, observers are trained in compliance monitoring. Observers are required to accurately record sampling data, write complete reports, and report any suspected violations relevant to the conservation of marine resources. The FMA division forwards reports of suspected violations (termed 'statements') to OLE for investigation. Additionally, OLE uses the data to make adjustments to training, outreach, and operations based on detected trends.

OLE works closely with the FMA Division and observer providers to address incidents that affect observer safety, sampling, and work environments. Observers record statements regarding potential resource or workplace violations. These statements are typically written during the debriefing process after an observer cruise[21] is completed. Statements are forwarded to OLE and/or the USCG, and some become "cases" that are pursued further by OLE. Descriptions of the statement types recorded by observers are provided in Table 5-3. Every statement received from the FMA division is evaluated and prioritized. Then, OLE Officers and Agents investigate the most egregious complaints to identify if violations have occurred and to determine the appropriate level of response. OLE also utilizes observer compliance data to track compliance trends. Trend analysis helps OLE focus and prioritize enforcement efforts.

Previous Annual Reports summarized observer statement data as the number of statements recorded for the year in each statement category. While this method is informative as a baseline, changes in coverage rates and fishing effort were not accounted for. For example, an increase in the number of statements recorded for a particular statement category from one year to the next is likely to be interpreted as 'bad' because it is often assumed that the values are comparable. However, since the same vessels do not fish year to year in the same fisheries, using the same fishing effort or level of monitoring, these values are not comparable. For example, an increase in the number of statements from one year to the next may be a result of an increase in fishing effort or observer coverage in a particular fishery, which increased the number of observer deployment days in that fishery.

This section contains analyses of observer statement data that corrects for the effects of differences in fishery monitoring and fishery effort to enable comparisons and identify areas to target outreach and enforcement. The 2018 Annual Report (AFSC and AKR 2019) provided a preliminary version of this method and the data were received favorably by the Council.

5.2.1. Data Preparation

A number of changes to the way observer statements have been traditionally summarized were made for the 2019 Report and are continued in this analysis.

[21] A cruise is actually a cruise number, and is assigned to an observer upon completion of their pre-deployment briefing and becomes archived when they are debriefed. The term 'cruise' is thus used to define this deployment period for an observer. A cruise deployment period can last up to 90 days (not including debriefing) and may contain many individual vessel/plant assignments, but is generally limited to four assignments unless an additional-boat waiver has been requested by the provider and approved by NMFS.

Number of Occurrences Versus Number of Statements

Each statement is recorded in the observer database as a single record by cruise, vessel/plant, and statement type. Within each statement, observers record the number of occurrences, which indicates how many times the particular issue happened within the statement. For example, if daily logbook data were not maintained as required by regulations on 10 separate hauls, the observer will write one record-keeping and reporting statement with 10 occurrences one for each haul in which it occurred.

Prior to 2019 summaries of potential violations were reported at the statement level. Therefore, if one statement contained 10 occurrences and one had 100, they would each be summarized as one statement and given equal value.

The analyses described in this chapter now use the actual number of occurrences recorded by the observer within each statement.

First Occurrence Date Versus Statement Received Date

Previous reports summarized complaints by year based on the date they were received by OLE. The lag time between the date of occurrence-at-sea and the date the statement is written and forwarded to OLE can be weeks or months because most statements are not written until the observer completes the cruise and returns for debriefing. Observers do record the "first occurrence date" when they write these statements. Because this date better aligns with the observer's deployment dates and is a better match for using number of occurrences rather than number of statements, it was used to identify which statements should be included in this annual report.

Description of Factors

There are many factors that may contribute to how many occurrences are recorded in statements for an observer vessel/plant assignment. Some factors are associated with gear type or sector - for example, only the longline gear type is subject to bird streamer line regulations, so the gear type of longline is a contributing factor to the occurrence of streamer line deterrent violations. Other factors span multiple sectors (e.g., whether the observer was assigned as a lead, second, or sole observer, which may be a contributing factor in some interpersonal statement types since lead and sole observers have more fishery data responsibilities than second observers). The factors chosen for this analysis focus on things that are easily identifiable within the observer database for each cruise/permit. Table 5-1 lists the factors and a description of each factor.

5.2.2. Rate Calculation Method

Occurrences of potential violations were used in the calculation of potential violation rates to standardize comparisons across various factors of interest (thereby eliminating the effects of differences in fishery monitoring levels or fishing effort). Two separate rates were calculated and are presented in this report: number of occurrences per 1,000 deployed days and number of occurrences per vessel/plant assignment.

Number of Occurrences per 1,000 Deployed Days

Total days deployed was gathered from haul and delivery information recorded by all deployed observers in 2020 wherever possible, and secondarily from eLogbooks and eLandings. All factors – with one exception - are captured in the observer's haul, delivery, or logistics data: Vessel Type, Gear Type, Observer Role (Lead or Second), NMFS region, and Coverage Type (Full or Partial as per ADP definitions). Management Program is not recorded in observer data but was obtained from the Alaska Region's eLogbook and eLandings data and matched to 2020 observer data using cruise, permit, dates, and landing report ID when applicable.

For each day in which a unique combination of factors was recorded in the observer's haul, delivery, or logistics data, that day was counted as a day for that particular factor combination. For example, for a given day, if a full-coverage observer on a vessel recorded some hauls with vessel type of "CP/MS", gear type of "NPT", and haul positions within the BSAI, and subsequently those hauls were designated by AKRO into management program code of "A80," then that particular deployment day is counted as FULL + CP/MS + NPT + BSAI + A80. Every deployed day was assigned at least one factor combination, and in some cases more than one (e.g., it is not uncommon for a CP to fish in both CDQ and AFA fisheries on the same day, so a day would have been counted as both CDQ and for AFA in this analysis). Days where the factor value could not be matched from haul or delivery data within the cruise/permit[22] (e.g., days when the observer is assigned but the vessel is steaming and there are no hauls retrieved that day) were matched from the "nearest neighbor" date within the cruise/permit - that is, the value was assigned using the value from the closest available day in time for which there were haul or delivery data within the cruise/permit.

Observer statements do not include any of the factors by which we are grouping -- they are written broadly for the cruise/permit. Therefore, in order to estimate the number of occurrences within each factor combination it was necessary to associate the number of occurrences recorded for the entire cruise/permit to each factor combination. This was accomplished by weighting the number of occurrences recorded in each statement by the number of days in each factor combination in the cruise/permit. For example, following the earlier example with deployed days, if 50% of the deployment days for a cruise/permit were FULL + CP/MS + Non-Pelagic Trawl + BSAI + A80, and the observer recorded a statement for this cruise/permit with 10 occurrences, then 50% (5) of the occurrences are assigned to that factor group while the remaining 50% are assigned to the other factor groupings the observer may have been deployed into in that cruise/permit. Finally, this weighted value was summed for each factor combination, within each statement category. The final rate for each factor combination was then calculated as the sum of all occurrences divided by the sum of all deployed days for each factor combination:

$$R_1 = \left(\frac{\sum Occurrences}{\sum Deployed\ Days}\right) * 1000\ .$$

[22] "Permit" is synonymous with a vessel or processing plant. The term refers to each vessel or processing permit.

Separation of OLE Priority Statement Types

Data are presented using the number of occurrences per 1,000 deployed days, as described above, for all statement categories within each of the broader categories. In addition, we chose to separate the six OLE priority statement types into two subgroups for this report. In the first, named OLE Priority: Safety and Duties, data are only reported using the number of occurrences per 1,000 deployed days, as described above. The second group of OLE Priority is named OLE Priority: Interpersonal. For this group, summary rates are presented as number of occurrences per 1,000 deployed days as described above, and are also presented using the number of occurrences per vessel/plant assignment in the denominator. A discussion of this method follows.

Number of Occurrences per Vessel/Plant Assignment

The four statement types that fall under Interpersonal OLE Priority are as follows:

- Intimidation, Coercion, and Hostile Work Environment.
- Harassment – Sexual.
- Harassment – Assault.
- Disruptive/Bothersome Behavior: Conflict Resolved.

The rate of occurrences per vessel/plant assignment is presented for these statement types because of the sensitive and significant nature of these statement categories and the fact that they affect a person (thereby defining the unit of measure). Here, a single occurrence may be enough to generate enforcement action.

To calculate this rate a cruise-vessel/plant assignment was considered to be associated with a given factor combination if the observer recorded any haul or delivery data with the factor combination. Every vessel/plant assignment was assigned at least one factor combination, and in some cases more than one (see previous example re: CPs fishing both CDQ and AFA). Statements were then matched for cruise/permits where they were recorded, and the number of occurrences were weighted for each factor combination (see preceding description). Finally, the rate per vessel/plant assignment was calculated as the sum of all occurrences divided by the sum of all vessel/plant assignments for each factor combination:

$$R_2 = \left(\frac{\sum Occurrences}{\sum Assignments}\right).$$

Improvements to the methods

All summaries by factor combinations are independent of the summaries of other factor combinations because the number of incidents were weighted for the number of days in each factor combination. The total number of occurrences across all factor combinations within a cruise/permit always sums to the total number of occurrences recorded in the statement for the cruise/permit. In this way we have accounted for all of the analyzed factors simultaneously. This differs from the method that was presented in Appendix D of the 2018 annual report (AFSC and AKRO 2019), in which all of the data for the year were summarized only for one factor at a time and no effort was made to account for factors simultaneously. Finally, some efforts were made to

protect the identity of individual observers or vessels. In cases where there were fewer than three observers deployed for a factor combination in 2020, that data were excluded from the analyses and data summary tables.

5.2.3. Results

Table 5-2 presents the results of the rate calculations for statement types grouped into their broader groups as defined by OLE, with the additional splitting of the 'OLE priority' statements into sub-groups of 'Interpersonal' and 'Safety and Duties,' as described above. A summary of observer statements is presented in Table 5-3. The factor group with the highest overall number of statements and occurrences was full coverage non-pelagic trawl CP/MS vessels participating in Amendment 80 fisheries in the BSAI (218 total statements and 890 total occurrences). One factor group had 0 statements or occurrences associated with it (partial coverage hook-and-line CVs participating in CDQ fisheries in the BSAI).

Figure 5-1 through Figure 5-7 further break down each statement category group into their specific statement types and show the rate of occurrences for each specific statement category group and vessel/plant factor combination, presented as bar charts to show relative rates for each group. Further discussion of each follows.

OLE Priority: Interpersonal Statements

This group of statement categories covers those issues that impact the observer in a personal way and are the highest priority for OLE. Five out of the 10 partial coverage factor groups had occurrence rates of 0 for all statement categories within this category group, while 7 out of the 22 Full Coverage factor groups had overall occurrence rates of 0 (Table 5-2). Results of the rate calculations for individual statement categories within this group are shown in Figures 5.1 (per vessel/plant assignment) and 5.2 (per 1,000 deployed days). Of the four statement categories within this group, rates tended to be highest in "Intimidation, Coercion, Hostile Work Environment".

As discussed previously, statements in this category group are presented with two rates: occurrences per vessel/plant assignment, and occurrences per 1,000 deployed days. Results differ slightly between these two rates, and are at least in part due to differences in deployment lengths between sectors. More time on the boat in a given sector is more deployed days. If an incident occurs on a short deployment with only a few deployment days, the rate per deployed day goes up. But as individual vessel/plant assignments get longer more deployed days accumulate, and the rate of occurrences per deployed day goes down, while the rate per assignment goes up. For example, full coverage observers deployed to A80 CP/MS vessels using non-pelagic trawl gear in the BSAI are typically deployed for longer durations than partial coverage observers deployed to CVs using non-pelagic trawl gear in the BSAI. It is common for trawl CV deployments to be shortened by quota restrictions or processor availability, or the vessel may switch to a different gear type (e.g., a trawl CV targeting cod with non-pelagic gear may switch to pelagic gear to target pollock if the pollock fishing becomes more profitable).

Intimidation, Coercion, Hostile Work Environment Statements: Statements are written in this category when issues create an environment that adversely affects am observer's well-being. The category also includes harassment on the basis of race, color, religion, sex, national origin, or age. This may or may not cause the observer to alter their behavior and/or sampling strategies. Forty-five statements totaling 179 occurrences were recorded in this category and were associated with 17 (47%) of factor groups in this analysis, with 0 occurrences in 53% of factor groups. As mentioned previously this statement category was analyzed in terms of occurrences per assignment and also in terms of occurrences per 1,000 deployed days, and the results of each differ. The highest rate of occurrences per assignment was associated with full-coverage, non-pelagic trawl CP/MS vessels participating in A80 fisheries in the BSAI (0.35 occurrences per assignment, Fig. 5-1). Non-pelagic trawl CPs are regulated by halibut PSC caps. Recently this fleet has been participating in halibut deck-sorting activities, and many of the 2020 statements from this sector describe issues related to halibut deck-sorting activities such as pressure to complete deck-sorting duties faster. The highest rate of occurrences per 1,000 deployed days was associated with partial coverage pot CVs participating in IFQ fisheries in the GOA (25.5 occurrences per 1,000 days, Fig. 5-2).

Disruptive/Bothersome Behavior - Conflict Resolved: Statements are written in this category when issues arise between observers and crew during the deployment that create an uncomfortable or hostile work environment for the observer - but are then resolved during the deployment with minimal impact to the observer's well-being, behavior, and/or sampling strategies. This category was created in 2016 as a means of separating the highest priority issues that were not resolved, from those that required less immediate action by OLE, and it has proven to be very useful in this regard. Issues documented in this category may result in OLE contact with involved parties and/or support future investigations. OLE further utilizes data to conduct outreach and inform industry groups.

Thirty-nine statements with 76 occurrences were recorded in this category and were associated with 17 factor groups in this analysis (47%), with 0 occurrences in 53% of factor groups. Results differ slightly when the rate of occurrence is calculated per 1,000 deployed days *versus* per vessel/plant assignment. The highest rates of occurrence from both methods were associated with partial coverage non-pelagic trawl CVs participating in Open Access fisheries in the BSAI (0.25 occurrences per assignment or 51.3 occurrences per 1,000 deployed days, Figs. 5.1 and 5.2). Observers deployed to shoreside processors in the GOA also experienced high rates per assignment (0.2 occurrences per assignment).

Harassment - Assault and Sexual Assault Statements: Statements in this category document issues of physical violence or threats; or sexual harassment/assault that occurred during observer deployments. Few statements were recorded in this group. However, we know that these issues tend to be under-reported (see B4 report to the Council in December 2018 by Smith et al.[23]). For this analysis, we did not attempt to correct for this potential under-reporting.

[23] OLE's Semi-Annual Report to the North Pacific Fishery Management Council, December 2018: http://meetings.npfmc.org/CommentReview/DownloadFile?p=a5d5601a-acad-4fed-8b2b-0486565aec46.pdf&fileName=B4%20OLE%20PRESENTATION.pdf.

There were 12 Sexual Assault statements recorded in 2020 with 20 total occurrences (up from 8 statements with 12 occurrences in 2019). These were associated with 10 factor groups (31%). The highest rate was at shoreside processing plants participating in GOA OA fisheries (12.7 occurrences per 1,000 deployment days or 0.47 occurrences per assignment). Further discussion on this will follow in the OLE response section.

There were four statements recorded totaling four occurrences for other assaults and they were associated with three factor groups in this analysis (9% of factor groups): full coverage CP/MS vessels using non-pelagic trawl gear in A80, CDQ, or OA fisheries in the BSAI. The rates are 0.2, 0.2, and 0.7 occurrences per 1,000 deployed days, respectively, and < 0.02 occurrences per vessel/plant assignment.

OLE Priority: Safety and Duties Statements

Results of rate calculations per 1,000 deployed days for the statement category group "OLE Priority: Safety and Duties" are shown in Figure 5-3. Statements in the category group include "Interference/Sample Biasing" and "Safety - NMFS" categories. Observers record "Interference/Sample Biasing" when issues cause the integrity of random samples to be compromised. Examples include pre-sorting by the crew before the observer has the chance to collect an unsorted sample or running fish too fast for a sample to be collected. These typically do not rise to the level of "intimidation or coercion" and so are recorded as separate types. "Safety - NMFS" statements are recorded when safety issues directly affect observer safety. An example is stacking boxes in an area that blocks the exit from the observer sample station.

Interference/Sample Biasing: Twenty-eight statements with 108 occurrences were recorded in this category and were associated with 15 factor groups in this analysis (47%). The highest rate was 12.8 occurrences per 1,000 deployed days and was associated with partial coverage CVs using non-pelagic trawl gear participating in Open Access fisheries in the BSAI. The next highest rate (12 occurrences per 1,000 deployed days) was associated with partial coverage pot CVs participating in IFQ fisheries in the GOA.

Safety - NMFS: Forty-four statements with 264 occurrences were recorded in this category and were associated with 18 factor groups in this analysis (56%). The highest rates were 12 occurrences per 1,000 deployed days in partial coverage CVs using non-pelagic trawl gear participating in Open Access fisheries in the BSAI and 9 occurrences per 1,000 deployed days at shoreside processors in the GOA.

Limited Access Programs Statements

This statement category encompasses statements that record potential violations of regulations specific to limited access privilege program (LAPP) fisheries (Fig. 5-4). The applicability of these statement categories is limited to sector groups within the management program for that LAPP, or management programs that operate under the same regulations (such as CDQ on A80 vessels). For example, "AFA" statements are not applicable to an observer deployed on an Open Access hook-and-line CV in the GOA. There are five statement categories in this group that

cover the various LAPPs into which the FMA Division deploys observers. A brief description (including applicability) and results for each follows.

American Fisheries Act (AFA) Statements: These statements cover issues relating to cameras, sample stations, gear, flowscales, sorting, etc. as specified in AFA regulations. The applicability of this statement category is limited to full coverage CP/MS trawl vessels, full coverage CV trawl vessels, and full coverage shore-based processors participating in AFA and CDQ fisheries. Fifteen statements with 76 occurrences were recorded in this category and were associated with four factor groups in this analysis (13%), with 0 occurrences in 87% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. The highest rate was associated with full coverage pelagic trawl CP/MS vessels in AFA fisheries in the BSAI (11.5 occurrences per 1,000 deployed days). This represents a large drop in the rate from 2019 when 233.8 occurrences per 1,000 days were calculated.

Amendment 80 (A80): Statements: These statements cover issues relating to bin monitoring requirements, cameras, sample stations, flowscales, sorting etc., as specified in Amendment-80 specific regulations. Beginning in 2020 deck-sorting operations moved to a regulated program, so those potential violations were recorded separately. The applicability of this statement category is limited to full coverage CP/MS trawl vessels but is not limited to vessels fishing in the A80 management program. Statements may be written under this category for A80 listed vessels participating in CDQ or Open Access or Rockfish Program (RPP) fisheries when sample station or other issues usually associated with A80 arise (e.g., AFA vessels fishing sideboard yellowfin sole).

Forty-six statements with 215 occurrences were recorded in this category and were associated with 6 factor groups in this analysis (19%), with 0 occurrences in 81% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. Where they occurred on CP/MS vessels, the highest rates were in CDQ, Open Access, and A80 fisheries in the BSAI (26.1, 22.5, and 12.8 occurrences per 1,000 days, respectively).

Rockfish Program (RPP) Statements: These statements document potential violations that are specific to the Central GOA Rockfish Program (formerly known as the Rockfish Pilot Program). Applicability is limited to trawl CVs and CPs that participate in those fisheries. No statements were written in this category in 2020 (only two statements were written in 2019).

IFQ Retention Statements: These statements document potential violations of regulations pertaining to IFQ species retention such as minimum size requirements or mandatory retention. Seven statements with 61 occurrences were recorded in this category and were associated with 8 factor groups in this analysis (25%) with 0 occurrences in 75% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. The highest rate was 613.6 occurrences per 1,000 deployed days and was associated with partial coverage pot CVs participating in IFQ fisheries in the BSAI. Overall this was the highest rate of any factor group and statement category within the “Limited Access Programs” category group. Sample size was relatively small in this factor group (5 observer assignments covering 44 deployment days). There were two statements totaling 27 occurrences associated with this factor group. However,

for comparison, in 2019, this group also had the highest rate (625 occurrences per 1,000 days in 2019). More often than not, deployments in this sector result in statements with high number of occurrences, and IFQ retention violations are something to watch in this sector as participation in this fishery continues to grow. The next highest rate was associated with CP/MS hook-and-line vessels fishing IFQ in the GOA (128.1 occurrences per 1,000 days). Other IFQ sectors had lower occurrence rates.

Catcher/Processor Longline Statements: Statements in this category document potential violations relating to flowscales, sample stations, gear, sorting, etc., as specified in regulations specific to CP longline vessels in the BSAI. As the name implies, applicability is limited to longline CPs. 11 statements with 96 occurrences were recorded in this category and were associated with two factor groups in this analysis (6%), with 0 occurrences in 94% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. The highest rate was in CDQ fisheries (58.9 occurrences per 1,000 days), and the next was Open Access (18.3 occurrences per 1,000 days).

Protected Resource and Prohibited Species Statements

Results of rate calculations per 1,000 deployed days for the statement category group "Protected Resource and Prohibited Species" are shown in Figure 5-5. This statement category group encompasses statements that record potential violations of regulations specific to protected species (marine mammals and seabirds) and prohibited species (salmon, crab, herring, and halibut in non-IFQ fisheries). Generally, these statement categories are applicable to all groundfish sectors with more specific applicability for some (e.g., Amendment 91 salmon statements are only applicable in A91 fisheries). A brief description (including applicability) and results for each follows.

Amendment 91 Salmon: This statement category documents potential violations of regulations specific to salmon bycatch requirements in the Amendment-91 pollock fishery in the BSAI such as mandatory retention requirements, sorting/catch handling requirements, and observer sampling issues regarding salmon. Applicability is limited to shore-based processing facilities, pelagic trawl CVs in the BSAI AFA sector, and CP/MS pelagic trawl vessels in the BSAI. Forty-eight statements with 138 occurrences were recorded in this category and were associated with 6 factor groups in this analysis (19%), with 0 occurrences in 81% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. The two highest rates were on pelagic trawl vessels participating in AFA fisheries in the BSAI (7.8 and 7.7 occurrences per 1,000 deployed days for CP/MS and 7.7 for CV).

Gulf of Alaska Salmon: This statement category documents potential violations of regulations specific to salmon bycatch requirements in trawl fisheries in the GOA such as mandatory retention requirements, sorting/catch handling requirements, and observer sampling issues regarding salmon. Applicability is limited to trawl CVs in the GOA. Twenty-one statements with 167 occurrences were recorded in this category and were associated with 6 factor groups in this analysis (19%), with 0 occurrences in 81% of factor groups. Note, this statement type does not apply to most of the factor groups in this analysis. The highest rate was recorded at shoreside

processors in the GOA (274.9 occurrences per 1,000 days). Most of these statements documented potential violations of salmon handling associated with the Electronic Monitoring EFP in which several shoreside processors and vessels participated in 2020.

Marine Mammal - Harassment: This statement category is used when marine mammals are harassed, potentially in violation of Marine Mammal Protection Act regulations. Two statements with three occurrences were recorded in this category and were associated with two factor groups in this analysis (6%), with 0 occurrences in 94% of factor groups. Potential violations occurred on partial coverage hook-and-line CVs participating in IFQ fisheries in the BSAI (4.4 occurrences per 1,000 days) and on full coverage pelagic trawl CVs participating in AFA fisheries in the BSAI (0.1 occurrences per 1,000 days).

Marine Mammal - Feeding: This statement category is used when marine mammals are fed intentionally or when they feed on unprocessed, live discards. Nineteen statements with 283 occurrences were recorded in this category and were associated with 7 factor groups in this analysis (22%), with 0 occurrences in 78% of factor groups. This is a major change from 2019, when no statements were recorded in this category. The highest rates were associated with partial coverage pot CVs participating in IFQ fisheries in the BSAI (68.2 occurrences per 1,000 days) and on full coverage non-pelagic trawl CP/MS vessels participating in A80 fisheries in the BSAI (27.8 occurrences per 1,000 days).

Prohibited Species - Mishandling: Regulations require prohibited species to be discarded immediately and with a minimum of injury (although exceptions apply such as in some mandatory retention fisheries). Prohibited species in Alaska includes all of the FMP prohibited species: salmon, halibut, snow and king crabs, and herring; as well as any species temporarily declared to be in prohibited species status - in 2020 this definition included sablefish and Pacific cod at certain times, areas, gears, and target fisheries. Statements in this category are written when a prohibited species is mishandled. Thirty-seven statements with 149 occurrences were recorded in this category and were associated with 16 factor groups in this analysis (50%). The highest rates were on partial coverage hook-and-line CVs participating IFQ fisheries in the GOA (75.2 occurrences per 1,000 days) and on non-pelagic trawl CVs participating in Open Access fisheries in the GOA (49.7 occurrences per 1,000 days). Overall rates were low in other factor groups where they occurred (less than 15 occurrences per 1,000 deployed day). Rates in this category for non-pelagic trawl CP/MS sectors decreased in 2020 from rates calculated in 2019. There are several potential factors that may contribute to the decline, including a change to the way these potential violations are recorded as well as positive behavioral changes in response to OLE enforcement and outreach.

Halibut Decksorting: This is a new statement category for 2020. It was created to document issues specific to halibut deck-sorting operations including deck-sorting sampling stations, equipment, and procedures. Applicability is limited to trawl CP/MS vessels that participate in deck-sorting operations. Eighteen statements with 45 occurrences were recorded in this category and were associated with 6 factor groups in this analysis (19%), with 0 occurrences in 81% of factor groups. Most factor groups in this analysis do not participate in deck-sorting. The highest rates were associated with non-pelagic trawl CP/MS vessels in the BSAI participating in Open

Access (6.3 occurrences per day), CDQ (4 occurrences per day), and A80 (2.7 occurrences per day).

Prohibited Species - Retaining: These statements are written when a prohibited species is retained. There were five statements totaling 112 occurrences in this category. Rates were associated with three factor groups in this analysis (9%). The highest rates were on full coverage pelagic trawl CP/MS vessels participating in CDQ and AFA fisheries (19 and 14.9 occurrences per day, respectively).

Seabirds - Avoidance Measures: Statements in this category document potential violations of seabird avoidance gear requirements on longline sets. The category is only applicable only to hook-and-line CPs, and to hook-and-line CVs in certain observer deployment scenarios (requirements differ by vessel length and geographic area). One statement with 15 occurrences was recorded in this category and was associated with 1 factor group in this analysis (3%), with 0 occurrences in 97% of factor groups. The statement was associated with partial coverage hook-and-line CVs participating in IFQ fisheries in the GOA.

Seabirds - Harassment: Two statements with three occurrences were recorded in this category and were associated with one factor group in this analysis (3%), with 0 occurrences in 97% of factor groups. Both statements were associated with full coverage hook-and-line CP/MS vessels participating in Open Access fisheries in the BSAI.

All Other Statement Types

Results of rate calculations per 1,000 deployed days for all other statement categories are shown in Figure 5-6. As this is a catch-all category group and applicability varies between categories. A brief description (including applicability) and results for each follows.

Contractor Problems: This category is used to document potential violations by the observer provider or contractor. This category is applicable to all observers. Thirteen statements with 23 occurrences were recorded in this category and were associated with 10 factor groups in this analysis (31%). Rate calculations by the factor groups used in this analysis are presented for consistency; however, it should be noted that they are of limited utility for this category since these statements are not written against a vessel or plant, but rather against the employer. In previous years, the most common reason this statement was written was when cruise-deployments exceeded 90 days. However, in 2020 COVID quarantine protocols required extended deployments in many cases, and many cruise-deployments were approved to exceed 90 days. Other reasons included transfer to another assignment before the collected fishery data from the previous assignment were transmitted to NMFS, deploying without an official contract, poor bunkhouse conditions, and COVID-related concerns.

Failure to Notify: This category is used to document instances when the observer is not notified of haulback, delivery, or other notice required by regulations. The category is applicable to all observer deployments. Thirty-eight statements with 255 occurrences were recorded in this category and were associated with 18 factor groups in this analysis 56%). The highest rate was at processing plants in the GOA, with 47.7 occurrences per 1,000 deployment days. Observers were

deployed to shoreside processors in the GOA in 2020 for the first time since 2014. They were deployed to collect prohibited species counts and biological data in support of the Electronic Monitoring EFP in the directed pollock trawl fishery. Many issues occurred at these processors, including failure to notify of deliveries. Throughout the year the FMA worked closely with observers, OLE, and the industry to accurately document and address issues as they occurred.

Inadequate Accommodations: This category is used to document instances where accommodations provided to the observer may not meet the standards outlined in regulation. The category is applicable to all observer deployments. Seventeen statements with 58 occurrences were recorded in this category and were associated with 7 factor groups in this analysis 22%), with 0 occurrences in 72% of factor groups. The highest rate was partial coverage trawl CVs participating in Open Access fisheries in the GOA (29 and 18.6 occurrences per 1,000 days for pelagic and non-pelagic trawl, respectively).

IR/IU: This category is used to document potential violations of Improved Retention/Improved Utilization regulations. The category is applicable to any observer deployment where IR/IU regulations apply (typically directed Pacific cod and pollock fisheries across gear types and vessel types). Five statements with 17 occurrences were recorded in this category and were associated with 8 factor groups in this analysis (25%), with 0 occurrences in 75% of factor groups. This represents a major drop from 2019, when 28 statements with 193 occurrences were reported in 47% of factor groups. The highest rate was on partial coverage pot CVs in Open Access fisheries in the GOA at 39.1 occurrences per 1,000 days.

Miscellaneous Violations: This is a catch-all category for statements written for potential issues that do not fit into any of the other categories. They may or may not be actual violations once OLE reviews the information. Topics include observer coverage issues and gear issues, among others. Nine statements totaling 9 occurrences were recorded in this category and were associated with 9 factor groups (28%).

Reasonable Assistance: This category documents instances when ‘reasonable assistance’ is not provided to the observer by the crew to complete required sampling duties. This category tends to be broad and can encompass a variety of issues. Twenty-seven statements totaling 174 occurrences were recorded in this category and were associated with 18 factor groups (56%). The highest rates were at shoreside processors in the GOA utilizing observers in support of the Electronic Monitoring EFP (50.6 and 17.7 occurrences per day for full coverage and partial coverage respectively). Another high rate was on partial coverage pot CVs participating in Open Access fisheries in the GOA (31.2 occurrences per 1,000 deployed days).

Record Keeping and Reporting: This category documents instances of logbook or landings misreporting. Ninety-one statements totaling 769 occurrences were recorded in this category associated with 27 (84%) of the analyzed factor groups. High rates of occurrence were recorded in 4 factor groups: 3 pot vessel groups and 1 trawl vessel group. The highest rate was seen in partial coverage pot CVs participating in IFQ fisheries in the BSAI (431.8 occurrences per 1,000 days), followed by full coverage pot CP/MS vessels fishing Open Access in the BSAI (243.6 occurrences per 1,000 days), full coverage non-pelagic trawl CP/MS vessels fishing Open

Access in the GOA (158.3 occurrences per 1,000 days), and partial coverage pot vessels fishing IFQ in the GOA (155.7 occurrences per 1,000 days).

Record Keeping and Reporting statements are prone to high occurrences per statement because observers typically report an occurrence for every haul or offload in which the issue occurred. In situations where an issue was not resolved for the entire deployment, there may be hundreds of occurrences per statement (Table 5-3).

Restricted Access: These statements document situations where physical barriers or policy restrictions (e.g., stacked gear or 'off-limits' areas onboard) prevent the observer from accessing necessary areas to complete all required duties as prescribed in the observer sampling manual. The restricted access may or may not present a safety issue; if it does then a "Safety-NMFS" statement may also be recorded for the situation. Seven statements totaling 84 occurrences were recorded in this category and they were associated with 6 (19%) of the analyzed factor groups (0 occurrences in 81% of factor groups). The highest rate was at shoreside processors in the GOA for observers deployed to support the EM EFP (75.9 occurrences per 1,000 days for full coverage and 7.1 occurrences per 1,000 days for partial coverage). As noted previously these observers were the first to deploy at these processors since 2014, and there were many documented issues with observer access, notification, and sampling throughout the course of the GOA pollock seasons.

Coast Guard Statements

These statements document marine casualties, potential MAR-POL incidents, and potential violations of Coast Guard equipment and drill requirements. They are forwarded to the USCG upon approval by FMA debriefing staff. They are generally applicable across all observer deployments. Results of rate calculations per 1,000 deployed days for the statement category group "Coast Guard" are shown in Figure 5-7.

Safety - USCG - Marine Casualty: Statements in this category document instances of what the Coast Guard defines as "marine casualty" and includes, but is not limited to, death, severe injury or illness of crew, man overboard, fire, vessel grounding, loss of power, and ammonia leaks. The category is applicable to all observer deployments.

Observer safety at-sea is a top priority of FMA. FMA documents these incidents in statements at the end of each cruise and forwards these statements to the Coast Guard. In addition, FMA responds to marine casualty incidents in near real-time through inseason communication with observers. FMA supervisors, the observer provider, and the Coast Guard are notified as soon as possible when an inseason advisor[24] is notified by an observer of a potential marine casualty. FMA also maintains a 'weekly safety spreadsheet' to track these incidents that is shared with the Coast Guard.

There were 134 statements totaling 206 occurrences reported in this category and they spanned 26 (81%) of the analyzed factor groups (19% of the analyzed factor groups had 0 occurrences).

[24] 'Inseason Advisors' are FMA staff. Each inseason advisor is assigned a list of vessels and/or observers to communicate with inseason to monitor health, safety, and data quality.

Occurrence rates were similar across most factor groups where they occurred 0 (generally between 1 and 7 occurrences per 1,000 deployed days) but were highest for partial coverage hook-and-line CVs in IFQ fisheries in the BSAI (27.2 occurrences per 1,000 days). It should be noted that the rate in this factor group was driven up by a single event in which multiple marine casualties were recorded.

There is a wealth of information recorded in this statement category. The level of detail in the statement text tends to be good, and there is strong reliability of observer reporting of these incidents. Documentation, follow-up, and resolution of these incidents are of the highest priority for FMA because they involve observer safety and well-being (along with observer-related issues reported in the 'OLE Priority, Interpersonal' category).

Safety - USCG -Equipment: These statements document potential safety equipment violations (required equipment missing, expired, malfunctioning, inoperable, etc.) as relating to observer deployments, including items listed on the observer pre-boarding 'safety checklist'. The category is applicable to all observer deployments. Three statements totaling three occurrences were recorded in this category and occurrence rates were associated with three (9%) of the analyzed factor groups. Rates tended to be low across the factor groups < 4 occurrences per 1,000 days); the highest rates were in partial coverage pot CVs in Open Access fisheries in the BSAI (7.8 occurrences per 1,000 days).

Safety - USCG - Fail to Conduct Drills: These statements document calendar months where safety drills were not conducted. These statements document calendar months where safety drills were not conducted as reported by the observer. While this category is technically applicable to all observer deployments that span entire calendar months, in practice it typically only applies to full coverage sectors. This is because in partial coverage sectors trips tend to be short and observer deployments usually do not span an entire calendar month. Consequently, an occurrence rate per 1,000 deployed days is of limited utility for this type, but it is presented here for consistency. Seventy-eight statements totaling 186 occurrences were recorded in this category and occurrence rates were associated with 17 (53%) of the analyzed factor groups. Rates were associated with most of the full coverage factor groups and tended to be similar (between 0.2 and 4 occurrences per 1,000 deployed days). The highest rate was for full coverage pot CP/MS vessels in CDQ fisheries in the BSAI (5.6 occurrences per 1,000 days).

MAR-POL/Oil Spill: These statements document instances of dumping pollutants at sea in potential violation of MAR-POL regulations, or of oil spills/leaks. The category is applicable to all observer deployments. Thirty-nine statements were recorded totaling 70 occurrences were recorded for this category and occurrence rates found to be associated with 15 (47%) of the analyzed factor groups. Rates were generally low and similar for most factor groups where they occurred (between 0.1 and 6 occurrences per 1,000 deployed days). The highest rate was in partial coverage pot CV's in IFQ fisheries in the BSAI (22.7 occurrences per 1,000 days). A common theme in pot vessel MAR-POL statements was lost pots.

5.3. OLE Investigative Response

This section explains how OLE has responded or plans to respond to the results in Section 5.2. Statements received by OLE are prioritized based on the potential impact of the reported complaints on observers, their data, and the resource. Some statements are sent to the field for investigation by OLE agents and officers. OLE agents and officers may contact observers to provide support when necessary and to conduct interviews to obtain additional information that may not be present in the statements and accompanying documents. The number of statements sent to the field for investigation and statuses can be found in Table 5-4.

OLE Priority Violations

This section identifies sectors of the fishing industry by processor type, gear type, body of water harvested, and Limited Access Privilege Program. These components are identified through the following series of acronyms that are defined in Table 5-1.

Harassment Statements (Assault and Sexual): Three assault statements in the CP NPT BSAI A80/CDQ sector received by OLE did not document assaults against an observer. The statements were written by observers to document assaults they witnessed between crew members. These reports were forwarded to another agency for investigation as they fall outside the authority of OLE. A fourth assault statement in the CP NPT BSAI A80 sector is linked to a second sexual harassment statement describing the same event.

Sexual harassment was reported by observers at some plants in the GOA. This involved three separate incidents, including a delayed report by an observer reporting unwanted actions of a fellow observer. Two of these cases have been resolved and one remains open and ongoing. There was one incident of sexual harassment reported at a plant in the BSAI. This incident was also resolved.

Two most egregious cases involving unwanted sexual touching occurred on vessels in the catcher processor fleet; one occurred in the CP PTR BSAI AFA sector and the other occurred in the CP NPT BSAI A80 sector. One case has been forwarded to the Office of General Counsel for prosecution, and the other remains an ongoing investigation. One resolved incident was reported in the CP NPT GOA OA sector. There was one incident of sexual harassment reported in the CV HAL GOA IFQ sector, and the investigation remains ongoing.

It is OLE's policy to address all reports of sexual harassment or sexual assault. Observers are provided with victim advocacy contact information. Additionally, an agent or officer will talk to a vessel or company representative to discuss appropriate outreach, training, and professional treatment of observers.

Intimidation, Coercion, Hostile Work Environment Statements: Observers reported occurrences of intimidation, coercion, and hostile work environment most frequently when assigned to the CP NPT BSAI A80 sector, CP PTR BSAI AFA sector, and the CP HAL BSAI OA sector (Fig. 5-1). Occurrences often involved derogatory remarks about observers, the government, and/or women. Occurrences in the AFA sector were more egregious than the ones in the A80 and OA sectors. Observers assigned to the AFA catcher processors more often experienced persistent

hostile work environments despite attempts to resolve conflicts. In one incident, an observer requested to be removed from the vessel. Multiple statements documented intimidation from the purser/data manager of the vessel. Statements reported on the A80 catcher processors included occurrences between observers rather than conflict with vessel personnel. For the occurrences between observers, attempts to resolve the conflict were successful. Incidents in the OA sector occurred on two separate vessels. One case has been resolved and the other is pending enforcement action.

When assessing frequency based on occurrences per 1,000 deployed days, observers reported incidents of intimidation, coercion, and hostile work environment most frequently in the CV POT GOA IFQ sector, the CV NPT BSAI OA sector, and the CV NPT GOA RPP sector (Fig. 5-2). One occurrence in the CV POT GOA IFQ sector was particularly egregious and required enforcement action. The occurrences in the CV NPT BSAI OA sector involved unwanted behavior from crew members and one involved a vessel operator. These occurrences were addressed by OLE. Occurrences in the CV NPT GOA RPP sector remain under investigation.

Interference and Sample Biasing: Reports of interference and sample biasing occurred at the highest rates per 1,000 deployed days in the CV NPT BSAI OA and CV POT GOA IFQ sectors (Fig. 5-3). The occurrences in the CV NPT BSAI OA sector did not impact the observer data as the attempts to influence the observer's samples were unsuccessful. The attempts to bias the observer's samples were related to the presence of halibut in the haul. The occurrences of interference and sample biasing in the CV POT GOA IFQ sector did have the possibility to negatively impact observer samples. Those occurrences involved vessel personnel attempting to control which pots the observer sampled. In one incident, a vessel operator interfered with the observer's sampling efforts and enforcement action was taken. In another incident, a crew member attempted to interfere with the observer's sampling efforts; however, the vessel operator intervened and corrected the issue.

Safety: Safety is an important topic as it impacts both the fishing industry and the observer community alike. Reports documenting concerns about safety occurred at the highest rates per 1,000 deployed days in the CV POT GOA IFQ and PLANT GOA OA sectors (Fig. 5-3). Several of the occurrences in the CV POT GOA IFQ sector involved crew members sleeping while on wheelwatch/lookout. In one incident, the vessel operator told the observer that their vessel does not conduct a wheelwatch Occurrences for the PLANT GOA OA sector were reported during the winter months and involved extremely icy sidewalks and walkways which presented falling hazards especially when observers were carrying gear. Throughout assignments, there were active attempts to improve the sidewalk conditions and observers were also provided rides to reduce the likelihood of falls.

Other sectors had fewer occurrences of safety issues. Additional issues that potentially impacted health and wellness included mold on mattresses or in staterooms and bathrooms, cigarette smoke in staterooms, and the presence of bedbugs in staterooms. Occurrences involving bedbugs were addressed by the vessel personnel, often through heat treatment. Occurrences involving general vessel safety include tripping hazards in sample stations and common areas and open

watertight doors in rough weather. There were also multiple occurrences of illegal drug and alcohol use and crew and observers failing to abide by COVID mandates while in port.

Disruptive/Bothersome Behavior - Conflict Resolved: Occurrences in this category are often resolved through effective communication. The CV NPT BSAI OA sector had the highest frequency of disruptive/bothersome behavior occurrences (Fig. 5-2). Occurrences involved minor disagreements or isolated incidents between observers and vessel personnel and had no impact on observer data or duties.

Limited Access Program Statements

American Fisheries Act (AFA) Statements: The CP/MS PTR BSAI AFA sector had the highest rate of occurrences involving the AFA operational requirements (Fig. 5-4). There were multiple occurrences of the flowscale or the motion compensated platform scales faulting and several occurrences of mixed hauls. Additionally, there were multiple occurrences of fish being run across the flowscale when 24 hours had lapsed since the last flowscale test. In one case, issues persisted throughout an individual observer's assignment despite attempts to resolve the issues.

Amendment 80 (A80): Statements: CP NPT BSAI CDQ and OA had the highest rates of occurrences involving Amendment 80 operational requirements (Fig. 5-4). The most frequent issue reported under this statement heading involved flowscale faulting or recording weight when fish was passing over the flowscale. Often, factory crew would clean the sensors which would resolve the issue temporarily. There were also multiple occurrences of fish falling through gaps along the sorting belts. Vessel crew were able to resolve these issues at sea. There were also multiple occurrences bin monitoring cameras failing. These issues were self-reported and resolved within the same day. There were also multiple occurrences of haul mixing (a new haul was dumped into a tank before the previous haul had finished) and crew working in the observer's sample station when the observer was trying to use the sample station. Compliance concerns related to halibut deck sorting will be discussed under the Protected Resources and Prohibited Species section.

Catcher Processor Longline: The most common complaint reported for the CP HAL BSAI CDQ/OA sector involved Pacific cod discard before going over the flowscale. Most often the discarded fish was dead or infested with sand fleas. However, this may have impact observer data if it is not communicated adequately with the observer. There were also several occurrences of missing weights for the motion compensated platform scale and several occurrences of the observer's sample station being used by the crew which may have interfered with the observer's ability to use the sample station.

IFQ Retention: The highest rate involving IFQ retention occurred in the CV POT BSAI IFQ sector. The majority of the occurrences involved small sablefish discard.

Protected Resources and Prohibited Species Statements

Amendment 91 Salmon: The highest rate involving salmon bycatch in the Bering Sea occurred in the PLANT BSAI AFA/OA, CP/MS PTR BSAI AFA, and CV PTR BSAI AFA sectors (Fig. 5-5). The most frequent compliance concern at the plants were salmon passing the last

point of sorting. However, salmon was frequently brought to the observer. During offloads where salmon passed the last point of sorting, it was often noted that the flow of fish was several fish deep which may have contributed to salmon not being sorted. There were also several shoreside occurrences where salmon was removed before the observers could finish counting them and collecting data. Similarly, in the CP sector, the most frequent compliance concern was salmon passing the last point of sorting. Several of these occurrences involved no crew working on the sorting line. There were also multiple occurrences of a new haul being started before the salmon counts from the previous haul were completed. When observers attempted to resolve the issues, they were met with resistance by crew who may have been unaware of the regulatory requirements associated with salmon bycatch handling. In the CV sector, there were several different compliance concerns. There were multiple occurrences of deckloads not being contained. There were several occurrences of individual salmon being discarded at sea. Additionally, there were times when large amounts of catch were discarded and it was unknown if salmon were present in those discards.

Gulf of Alaska Salmon: The highest rate involving salmon bycatch handling in the GOA occurred in the PLANT GOA OA sector. Similarly to the PLANT BSAI AFA sector, the most frequent compliance concern involved salmon passing the last point of sorting. This was problematic as plant personnel did not always bring back salmon that passed the sorting line. Observers noted that the flow of fish was fast, and there were often several layers of fish on the sorting lines. There were also times when there were workers sorting the catch and several occurrences where the observers were not given access to the salmon to collect their data.

Prohibited Species - Mishandling: Observers reported the highest rates of prohibited species mishandling in the CV HAL GOA IFQ and CV NPT GOA OA sectors (Fig. 5-5). Multiple statements reported instances of undersized halibut being gaffed or hitting the crucifer. Several vessels were reported to have allowed undersized halibut to hit the crucifier during every haul or to have regularly handled halibut by the caudal peduncle (tail). Statements documenting prohibited species handling on the NPT vessels involved multiple instances of halibut sitting on deck rather than being discarded immediately. When halibut was discarded, crew would hold the halibut by the tail, despite being reminded about proper handling procedures.

Halibut Deck Sorting: Halibut deck sorting became a regulated program in 2020. As the EFP for the program came to an end, a lot of outreach and education was conducted by OLE. An outreach letter was provided to the CP NPT sectors at the 2020 Am8 co-op meeting, through individual vessel company representatives, and during boardings. The highest rate of compliance concerns relating to halibut deck sorting was 6.3 occurrences per 1,000 deployed days (Fig. 5-5). The most egregious compliance concerns involved the factory running fish while the observer was still on deck and fish being spilled from the codend before the observer was present on deck. There were also several occurrences of deck sorting cameras failing. These occurrences were reported in-season by vessel/company management to OLE personnel and deck sorting ceased until the cameras were repaired.

Marine Mammal – Feeding: The highest rate of potential marine mammal feeding was in the CV POT BSAI IFQ sector at 68.2 occurrences per 1,000 deployed days followed by the CP NPT

BSAI A80 at 27.8 occurrences per 1,000 deployed days (Fig. 5-5). The majority of these occurrences involved orcas following vessels and feeding on discarded fish, either sablefish (most often in the CV POT BSAI IFQ sector) or halibut (most often in the CP NPT BSAI A80 sector). None of these occurrences involved intentional takes of marine mammals. Multiple vessels in the CP NPT BSAI A80 sector attempted to change fishing areas or change direction while deck sorting when the vessel operator was made aware of the presence of orcas.

Other Statement Types

Contractor Problems: There were multiple occurrences of observers reporting they were coerced to extend their 90-day contract. Waivers were granted and observers ultimately agreed to stay on vessels as replacement observers were not always available. Some observers extended up to 120 days. There were also several occurrences of observers not being provided with a contract prior to their deployment as well as observers not being paid in a timely manner. Additionally, there were several occurrences of observers not being given the opportunity to complete their duties before disembarking.

Reasonable Assistance: Observers assigned to the PLANT GOA sector reported incidents of plant personnel failing to provide reasonable assistance at a higher rate than in other assignment types (Fig. 5-6). Observers reported that plant personnel didn't understand the observers' roles and there was a lack of communication between crew shifts and between plant management and crew about observers' roles. Observers also reported they had difficulty storing samples due to the amount of crew working in sample storage areas. Observers also reported not receiving requested information in a timely manner or at all. Some of these issues were resolved through discussions with plant management, but in some cases recurred with new observers.

Restricted Access: Observers assigned to the PLANT GOA sector reported incidents of restricted access at a higher rate than in any other assignment type (Fig. 5-6). All statements involved observers not having access to a computer to enter their data either due to plant personnel using the computer or the office being closed.

Record Keeping and Reporting: The CV POT BSAI IFQ sector and CP POT BSAI OA sector had the two highest rates of occurrences per 1,000 deployed days (Fig. 5-7). In the CV POT IFQ sector in the GOA a majority of statements involved inaccurate reporting of pot gear deployment and retrieval positions. Pot gear begin position is when the first pot enters the water, and the end position is where the last pot of a set was retrieved. Some vessel operators recorded the positions incorrectly. Additionally, there were multiple occurrences of at-sea discards not being reported on the fish tickets.

Observers assigned to the plants in the GOA also reported multiple record keeping and reporting issues. These issues involved inaccuracies on the fish tickets and multiple fish tickets had to be corrected after the observers noted that bycatch was not reported, or the number of bycatch species, particularly salmon, was inaccurate.

5.4. Enforcement Considerations to Improve Compliance

After reviewing the rate of occurrences of various statement category groups by sector, several

trends emerged. OLE will take these trends into consideration when planning outreach and education efforts and when conducting patrols and operations.

PLANT GOA: The PLANT GOA sector received observer coverage for the first time in many years. Observers experienced compliance concerns in the Interpersonal category at a rate of 0.67 per assignment (Table 5-2). These occurrences often occurred during off time, not while conducting their duties. Several of these occurrences involved unwanted comments of a sexual nature or unwanted advances. When reported to plant management, management intervened on the behalf of the observers.

Observers assigned to the PLANT GOA sector reported the highest rate of safety or interference with duties, at 244.1 occurrences per 1,000 deployed days (Table 5-2). The majority of safety occurrences involved icy conditions in Kodiak. However, there were multiple occurrences of plant personnel interfering with an observer's ability to complete duties.

The PLANT GOA sector also had the highest rate of occurrences of compliance concerns in the Protected Resources and Prohibited Species category at 276.7 per 1,000 deployed days (Table 5-2). These occurrences were most often related to salmon bycatch handling. Regulations require that when an observer is present, all salmon must be provided to the observer. When salmon passed the last point of sorting, factory personnel often collected the salmon and returned them to the observer. However, this frequently resulted in making the salmon available after the observer had completed duties. There were other occasions where the observers weren't provided access to the salmon at all, or were taken from the observers before they completed their duties. It is important to note, salmon retention requirements were in place before the trawl EM EFP started.

Observers assigned to the PLANT GOA sector also experienced compliance concerns under the All Other Statements category at a rate of 397.8 occurrences per 1,000 deployed days (Table 5-2). These occurrences involved plant personnel failing to provide observers with reasonable assistance or restricting their access. For multiple occurrences, the observers were able to talk to plant management to resolve issues.

Increased observer coverage in the PLANT GOA sector increased the likelihood for observers to report compliance concerns in this sector. Multiple observers reported plant personnel were unclear on the observer roles and requirements to enable them to complete duties. Plant management were able to resolve many issues, but the issues often repeated when new plant personnel were introduced. Improved communication and awareness about observer roles and responsibilities may decrease the occurrence rate in the future.

CP NPT BSAI A80 (Interpersonal): Observers assigned to the CP NPT BSAI A80 sector experienced compliance concerns in the Interpersonal category at a rate of 0.49 per assignment (Table 5-2). The most significant occurrences involved unwanted touching of a sexual nature. One case has been forwarded for prosecution. There were also multiple occurrences of unwanted unwelcome comments of a sexual nature and unwanted sexual advances. The majority of behaviors were reported by the observers directly to data managers or vessel management. Vessel management often intervened on the behalf of the observers, taking disciplinary actions

against the crew member. The majority of interpersonal occurrences were reported by the vessel companies to OLE and/or resolved inseason. Holding offenders accountable stops bad and/or illegal behavior and can prevent reoccurrences.

CP PTR BSAI AFA (Interpersonal): Observers assigned to the CP PTR BSAI AFA sector experienced compliance concerns in the Interpersonal category at a rate of 0.43 per assignment (Table 5-2). The most egregious of these occurrences involved unwanted touching and unwelcome comments of a sexual nature. There were also multiple occurrences of crew members making unwanted advances towards observers. Several of these occurrences were addressed by vessel management. While some occurrences were resolved, other occurrences had lasting impacts on observers. None of the occurrences involving behavior of an unwanted sexual nature were self-reported by the vessel or company to OLE personnel.

There were also multiple occurrences of crew members creating a hostile work environment for observers. The most egregious of these incidents involved vessel data managers and persisted through multiple assignments. The persistent nature may have been due to the lack or reporting and/or response by the vessel companies.

Although the rate of occurrences for the interpersonal category for the AFA sector is below that of the A80 sector, based on the totality of the occurrences, the CP PTR BSAI sector would benefit from training personnel on appropriate and professional treatment of observers. Additionally, establishing better communication between vessel management and the observers may increase the likelihood of reporting to vessel management and the opportunity to address issues inseason. Vessel companies should contact law enforcement to report suspected acts of sexual assault, sexual harassment, and hostile work environment.

CV POT BSAI IFQ: The CV POT BSAI IFQ sector had the highest rate of compliance concerns in the limited access category at a rate of 613.6 occurrences per 1,000 deployed days (Table 5-2). The majority of these occurrences involved the discard of dead or small sablefish. Several occurrences involved what was perceived as medium sized sablefish being discarded.

The CV POT BSAI IFQ sector also had the highest rate for compliance concerns under the all other statement category at 431.8 occurrences every 1,000 deployed days (Table 5-2). The majority of these involved record keeping and reporting violations in both the vessel's logbook and on the fish tickets. Several occurrences involved inaccurate start or end positions, or rounding of set and retrieval times. Fish ticket inaccuracies often involved failure to report at sea discards. Three of the four highest rates of record keeping and reporting compliance concerns involved the pot sectors.

CV POT GOA IFQ: The CV POT GOA IFQ sector had the second highest rate of 'safety and interference with observer duties' compliance concerns at 131.7 occurrences per 1,000 deployed days (Table 5-2). The most significant occurrence impacted observer's sampling methods. Several occurrences also involved intimidation of the observer. The majority of safety occurrences involved failure to conduct proper lookout/wheel watch in accordance with U.S. Coast Guard Rule 5. Enforcement action been taken for several verified violations.

5.5. Outreach and Compliance Assistance

Meetings with Industry

In 2020, OLE continued outreach meetings with industry adapting them to virtual platforms. OLE personnel met with 10 individual companies that own vessels or processing facilities. Meetings focused on reports of potential violations specific to each company and observer safety and work environment. OLE personnel also participated in the annual Amendment 80 co-op meeting, a Halibut Deck Sorting check-in meetings, and a meeting of the GOA catcher vessel fleet. The frequency of meetings between OLE and industry has improved conflict resolution at sea and increased self-reporting. This is most evident for companies in the A80 sector.

Observer Safety and Professionalism

During 2020, representatives from OLE and FMA held a meeting with observer providers to discuss requirements specific to responsibilities for observer providers and regarding observer conduct. Observers are required to accurately report suspected violations of regulations relevant to the conservation of marine resources and their environment. Some observers have stated they are reluctant to report suspected violations especially if they are concerned about retaliation from the vessel if they return to it or if they believe the violations were minimal or unintentional. Observers are also required to maintain confidentiality of Magnuson data by not disclosing their collected data or observations made aboard a vessel or a processing facility to any person other than the owner/operator of the observed vessel/facility, an authorized officer, or NMFS. On several occasions, vessel operators have reported that observers have disclosed information about previous vessel assignments.

Observer providers are required to develop, maintain, and implement a policy addressing observer conduct and behavior for observers. This policy must address sexual contact between observers and industry personnel. Observers have reported that observer providers are aware of such relationships and no actions were taken. Additionally, during routine boardings or during the course of investigation, vessel or plant personnel have alleged relationships between crew and observers.

5.6. Enforcement Operations and Actions

Enforcement Operations

In February 2020, four OLE agents and officers deployed to the port of Dutch Harbor for a pulse operation targeting open investigations from 2019. Strict federal, state, local, and agency COVID mandates and mitigation measures were followed. The operation started with 59 individual incidents containing 219 individual statements involving 50 separate vessels or processing facilities. Over the course of 4 weeks, OLE issued 37 compliance assistance, 10 summary settlements, and 29 written warnings. Several cases remain under investigation and three additional investigations were initiated during the operation.

Written Warnings, Summary Settlements, Cases Forwarded for Prosecution

Table 5-4 details the status of all 2020 statements and the incidents created from the statements. There were seven cases consisting of 44 separate statements resolved through the issuance of Written Warnings. The majority of cases resolved through Written Warnings involved incidents under the protected resources and prohibited species and other statement type categories. Several cases involved occurrences under the safety and interference with duties category where mitigating circumstances were considered.

OLE resolved eight cases consisting of 24 statements through the issuance of summary settlements. The majority of these cases involve incidents under the interpersonal or the protected resources and prohibited species categories.

Two cases were forwarded to the GCES for prosecution. Several others are in the final stages of investigations and will be forwarded to GCES for prosecution. The majority of the current cases that will be forwarded for prosecution fall under interpersonal or safety and interference categories.

NOAA General Counsel - Enforcement Decisions, Orders and Enforcement Actions

AK1701779; FV *Seafisher* (CP NPT BSAI A80) – Crewman Iakopo Jake Vae was charged under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) with forcibly assaulting and sexually harassing a fisheries observer on board the vessel. A $60,000 NOVA was issued.

AK1802015; FV *Alaskan Lady* (CP HAL BSAI OA) – Crewman Eliman Bah (aka Eli Simpson) was charged under the Magnuson-Stevens Act with harassing a fisheries observer by conduct that had sexual connotations, the purpose or effect of interfering with the observer's work performance, or otherwise created an intimidating, hostile, or offensive environment. A $24,000 NOVA was issued.

AK1804012; CP *Seafisher* (CP NPT BSAI A80) – Crewman Ioane Ioane was charged under the Magnuson-Stevens Act with harassing a fisheries observer by conduct that had sexual connotations, the purpose or effect of interfering with the observer's work performance, or otherwise created an intimidating, hostile, or offensive environment. A $24,000 NOVA was issued. The NOVA became a final administrative decision due to default.

Table 5-1. -- Description of factors used in rate calculations. Each factor is used in unique combinations with other factors to calculate rates.

Factor	Value	Description
Coverage Type	FULL	Full Coverage
	PARTIAL	Partial Coverage
Vessel Type	CP/MS	Catcher-Processor/Mothership vessel
	CV	Catcher Vessel
	PLANT	Shorebased Processor (floating or land)
FMP Area	BSAI	Bering Sea/Aleutian Islands
	GOA	Gulf of Alaska
Gear Type	HAL	Hook-and-Line
	NPT	Non-Pelagic Trawl
	POT	Pot (single or strung)
	PTR	Pelagic Trawl
Management Program	A80	Amendment 80
	AFA	American Fisheries Act
	CDQ	Community Development Quota
	IFQ	Individual Fishing Quota
	OA	Open Access
	RPP	Rockfish Pilot Program (CGOA Rockfish Program)

Table 5-2. -- Unique factor combinations into which at least three observer-cruises were deployed in 2020; the number of assignments and deployed days in each factor combination; total number of statements and occurrences recorded across all statement categories in each factor combination; and the rate of occurrences per 1,000 deployed days in the broad statement category groups, for each factor combination. Rate of occurrences per assignment are also presented for OLE Priority: Interpersonal statement categories. Bars indicate relative value compared to other values within that statement group only. The highest value in each column within each statement category group is highlighted in yellow/red for easy reference.

FACTOR COMBINATIONS					SUM TOTALS				STATEMENT CATEGORY GROUP and INCIDENT OCCURRENCE RATE					
									OLE PRIORITY: INTER-PERSONAL	OLE PRIORITY: SAFETY AND DUTIES	COAST GUARD	LIMITED ACCESS PROGRAMS	PROTECTED RESOURCE & PROHIBITED SPECIES	ALL OTHER STATEMENT TYPES
COVERAGE TYPE	VESSEL TYPE	GEAR TYPE	MANAGEMENT PROGRAM	NMFS REGION	VESSEL/PLANT ASSIGNMENTS	DEPLOYED DAYS	STATEMENTS (all categories)	OCCURRENCES (all categories)	Occurrences per Vessel/Plant Assignment	Occurrences per 1000 Deployed Days				
FULL	CP/MS	HAL	CDQ	BSAI	26	517	6	44	0	0	2.4	9.3	58.9	2.4	12.8
			IFQ	BSAI	3	33	0	1	0	0	0	3.6	36.4	0	0
				GOA	3	89	2	14	0	0	3.5	10.3	128.1	0	13.9
			OA	BSAI	73	3577	62	291	0.29	5.9	19.7	7.3	22.3	5.5	20.7
		NPT	A80	BSAI	167	9902	218	890	0.49	8.3	2.6	12.1	12.8	35.0	19.2
			CDQ	BSAI	75	1631	24	83	0.08	3.6	1.5	8.8	26.1	4.8	5.9
			OA	BSAI	67	1744	21	80	0.04	1.6	1.4	7.5	22.5	7.2	5.8
				GOA	26	635	10	119	0.18	7.2	2.0	5.1	7.4	5.2	160.5
			RPP	GOA	11	298	5	8	0.05	2.0	4.5	11.6	5.0	2.3	2.1
		POT	CDQ	BSAI	7	179	2	4	0	0	0	22.3	0	0	0
			OA	BSAI	12	156	2	39	0	0	0	6.4	0	0	243.6
		PTR	A80	BSAI	5	28	0	0	0	0	0	2.6	0	6.5	0
			AFA	BSAI	94	5694	107	408	0.43	7.1	0.7	18.4	11.5	23.3	10.6
			CDQ	BSAI	56	1364	19	59	0.11	4.7	0	13.4	1.2	22.3	1.9
			RPP	GOA	4	43	1	2	0	0	3.6	24.0	9.6	0	0
	CV	NPT	OA	BSAI	33	530	9	32	0.18	11.1	3.5	6.7	0	32.0	7.3
			RPP	GOA	40	352	12	17	0.14	16.1	1.2	7.5	0	2.3	21.6
		PTR	AFA	BSAI	189	9103	145	761	0.33	6.8	7.8	11.8	0.2	10.1	46.8
			RPP	GOA	47	378	13	23	0.02	2.5	14.8	3.6	0	0.5	40.6
	PLANT	(N/A)	AFA	BSAI	69	4858	71	153	0.27	3.8	4.2	3.3	1.4	4.3	14.4
			OA	BSAI	13	149	2	4	0.03	2.4	2.9	5.2	0	6.3	8.4
				GOA	15	553	38	518	0.67	18.1	244.1	0	0	276.7	397.8
PARTIAL	PLANT		OA	GOA	6	282	11	18	0	0	0	0	0	21.3	42.6
	CV	HAL	CDQ	BSAI	4	26	0	0	0	0	0	0	0	0	0
			IFQ	BSAI	6	49	2	3	0	0	6.8	47.6	6.8	0	5.8
				GOA	72	452	18	100	0.04	6.0	3.7	14.7	1.5	112.8	82.8
		NPT	OA	BSAI	16	78	5	10	0.25	51.3	12.8	0	0	0	64.1
				GOA	41	161	10	22	0.02	6.2	0	12.4	0	58.7	56.7
		POT	IFQ	BSAI	5	44	7	50	0	0	0	22.7	613.6	68.2	431.8
				GOA	24	167	13	60	0.18	25.5	131.7	0	12.0	0	187.2
			OA	BSAI	23	128	6	12	0	0	0	23.4	0	0	70.3
		PTR		GOA	63	276	18	29	0.02	5.1	10.9	7.2	0	20.1	61.3

Table 5-3. Summary of observer statements by type from 2019 and 2020, with year-over-year percent change (YOY). Maximum values in each column are highlighted in yellow and red for easy reference. Halibut Deck Sorting category was added for 2020.

Category Group	Category	Total Statements			Total Occurrences			% of Factor Groups with at least > 0 Occurrences			Occurrences Per Statement Statistics (2020 only)					
		2019	2020	% change YOY	2019	2020	% change YOY	2019	2020	% change YOY	MEAN	MEDIAN	MIN	MAX	25th Quartile	75th Quartile
OLE PRIORITY: INTER-PERSONAL	Disruptive/Bothersome Behavior - Conflict Resolved	35	39	+11%	109	76	-30%	47%	53%	+6%	1.9	1	1	14	1	2
	Harassment-Assault	2	4	+100%	2	4	+100%	9%	9%	+0%	1.0	1	1	1	1	1
	Harassment - Sexual	8	12	+50%	9	22	+144%	18%	31%	+13%	1.8	1	1	5	1	2.25
	Intimidation, coercion, hostile work environment	38	45	+18%	193	179	-7%	47%	53%	+6%	4.0	2	1	27	1	4
OLE PRIORITY: SAFETY AND DUTIES	Interference/Sample Biasing	37	28	-24%	107	108	+1%	41%	47%	+6%	3.9	1.5	1	21	1	5
	Safety-NMFS	71	44	-38%	356	264	-26%	50%	56%	+6%	6.0	1	1	50	1	3
COAST GUARD	MARPOL/Oil Spill	62	39	-37%	126	70	-44%	53%	47%	-6%	1.8	1	1	10	1	2
	Safety-USCG-Equipment	11	3	-73%	11	3	-73%	29%	9%	-20%	1.0	1	1	1	1	1
	Safety-USCG-Fail to Conduct Drills	142	78	-45%	276	186	-33%	59%	53%	-6%	2.4	1	1	21	1	2
	Safety-USCG-Marine Casualty	197	134	-32%	257	206	-20%	76%	81%	+5%	1.5	1	1	6	1	2
LIMITED ACCESS PROGRAMS	AFA	33	15	-55%	1181	76	-94%	12%	13%	+1%	5.1	1	1	50	1	3
	Amendment 80	83	46	-45%	784	215	-73%	18%	19%	+1%	4.7	2	1	98	1	3
	Catcher Processer Longline	18	11	-39%	27	96	+256%	12%	6%	-6%	8.7	3	1	38	1.5	9
	IFQ Retention	20	7	-65%	86	61	-29%	12%	25%	+13%	8.7	4	1	27	1	13.5
	Rockfish Program	2	0	-100%	2	0	-100%	6%	0%	-6%						
	Amendment 91 salmon	77	48	-38%	425	138	-68%	18%	19%	+1%	2.9	1	1	21	1	3
PROTECTED RESOURCE & PROHIBITED SPECIES	Gulf of Alaska Salmon	23	21	-9%	28	167	+496%	12%	19%	+7%	8.0	2	1	50	1	3
	Halibut Deck Sorting*	NA	18	NA	NA	45	NA	NA	19%	NA	2.5	2	1	9	1	3
	Marine Mammal-Feeding	0	19	+100%	0	283	+100%	0%	22%	+22%	14.9	7	1	59	2.5	22
	Marine Mammal-Harassment	1	2	+100%	1	3	+200%	0%	6%	+6%	1.5	1.5	1	2	1.25	1.75
	Prohibited Species - Mishandling	69	37	-46%	348	149	-57%	50%	50%	0%	4.0	2	1	17	1	4
	Prohibited Species - Retaining	7	5	-29%	7	112	+1500%	18%	9%	-9%	22.4	30	1	50	1	30
	Sample Bias-Marine Mammals	6	0	-100%	6	0	-100%	6%	0%	-6%			NA			
	Sample Bias-Seabirds	2	0	-100%	2	0	-100%	9%	0%	-9%			NA			
	Seabird-Avoidance Measures	13	1	-92%	84	15	-82%	15%	3%	-12%	15.0	15	15	15	15	15
	Seabird-Harassment	2	2	0%	5	3	-40%	6%	3%	-3%	1.5	1.5	1	2	1.25	1.75
ALL OTHER STATEMENT TYPES	Contractor Problems	15	13	-13%	49	23	-53%	32%	31%	-1%	1.8	1	1	5	1	2
	Failure to Notify	46	38	-17%	166	255	+54%	59%	56%	-3%	6.7	2	1	74	1	4
	Inadequate Accomodations	16	17	+6%	112	58	-48%	32%	22%	-10%	3.4	1	1	19	1	2
	IR/IU	28	5	-82%	193	17	-91%	47%	25%	-22%	3.4	2	1	10	1	3
	Miscellaneous Violations	8	9	+13%	9	9	0%	15%	28%	+13%	1.0	1	1	1	1	1
	Reasonable Assistance	43	27	-37%	212	174	-18%	59%	56%	-3%	6.4	2	1	61	1	4.5
	Record Keeping and Reporting	186	91	-51%	1641	769	-53%	79%	84%	+5%	8.5	2	1	100	1	4
	Restricted Access	5	7	+40%	85	84	-1%	18%	19%	+1%	12.0	3	1	42	1	18

Table 5-4. -- Status of Statements and Incidents - The table below records statements and incidents. ‘Ongoing’ typically involves complex investigations. ‘No OLE Action’ includes incidents forwarded to another agency, incidents determined not to be a violation after an investigation, incidents that were closed due to a lack of personnel to conduct an investigation, and incidents closed as ‘info only’. Many info only incidents involved observer and operator communication resulting in voluntary compliance at sea.

Statements	**Incidents**	**Statuses**
619 Statements received and reviewed in 2020 39 statements did not document an actual violation 580 statements were forwarded to agents and officers	223 new incidents created (532 statements) 48 statements were added to 19 open incidents	43 Ongoing (142 statements)
		2 Forwarded for prosecution (2 statements)
		7 Written Warnings issued (44 statements)
		8 Summary Settlements issued (24 statements)
		64 Compliance assistance provided (157 statements)
		118 Closed - No OLE Action (211 statements)
Excludes 60 observer coverage potential violations reported by agency staff.	*Multiple statements are often combined into a single incident if the same vessel, operator, or company is involved.*	

* As of 22 April 2021.

Figure 5-1. -- Rate of occurrences per vessel/plant assignment of statement types within the "OLE Priority: Inter-Personal" category group, by each factor combination where they occurred.

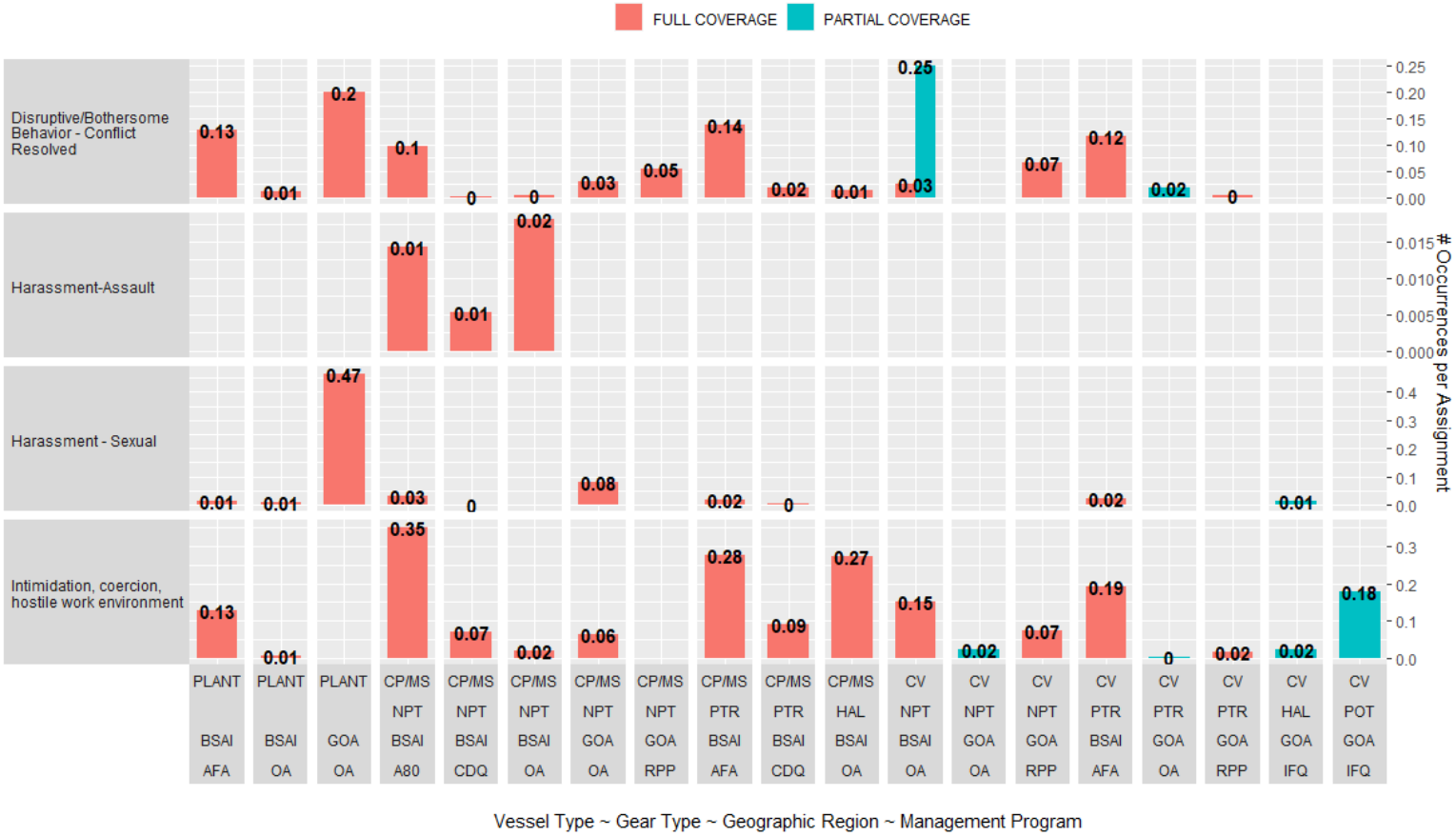


Figure 5-2. -- Rate of occurrences per 1,000 deployed days of statement types within the "OLE Priority: Interpersonal" category group, by each factor combination where they occurred.

Figure 5-3. -- Rate of occurrences per 1,000 deployed days of statement types within the "OLE Priority: Safety and Duties" category group, by each factor combination where they occurred.

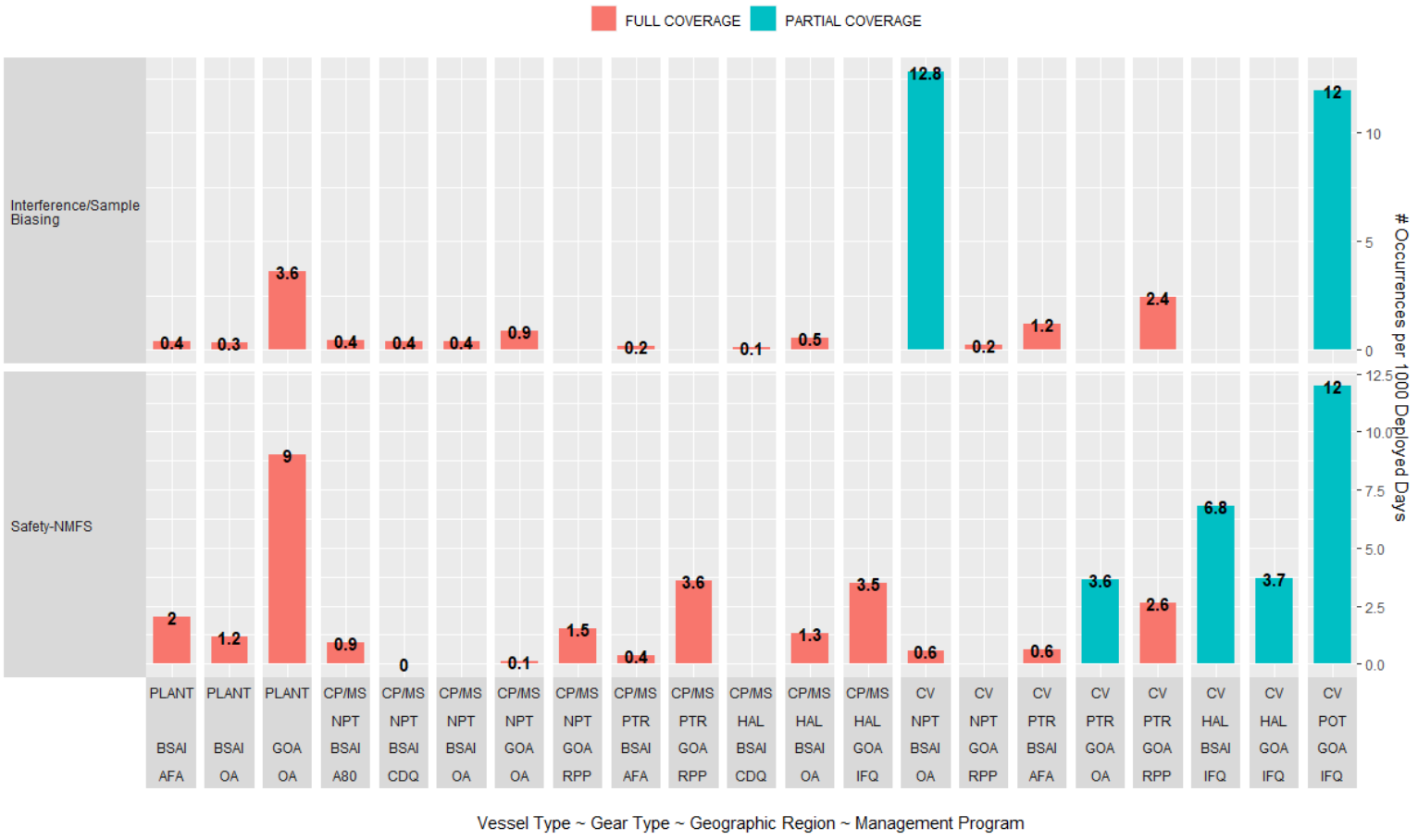


Figure 5-4. -- Rate of occurrences per 1,000 deployed days of statement types within the "Limited Access Programs" category group, by each factor combination where they occurred.

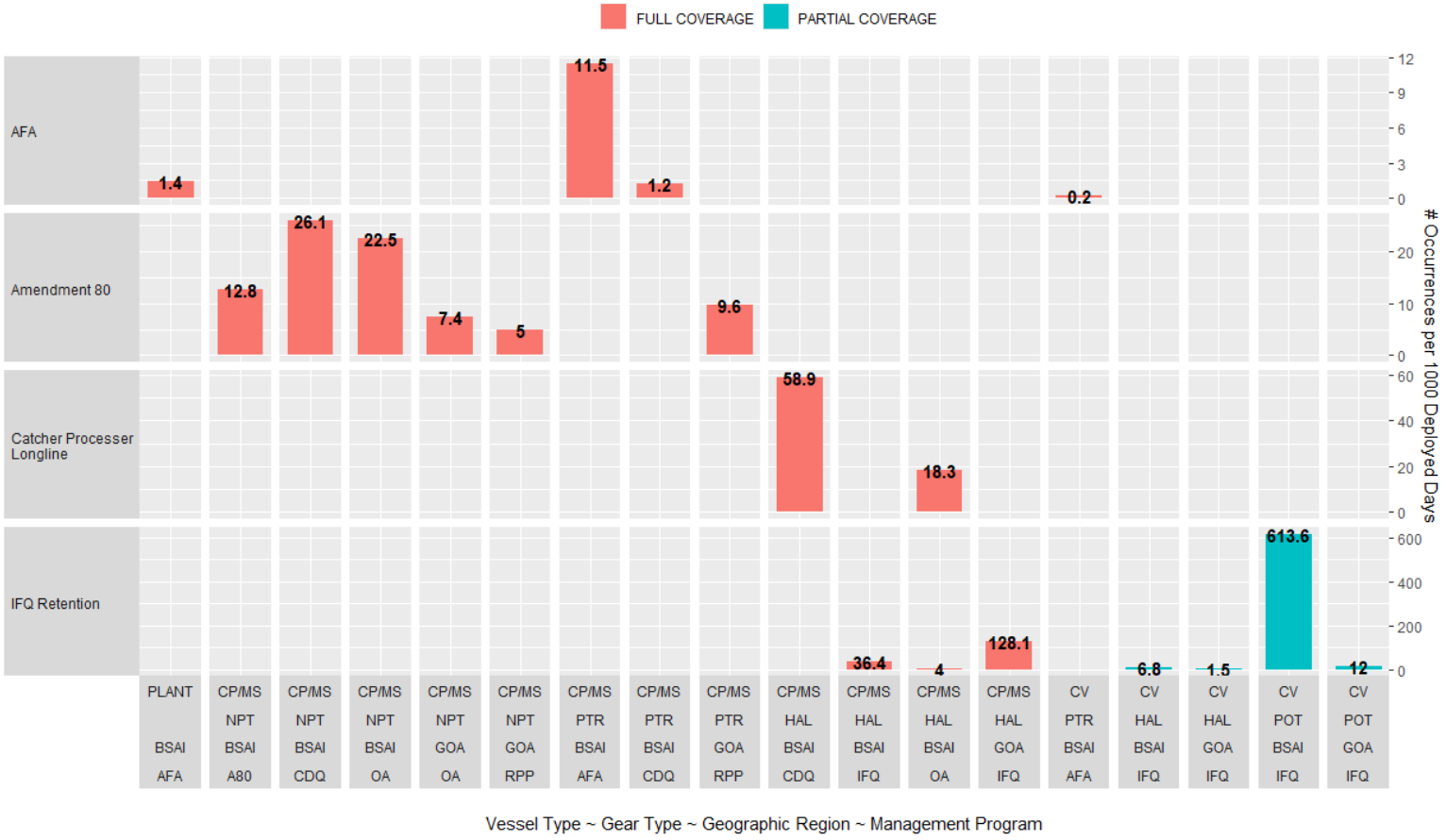


Figure 5-5. -- Rate of occurrences per 1,000 deployed days of statement types within the "Protected Resources and Prohibited Species" category group, by each factor combination where they occurred.

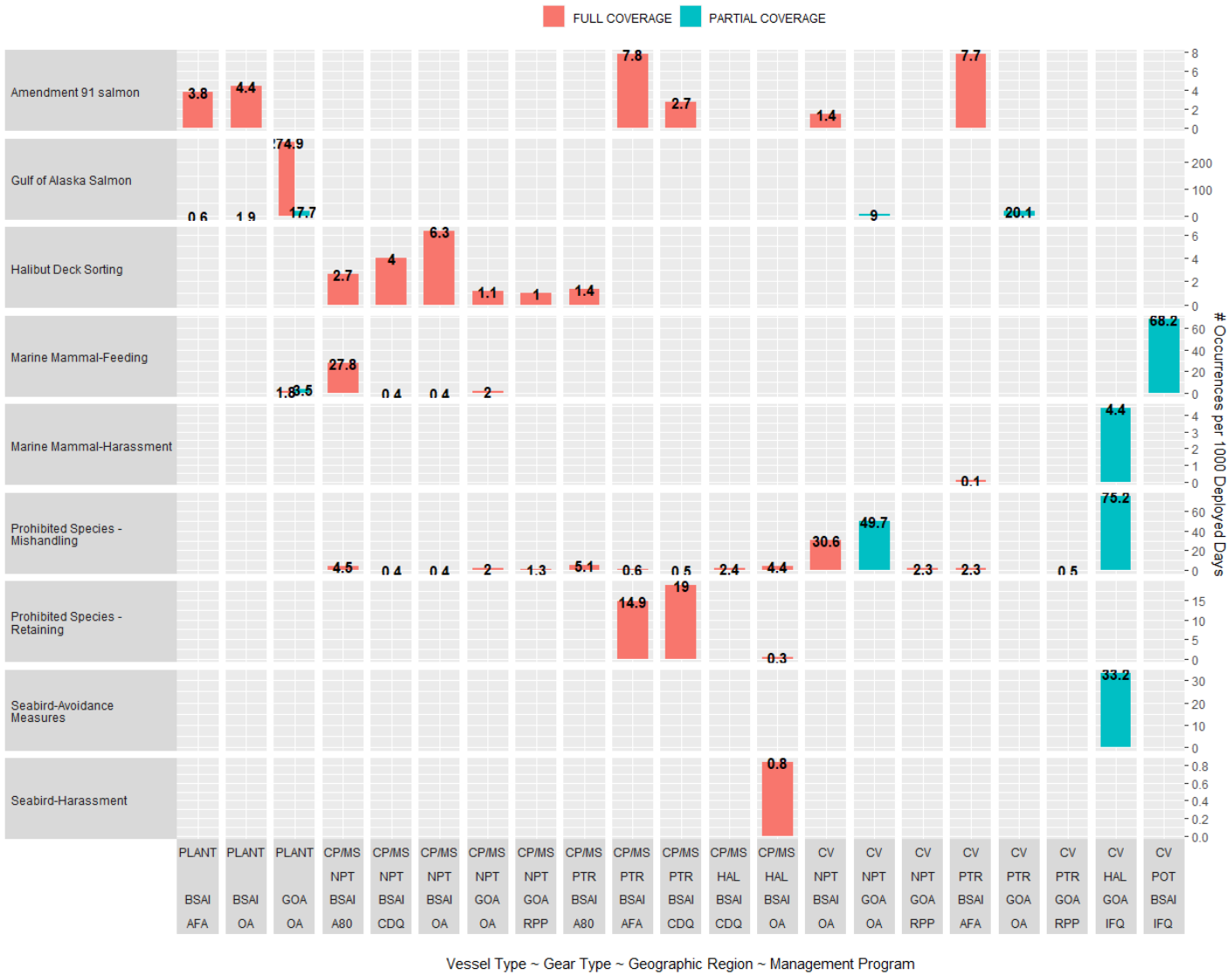
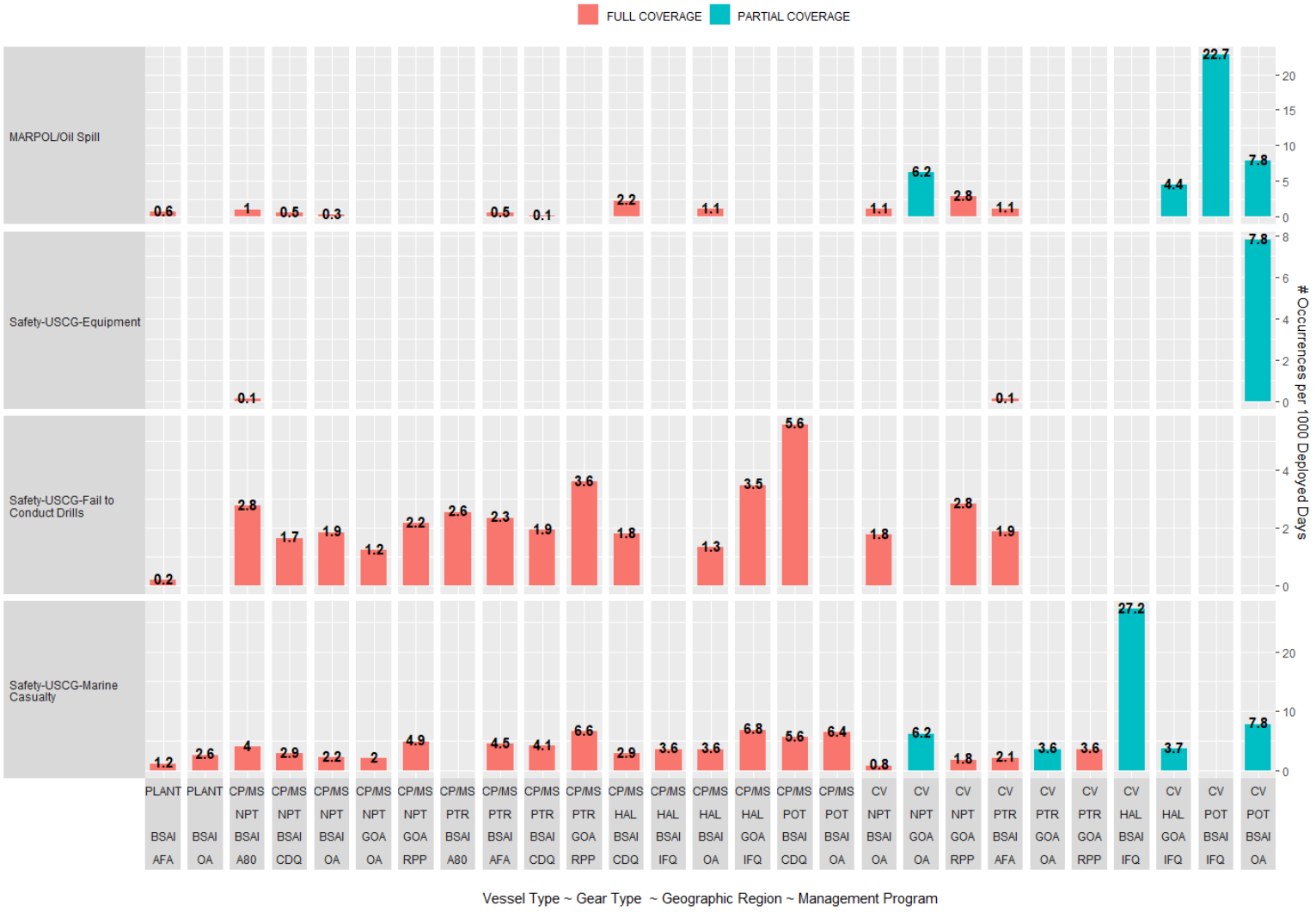


Figure 5-6. -- Rate of occurrences per 1,000 deployed days of statement types within the "All Other Statement Types" category group, by each factor combination where they occurred.

Figure 5-7. -- Rate of occurrences per 1,000 deployed days of statement types within the "Coast Guard" category group, by each factor combination where they occurred.



6. NMFS Recommendations

6.1. Recommendations

NMFS recommends the following for the 2022 Draft ADP:

- **Observer Selection Pools**
  - NMFS recommends that the three observer coverage strata defined by gear (hook-and-line, pot, and trawl) remain the same for 2022.
  - Continue to allocate observer deployment using a 15% hurdle plus optimization.
    - Base optimization on discarded groundfish, Pacific halibut PSC, and Chinook salmon PSC or create an alternative optimization by gear type rather than by discards.
  - Consider port-based or trip-based selection for deployment.
    - NMFS will continue to monitor ongoing State of Alaska health mandates, travel restrictions, and quarantine requirements. If necessary, the observer deployment strategy in 2022 will prioritize methods that protect lives and livelihoods, including port-based deployment.
- **Fixed Gear EM Selection Pool**
  - NMFS recommends that the EM selection pool be composed of up to 168 fixed gear vessels, which would maintain the size of the EM pool from 2021. If additional funds become available, the number of EM boats could increase by Council's recommendation of 30 additional vessels.
  - If funding is insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS recommends prioritizing placement in the EM selection pool as follows:
    - Vessels that are already equipped with EM systems;
    - Vessels that are unlikely to introduce data gaps based on 3 years of past fishing history. This would be consistent with the Council's research priority to evaluate data gaps in biological samples due to implementation of EM; and
    - Vessels 40-57.5 ft length overall (LOA) where carrying a human observer has been problematic due to bunk space or life raft limitations.
  - For 2022, if a vessel operator had repeated problems with EM system reliability or video quality or has failed to comply with the requirements in their Vessel Monitoring Plan, NMFS may disapprove a Vessel Monitoring Plan for 2022 and the vessel may be removed from the EM pool.
- **Trawl EM EFP**
  - NMFS recommends continuing the pelagic trawl electronic monitoring (EM) EFP in 2022.
  - NMFS supports increasing the number of participants and continuing efforts to improve processor participation and support.

- **ODDS**
    - NMFS recommends that all ODDS trips be closed using the existing pull down menu that lists eLandings report numbers associated with the vessel. This recommendation will strengthen the existing linkage between ODDS and eLandings.
    - NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).

In addition to ongoing implementation of trawl EM, NMFS recommends collaborating with industry partners on the following EM development and cost efficiency projects:

- Evaluating more cost-effective and mobile EM systems;
- Exploring alternative EM review protocols to minimize changes in catch handling required by EM participants;
- Testing EM configurations which could allow a vessel to have multiple VMPs and therefore allow cross-over between the fixed gear EM program and the trawl EM EFP;

Integrated Partial Coverage Analysis

- NMFS recommends developing an integrated evaluation of the partial coverage category. This would account for upcoming changes to the trawl components of partial coverage (BSAI Pacific cod Limited Access Program and transition of Trawl EM to a regulated program) and a new contract for observer coverage in the partial coverage category. An integrated view of fixed gear would enable evaluation of each data collection method (observers and EM) and design sampling that combines both to be most effective. The analysis would incorporate the goal of spending the limited, available funding more efficiently such that more coverage (both EM and observers) is achieved for the cost.

- NMFS recommends that this effort be conducted holistically with a target date of being fully implemented by 2024. To enable staff to work on the analysis, NMFS recommends that the elements of the 2022 ADP are carried forward to 2023.

6.2. Update to Previous Recommendations

NMFS has made recommendations in previous annual reports and responded to those recommendations in annual deployment plans[25]. Here we provide a status update on those recommendations.

Topic	NMFS recommendations	Status
No Selection Pool	2013-2018 Annual Reports: Recognizing the challenging logistics of putting observers on small vessels, NMFS recommended that vessels less than 40 ft length overall (LOA) be in the no selection pool for observer coverage.	Since the 2013 ADP, NMFS has been placing vessels less than 40 ft LOA in the No selection pool.
	2014-2016 Annual Reports: NMFS recommended that vessels less than 40 ft LOA be considered for testing of electronic monitoring since NMFS has no data from this segment of the fleet.	In December 2016, at the recommendation of the EM Workgroup, the Council requested a discussion paper about incorporating vessels <40 ft LOA in the EM selection pool. This project is on the list of analytical projects related to the Observer Program, but no staff have been assigned to work on this project yet. In February 2018, the Council reviewed a discussion paper of EM prioritization. The Council recommended that development of EM on trawl vessels as higher priority than implementation of EM on fixed gear vessels < 40 ft LOA. In 2017 Annual Report NMFS recognized Council's priority for EM research has shifted to trawl vessels, so the evaluation fixed-gear < 40 ft will not begin immediately. However, since there is no monitoring data from this segment of the fleet, NMFS does continue to recommend that vessels < 40 ft be considered for the EM selection pool in the future.

[25] Annual Deployment Plans available online at: https://www.fisheries.noaa.gov/tags/north-pacific-observer-program?title=annual%20deployment&field_species_vocab_target_id=&sort_by=created. Annual Reports available online at: https://www.fisheries.noaa.gov/tags/north-pacific-observer-program?title=annual%20report&field_species_vocab_target_id=&sort_by=created.

Topic	NMFS recommendations	Status
Fixed Gear EM Selection Pool	2014 and 2015 Annual Reports: NMFS recommended continuing to allow hook-and-line and pot vessels < 57.5 ft LOA where taking an observer is problematic an opportunity to 'opt-in' to the EM selection pool to participate in the EM cooperative research under the EM pre-implementation plan developed by the EM workgroup.	This recommendation was implemented in 2016. The vessels were required to follow procedures outlined in the Final EM Pre-Implementation Plan. Vessels participating in the EM selection pool in 2016 were not required to carry an observer for the entire year and vessels were not required to log trips in ODDS. Starting in 2018, NMFS integrated EM into the Observer Program and starting to incorporate the EM selection pool into the 2018 ADP, rather than using an EM Pre-implementation Plan process.
	On August 8, 2017, NMFS published a final rule to integrate EM into the Observer Program. NMFS incorporated the EM selection pool into the 2018 ADP, rather than using an EM Pre-Implementation Plan process.	Under the regulated program, NMFS incorporated EM data from hook-and-line vessels into CAS in 2018 so the information was be used for inseason management. Pot vessels were still in "pre-implementation" in 2018 while the methods to incorporate the data into CAS were developed. Starting in 2019 EM data from both pot and hook-and-line vessels is being used for inseason management.
	2016 Annual Report and 2018 ADP: NMFS supported the Council's request to expand the size of the EM pool. The final number of vessels was based on analysis of EM costs and available funding.	NMFS has implemented the size of the EM program based on available funding and if there were insufficient funds to support all vessels that opted in, priority has been based on: vessel size, fishing effort, minimizing data gaps, and cost efficiency. The size of the EM pool through time has been: • 2018: there was sufficient funding to accommodate the 141 vessels that requested EM. • 2019: there was sufficient funding to accommodate all of the vessels that requested to participate in EM and NMFS approved the 168 vessels in the EM selection pool. • 2020: NMFS approved 169 vessels for the EM selection pool. Of these, 165 vessels were in the EM pool previously. Sixteen new vessels requested to be in the EM pool in 2020. Of these, three new vessels were selected using a prioritized list based on: vessel size, fishing effort, minimizing data gaps, and cost efficiency. An additional new vessel was allowed in with an EM system taken off an opted out vessel with the same owner. • 2021: None of the vessels in the EM selection pool in 2020 opted out of the program. Three additional vessels opted in; however, no additional funding was available to accommodate additional vessels.

Topic	NMFS recommendations	Status
	Draft 2018 ADP: NMFS communicated that the agency intended to implement post-selection process for EM trips in 2019 where 100% of trips would have video recording, and trips would be post-selected for review. This approach would provide a mechanism to avoid monitoring bias.	NMFS received feedback from the Council regarding logistical and cost considerations of a post-selection process. Since 2018, NMFS has implemented trip-selection in the EM pool where trips were selected prior to departure, so the vessel were only be required to use the EM system on selected trips. However, NMFS recommended continuing to evaluate the monitoring effect in the EM selection pool and, in the future, may recommend post-selection of trips.
Trawl EM	Draft 2020 ADP: NMFS recommended adding the Trawl EM Trip-Selection Pool.	Starting in 2020, NMFS approved fishing under an EFP to evaluate the efficacy of EM on pollock catcher vessels using pelagic trawl gear in the BSAI and GOA. The goal for EM is compliance monitoring and the accounting for the vessel's catch and bycatch would be done via eLandings reports and shoreside plant observers.
Observer Trip Selection – Strata Definitions	Observer deployment changes due to COVID: In June 2020, NMFS recommended to the Council that we modify the 2020 ADP in response to COVID and emulate "one observer, one boat", modify trip selection to extend observer deployments for longer periods of time, similar to previously used vessel selection. Draft 2021 ADP: NMFS recommended port-based trip-selection for observer deployment due to COVID-19.	In June 2020, NMFS received feedback from the Council to use trip selection out of a select number of key ports (e.g., in addition to Kodiak), instead of a vessel-selection approach. Starting in July 2020 and under the final 2021 ADP, observers were deployed on randomly selected trips from specific ports. Ports were identified because travel and lodging conditions allowed observers to meet and maintain applicable health mandates and because there were expected to be enough fishing trips originating and ending in these ports to make it cost effective. Ports included: 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.
	2020 Draft ADP: NMFS recommended removing tender strata. Appendix B of the draft ADP evaluated the tendering strata (tender pot and tender trawl) and showed that implementation of tender strata did not substantially change the expected rates of coverage. Additionally, optimization weightings for tender strata are lower than optimization weightings for non-tendered strata, which means that combining tendered and non-tendered trips into one stratum is unlikely to result in a decline in the number of observed tendered trips. Furthermore, implementation of the trawl EM EFP decreased the number of tender trips in the observer trip-selection pool.	The final 2020 and 2021 ADPs implemented 3 sampling strata for the deployment of observers based gear only (hook-and-line, pot, and trawl) and did not include tender strata.

Topic	NMFS recommendations	Status
	2018 and 2019 ADP: NMFS recommended sampling strata based on gear and tender. The Council did not support a separate stratum for hook-and-line vessels delivering to tenders, because there are so few instances of this activity.	In the 2018 and 2019 ADPs, hook-and-line vessels delivering to tenders were combined with the hook-and-line vessels delivering shoreside for a single hook-and-line stratum. This was due to the small number of tender deliveries for this gear type.
	2017 Annual Report: NMFS recommended maintaining a single trawl gear stratum (i.e., NPT and PTR in the stratum).	NMFS has continued to implement a trawl stratum. The flexibility of vessels to use both gear trawl types adds considerable ambiguity in the sampling plan design and its assessment that cannot be solved by trawl gear type stratification. The realized rates between non-tender trawl gear types were different for NPT and PTR gear in 2017 (Appendix A of 2017 Annual Report); however, these differences are accounted for in estimation through the post-stratification process. If there is continued concern about this issue, the Council's new focus on trawl within the EM workgroup (in particular, ongoing research on new ways to account for salmon) could provide longer-term solutions.
	2015 Annual Report: NMFS recommended evaluating two additional strata for the 2017 ADP: ● Separate strata for vessels delivering to tenders. Based on analyses in this report and that from 2014, NMFS continues to see differences in the characteristics of tendering and non-tendering vessels. Establishing a separate stratum (or strata) for vessels delivering to tenders would enable NMFS to adjust sampling rates to provide the necessary data to manage fisheries. ● Separate strata for partial coverage catcher-processors. Given the potential expansion in the number of catcher-processors in partial coverage in 2016, establishing a separate stratum (or strata) for partial coverage vessels would enable NMFS to adjust sampling rates.	In the 2017 ADP, the stratification scheme was based on gear and tender deliveries. Based on the analysis of alternative deployment strategies NMFS did not recommend implementing a separate stratum for partial coverage catcher-processors
	2014 Annual Report: NMFS recommended that the 2016 ADP should explore defining strata to deploy observers by gear (e.g., fixed gear, and trawl gear) and FMP area (BSAI, GOA)	Strata definitions based on gear (hook-and-line, pot, and trawl) was implemented starting in 2016.

Topic	NMFS recommendations	Status
Observer Trip Selection – Allocation Strategy	2016 Annual Report: NMFS recommended that sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area and that the ADP include evaluation of 1) 15% coverage rates across all strata and 2) equal coverage rates that can be afforded 2017 Annual Report: Within budget constraints, NMFS recommended allocating observer deployment beyond the minimum "hurdle" using the using optimization based on discarded groundfish, Pacific halibut, and Chinook salmon. NMFS will also consider other PSC species (crab and herring).	In Appendix B of the 2019 Draft ADP, NMFS provided an evaluation of hurdle thresholds to evaluate whether the 15% threshold is warranted for all gear-specific strata. The analysis looked at the chances of observing 3 or more trips in each NMFS Reporting Area under varying levels of observer coverage in 3 years (2015-2017). While 15% coverage is sufficient to meet a 50% probability of observing three trips or more in most areas for the hook-and-line and trawl strata, it does not achieve this probability of observation in the other strata. Over the course of a year, some NMFS Areas will have low fishing effort and even at a 15% threshold, there is a relatively high probability that there will be no observed trips for those area. While it is possible to pool data across areas to produce bycatch estimates, these estimates suffer from lower resolution and variance estimates are not able to be produced. NMFS recommended of a 15% minimum level of sampling for the hurdle approach for all strata, which precautionary with respect to avoiding bias and increasing the chance of getting data across all gear types and areas. Starting in 2018 ADP NMFS implemented observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut and Chinook.
Dockside Monitoring and Tendering	2017 Annual Report: NMFS recommended maintaining status quo for dockside monitoring. However, for the past 3 years, NMFS had been unsuccessful in achieving its goal of obtaining an unbiased sample from the GOA pollock trawl fleet for enumerating salmon bycatch and determining stock of origin, which were primarily related to tendering activity. Therefore, NMFS recommended the Council and NMFS consider longer-term solutions for monitoring Chinook salmon PSC and trawl trips delivering to tenders in the GOA.	In the 2018 ADP, NMFS clarified the agency's objectives for collecting genetic samples from salmon PSC to identify stock of origin. The sampling protocol for vessels delivering to shoreside processors in the GOA pollock fishery is that when trips that are randomly selected for observer coverage those trips will be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. For trips that are delivered to tender vessels and trips outside of the pollock fishery, salmon counts, and tissue samples will be obtained from all salmon found within observer at sea samples of the total catch. Therefore, there is no expectation that offloads to tender vessels will be monitored. Draft 2020 ADP: NMFS recommended adding the Trawl EM Trip-Selection Pool, including pollock tender deliveries in the Western GOA.
Vessel Selection	2014 Annual Report: Based on the 2013 and 2014 Annual Reports, NMFS recommended that participants in the vessel selection category be placed in the trip selection category.	This recommendation was implemented in 2015. Vessels that were in vessel selection were placed in the small-vessel trip selection strata in the 2015 and subsequent ADPs. Although, the EM Workgroup implemented vessel-selection for EM boats in 2016.

Topic	NMFS recommendations	Status
Observer Effect Performance Metrics	2017 Annual Report: NMFS recommended evaluating the suite of trip metrics used to evaluate observer effect. In particular, evaluating how they relate to at-sea data collections and, to the extent feasible, providing additional information regarding interpretation of effect sizes and p-values (e.g., consideration of sample sizes).	No change to the performance metrics were made for the 2018 Annual Report. Model-based approaches are being considered as an alternative and this item has been added to list of analytical priorities.
Trip Identifier	2014 Annual Report: NMFS staff will consider and identify the best approach to develop a trip identifier tied to landing data to provide linkage between ODDS and eLandings and improve data analysis. Identification of tender trips through electronic reporting on tenders (via tLandings) would also facilitate analysis.	NMFS implemented modifications to the eLandings system that enables the ODDS trip number to be voluntarily be entered on a groundfish landing reports in eLandings starting in 2016. Identification of tender trips has also been improved by requiring vessels delivering to tenders to identify whether they plan to do a tender delivery trip by checking a box in ODDS and by requiring tenders to use tLandings to report landing reports.
ODDS	2015 Annual Report: Allow vessels to log three trips in ODDS.	In the 2014 Annual report, NMFS recommended evaluating changes to ODDS to address temporal bias exhibited in 2013 and 2014. The 2015 annual report found differential cancellation rates in ODDS, and this led the OSC to recommend a change in cancellation policy be explored. However, a temporal bias in realized trips was not found in 2015 and NMFS did not change the ability for vessels to log 3 trips and cancel trips in ODDS.
	2016 Annual Report: In the longer term, NMFS recommended making changes to ODDS to allow changing the dates for observed trips, rather than cancelling and inheriting observed trips, while maintaining the order of the trips.	The recommended changes to ODDS have not yet been completed and there are logistical issues that make these changes challenging to implement. However, in 2017 we are seeing broader impacts of the trip inheriting process in ODDS (see Section 3.6.2) and therefore have further recommendations for making changes to the application (see Section 6.1).
Conditional Releases	Draft 2016 ADP: NMFS recommended not granting conditional releases or temporary exemptions to vessels subject to observer coverage.	Starting in 2016, NMFS discontinued all conditional releases and temporary exemptions to vessels subject to observer coverage and mitigated the impact of observers on vessels through the EM pre-implementation plan. Qualifying vessels that volunteered for EM participation are not required to carry an observer.
	2015 ADP: Automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).	NMFS implemented this recommendation in the 2015 ADP in response to the Council's motion on the draft 2015 ADP. The "three in a row" release policy was continued under the 2016-2018 ADPs.

Topic	NMFS recommendations	Status
Voluntary Full Coverage	2013 ADP: Provide trawl vessels an option to carry an observer at all times when fishing in the BSAI.	During the 2013-2016 ADPs trawl catcher vessels were able voluntarily carry an observer at all times while fishing in the BSAI but they continued to pay fees in the partial coverage category. In 2016, NMFS published regulations to allow the owner of a trawl catcher vessel to annually request that NMFS place the vessel in the full coverage category for all directed fishing for groundfish using trawl gear in the BSAI in the following calendar year. Starting in 2017, the regulated process replaced the interim policy. In 2017, NMFS approved requests for 31 catcher vessels to be in the full coverage category. In the 2018, NMFS approved requests for 34 catcher vessels to be in full coverage.

Other recommendations:
At their June 2014 meeting, the Council's SSC recommended that: In addition to sample size needs for spatial and temporal coverage, develop accuracy and precision objectives for catch, PSC, and bycatch.

NMFS does not recommend that specific precision objectives for catch, PSC, and bycatch be used to determine deployment of observers. In the development of the starting in the 2016 ADPs, NMFS has compared alternative sampling designs by simulated observer deployments and estimating the relative precision of total retained and discarded groundfish. The alternative designs have been evaluated using a gap analysis and ranked based on the results from the simulations. NMFS agrees that as the program continues to develop, understanding the sources of variation provides additional information and aids in decisions about sample design. Recognizing that funds are limited, NMFS uses its ADP process to make annual adjustments to observer deployment that maximizes expenditures while considering risk of exceeding budgets. NMFS is preparing a tech memo publication with information on variance of the catch estimates.

7. Citations

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Appendix A – Alaska Fixed Gear Electronic Monitoring Report for the 2020 Season

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Introduction

Electronic monitoring (EM) programs use video monitoring to track fishery activities. EM can be a practical alternative to carrying an on-board observer, particularly when the space or cost of an observer is prohibitive. The North Pacific Fishery Management Council (NPFMC) established an intent to incorporate electronic monitoring (EM) as a tool of the North Pacific Observer Program for catch estimation in the fixed gear groundfish and halibut fisheries. In 2018, the NPFMC EM program fully incorporated EM in regulation as a monitoring option for fixed gear vessels in the partial coverage category of the North Pacific Observer Program.

Pacific States Marine Fisheries Commission (PSMFC) developed a program beginning in 2012 to test the use of EM for the Trawl Rationalization Program on the West coast. This program led to a regulation recommendation for the whiting and fixed gear fleets by the Pacific Fishery Management Council; ongoing work is evaluating the possibility of using EM for other groundfish fisheries. PSMFC has participated in the NPFMC working group and has reviewed EM data for Alaska longline vessels since 2014.

The fixed gear vessels in the partial coverage category using EM include small boat longline and pot vessels targeting sablefish (*Anoplopoma fimbria*), Pacific cod (*Gadus macrocephalus*) and Pacific halibut (*Hippoglossus stenolepis*). EM systems were provided and installed by Archipelago Marine Research (AMR) and Saltwater, Inc. (SWI). Data were reviewed by PSMFC. This report describes EM data collected during 2020.

Vessel Participation

Vessels in participating fisheries could elect to use EM rather than an observer. If they chose to use EM, they would log each trip in the ODDS system and then trips were randomly selected for EM coverage and review. Vessels made landings in ports including Homer, Kodiak, Sand Point, and Sitka.

Electronic Monitoring Systems

AMR and SWI were contracted to provide and install EM systems, collect data drives from the vessels, collect logbooks, and provide logistical support. The on-board systems included a sensor to capture hydraulic pressure activity; a GPS to capture locations from which the speed of the vessel was calculated; and 2-4 cameras. Additionally, on some vessels, an engine oil pressure sensor triggered the system to power down to sleep mode during periods of inactivity (e.g., at night or in port) in order to reduce power drain.

Sensor data (GPS and hydraulics) were collected at 10-second intervals when the EM system was fully powered on. Video began recording when the hydraulic pressure exceeded a trigger threshold set by the EM technician and specific to each vessel. In order to capture all catch handling, video recording continued for two hours past the last point when pressure was above the trigger threshold.

Video feed and system information were displayed on the user interface (typically installed in the wheelhouse) providing vessel operators with a live update of system performance, and continuous video feeds (even when not recording).

Effort Logs

Effort logs were distributed to all of the participating vessels. Images of effort logs were transmitted to PSMFC.

Electronic Monitoring Video Review

PSMFC reviewers used EM Interpret™ Pro (EMI) software from AMR. The software integrates the hydraulic sensor and GPS data with the synced video output. GPS data, dates and times are automatically recorded, and reviewers added annotations to identify trips, hauls, and catch data. A configuration of this software allows review of both the AMR and SWI EM data.

The start and end locations, dates, and times of all trips and hauls were annotated. Other metadata such as the vessel information, ports, and fishery were either recorded by the hardware or annotated by the reviewer.

Reviewers recorded whether a streamer line, used as a seabird deterrent, was present or absent for each longline gear trip. Reviewers would randomly check at least two setting events to determine if streamer lines were used or not and would record use as ‘partial’ if streamer lines were used on one haul, but not the other.

Reviewers recorded whether sensor and video data were complete for each haul based on the quantitative data from the sensor readings. Reviewers also assessed data quality and image quality for each haul. “Data Quality” was defined as the overall ability of the reviewer to effectively quantify and accurately identify catch data. Data quality could be impacted by a diversity of factors such as the image quality, catch handling, and camera angles or operation.

Reviewers also gave specific ratings of the image quality and reasons for decreases in image quality (e.g., water spots on the camera, night lighting, etc.)

Species and counts of catch were recorded for a subset of hauls. In 2020, one of every three hauls were reviewed except for string pot gear which was reviewed at 100%.[26] Catch was defined as anything seen by an EM reviewer, excluding free-moving marine birds and mammals alongside the vessel. Video reviewers were trained by a PSMFC staffer working with the North Pacific Observer Program on Alaska species reporting conventions. The reviewers were instructed to record species to the lowest identifiable taxonomic level or grouping as required by the Alaska region.

Catch that was kept on the vessel (excluding use as bait or food) was considered retained; otherwise, catch was recorded as discarded.[27] Discards included marine organisms that fell off or out of fishing gear before it came onboard the vessel, or that were free-floating on the surface. For cases where the video stopped recording before catch handling was completed, fish that were onboard at the time of the video ending were reported as retained.

Discards were categorized as intentional or unintentional depending on the method of discard. Any fish that dropped off the gear (i.e., without visible shaking or other interaction by a crew member, or without hitting the roller) was defined as unintentional. All other discards were categorized as intentional. If a halibut was discarded, reviewers assessed the release method and condition when longline gear was used, and the condition only when pot gear was used.

Video reviewers recorded the number of minutes it took to review each haul. On-deck sort time was calculated from the start and end times of catch handling in the video. Review rate was calculated as review minutes divided by sort minutes.

Results

In 2020, EM data were collected from 106 vessels from 258 trips (195 longline trips and 63 pot trips). By target species, there were 122 halibut trips, 23 Pacific cod trips, and 113 sablefish trips (Appendix Table A- 1). The data spanned 682 halibut sea days, 86 Pacific cod sea days, and 674 sablefish sea days for a total of 1,442 sea days with trips averaging 5.6 days across all fisheries.

Of the 11,491 hauls on reviewed trips, the catch level data was recorded for 3,814 hauls. All catch data presented is from this subset of hauls.

Effort Log

A complete logbook (either the EM effort log, or an alternative such as the IPHC logbook) was

[26] A few exceptions were made to these rules. If there were two or fewer hauls, all were reviewed. For a few string pot trips with poor camera angles, only 1 of 3 hauls were reviewed rather than 100%.

[27] If camera views were not sufficient to see the whole deck, fish were recorded as retained or discarded based on whether they were retained or discarded at the rail. It is possible that some fish were brought onboard and later discarded out of view of the rail cameras; these fish would be recorded as retained in the EM data since the discard was not visible to the EM reviewer. In instances where fish were initially retained and later discarded in view of the rail cameras, the fish were recorded as discarded.

submitted with the video data for 253 of the 258 trips (98%; Appendix Table A- 2). The remaining five trips had no logbook submitted.

Data Quality

Aspects of data quality including video and sensor completeness, overall data quality, and image quality were noted by reviewers for every reviewed haul (Appendix Table A- 3, Appendix Table A-4, Appendix Fig. A-1).

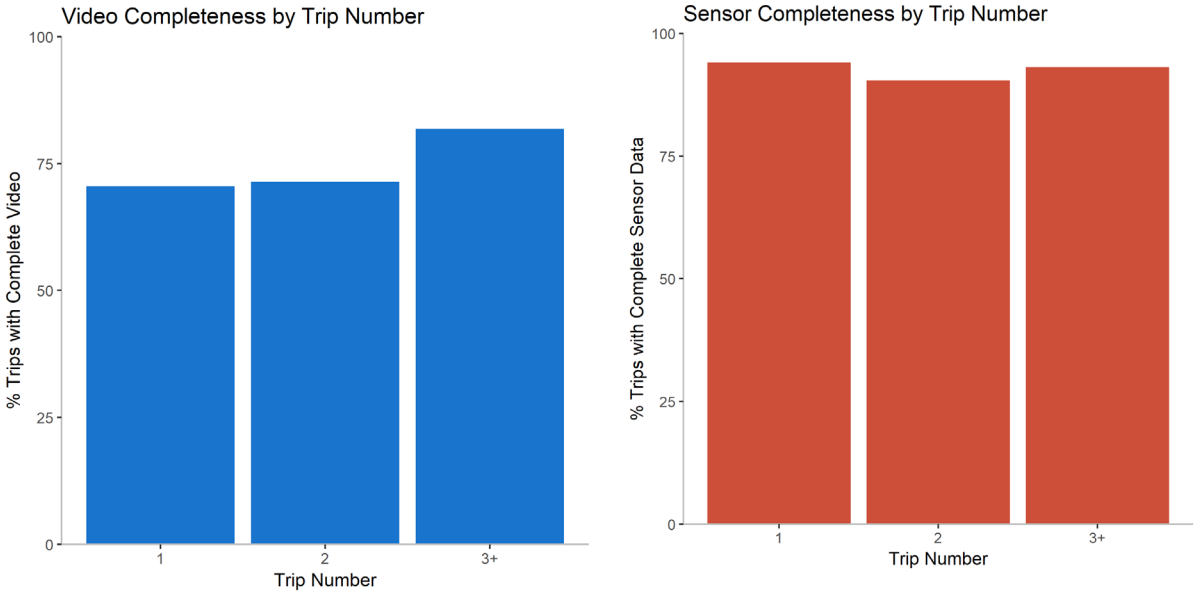
Review Rates

Review rate for halibut and sablefish target fisheries ranged from 0.42 to 2.22 minutes of review per minute of video (Appendix Table A-5). The review rate in the Pacific cod snap longline fishery was slower and close to real time (e.g., 1 hour of catch handling took over 2 hours to review). Pacific cod hauls tended to have a larger variety of species caught, as well as being the only fishery where stern hauling was conducted. Stern haulers were more difficult to review due to a side view of the line (as opposed to a top down view), as well as poor lighting on the line at night.

Seabird Deterrents

Streamer lines are used as deterrents to seabirds on longline vessels. In 2020, 67% of trips were confirmed to have used a streamer line (Appendix Table A-6). No streamer line was used for 35 trips and streamers were partially deployed for 5 trips, while in 20 trips the presence or absence of a streamer line could not be determined.

Appendix Figure A- 1. -- Video and sensor completeness in relation to the number of trips the electronic monitoring system had been on a specific vessel.



Appendix Table A- 1. -- Summary of EM monitored fishing activity for 2020.

	Halibut Target		**Pacific Cod Target**		**Sablefish Target**			**All Fisheries**
	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	
Vessels	39	37	9	1	26	10	18	**106**
Trips	59	63	20	3	54	16	43	**258**
Hauls	611	552	9,269	19	441	97	502	**11,491**
Reviewed Hauls	218	198	3,031	5	158	34	170	**3,814**
Sea Days	366	316	78	8	306	82	286	**1,442**
Average Trip Length (Days)	6.2	5.0	3.9	2.7	5.7	5.1	6.7	**5.6**

Appendix Table A- 2. -- Logbook submissions.

	Halibut Target		Pacific Cod Target		Sablefish Target				
Logbook Submitted	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**	**%**
Yes	57	63	19	3	52	16	43	**253**	**98%**
No	2	-	1	-	2	-	-	**5**	**2%**
Total	**59**	**63**	**20**	**3**	**54**	**16**	**43**	**258**	**100%**

Appendix Table A- 3. -- Trip-level data quality including video and sensor completeness.

		Halibut Target		Pacific Cod Target		Sablefish Target			
		Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**
Video Complete	Number of trips	46	45	14	2	49	13	38	**207**
	Percent of trips	*78%*	*71%*	*70%*	*67%*	*91%*	*81%*	*88%*	***80%***
Sensor Data Complete	Number of trips	57	59	19	3	50	13	39	**240**
	Percent of trips	*97%*	*94%*	*95%*	*100%*	*93%*	*81%*	*91%*	***93%***

Appendix Table A- 4. -- Haul-level data quality including data completeness and image quality.

	Halibut target		Pacific cod target		Sablefish target			
	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**
Haul Video Completeness (number of hauls)								
Video complete - Entire haul recorded	197	168	2,841	5	147	26	165	**3,549**
Intermittent gaps in video	1	4	6	-	3	1	2	**17**
Video starts after haul start	-	3	-	-	-	-	1	**4**
Video ends before catch handling ends	3	1	-	-	-	-	-	**4**
Video ends before fish stowed (handling complete)	16	14	-	-	6	-	2	**38**
1+ cameras not working	1	8	184	-	2	7	-	**202**
Catch Video Completeness (number of hauls)								
Complete - All catch recorded	215	192	2,933	5	155	33	149	**3,682**
Incomplete	3	6	98	-	3	1	21	**132**
Data Quality from Video (Number of Hauls)								
High	173	170	2,176	-	130	31	134	**2,814**
Medium	30	21	671	5	20	2	15	**764**
Low	12	7	79	-	6	-	-	**104**
Unusable	3	-	105	-	2	1	21	**132**
No Video	-	-	-	-	-	-	-	**-**
Image Quality (Number of Hauls)								
High	154	143	1,900	-	111	21	131	**2,460**
Medium	49	46	934	3	36	12	29	**1,109**
Low	13	9	163	2	9	-	4	**200**
Unusable	2	-	34	-	2	1	6	**45**
No Video	-	-	-	-	-	-	-	**-**
Primary Reason for Medium Image Quality (Number of Hauls)								
Banding/Scrambling/Color	-	-	-	-	1	-	-	**1**
Condensation	-	3	-	-	-	-	-	**3**

Dirty Cameras	7	7	254	2	5	2	11	**288**
Glare	3	2	211	-	2	-	2	**220**
Night Lighting	9	6	71	-	4	2	1	**93**
Obstruction	-	5	5	-	1	-	1	**12**
Out of Focus	-	-	3	-	-	-	-	**3**
Poor Camera Angles	15	5	115	1	1	2	1	**140**
Video completeness	7	8	185	-	4	3	1	**208**
Water Spots	8	10	90	-	18	3	12	**141**
Primary Reason for Low Image Quality (Number of Hauls)								
Banding/Scrambling/Color	-	-	-	-	-	-	3	**3**
Dirty Cameras	-	1	90	-	5	-	-	**96**
Glare	-	-	29	-	-	-	-	**29**
Night Lighting	-	1	1	-	-	-	-	**2**
Obstruction	2	-	-	-	-	-	-	**2**
Out of Focus	-	1	-	-	-	-	-	**1**
Poor Camera Angles	10	-	30	2	-	-	-	**42**
Video Completeness	-	5	2	-	-	-	1	**8**
Water Spots	1	1	11	-	4	-	-	**17**

Appendix Table A- 5. -- Review rate by target fishery. Review of both retained and discarded catch included.

	Halibut target		**Pacific cod target**		**Sablefish target**		
	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot
Haul Count	218	198	3,031	5	158	34	170
Average Sort Min/Haul	138	140	4	106	196	173	126
Average Review Min/Haul	87	84	4	232	130	76	79
Average Review Min/Sort Min	0.66	0.61	1.01	2.22	0.68	0.42	0.66

Appendix Table A- 6. -- Presence of streamer lines on EM monitored trips.

Streamer Line Status	Halibut target		Pacific cod target	Sablefish target		Total
	Fixed Hook Longline	Snap Longline	Snap Longline	Fixed Hook Longline	Snap Longline	
Streamer Line Present	31	41	2	43	14	**131**
No Streamer Line	15	12	-	6	2	**35**
Partial	-	2	-	3	-	**5**
Unknown	12	6	-	2	-	**20**
NA	1	2	1	-	-	**4**
Percent Trips with Streamer Line	***53%***	***65%***	***67%***	***80%***	***88%***	***67%***

Appendix B – Electronic Monitoring Innovation Project (EMIP) Summary for 2020

Introduction and Project Background

The primary focus of the EM Innovation Project (EMIP), spearheaded by the AFSC FMA Division, is to develop and integrate computer vision algorithms into cost-effective electronic monitoring systems with the aim of providing automated catch accounting data to support Council and Agency goals. This research was supported through competitive RFP processes, funded by the Fisheries Information Systems (FIS) and the National Observer Program (NOP).

In 2020, as a direct result of the world wide coronavirus pandemic, regular maintenance and deployment of research camera systems was not feasible. The team scaled down deployment of experimental systems and focused on using existing data to develop new algorithms built on previous chute and stereo developments. In previous project research, the team focused on improving the development of EM Innovation (EMI) hardware and software applications to fully support automated fish count, size measurement and species identification across trawl (TRW), hook-and-line (HAL), and processing plant fishery applications. These data elements are all needed to estimate total discarded/retained catch and length compositions necessary for stock assessments. The project's effort in developing these automations are detailed in the publications listed below.

Research Methods and Outcomes

The machine vision algorithms used for automated data analysis relies on training imagery acquired through the deployed EMI systems on volunteer vessels and imagery collected from numerous surveys (IPHC, and NMFS Sablefish and BSAI/GOA Trawl). This imagery, in the form of image frames and video, is acquired through EMI systems built and designed by the project and through use of existing camera systems utilized by EM vendors and processing plants. Imagery is acquired, catalogued and annotated and then passed on to our partners at the Information Processing Laboratory situated in the University of Washington's Electronic and Computer Engineering Department (UWEE). Once there, our partners iteratively develops and trains the machine vision algorithms needed for the project. The project team then tests the algorithms and, where applicable, integrates them into the EMI systems for real-time automated analysis. EMI systems and research streams include:

1. Camera chute systems for species identifications, counts, and sizing for catch accounting purposes in the trawl (TRW) fishery
2. Hook-and-line (HAL) analysis systems for automating the analysis of video to count, identify and measure fish coming over the rail during multispecies longline fisheries from vendor camera systems as opposed to the EMI stereo system. Slinky pot gear is a new gear strategy for sablefish collections in some areas. The EMI team collected images of slinky pot catches on tables to investigate potential automation strategies.

3. Automated monitoring system to validate compliance with accurate reporting of salmon bycatch by plants receiving trawl deliveries.

These advances also have the potential to benefit other EM programs as the technology could be transferable and the machine learning algorithms could be re-trained for any new image data stream.

EM Innovation Trawl: Developing camera chute systems to automate the estimation of halibut discards, and for species identifications on trawl vessels

Halibut measurement: FMA has developed camera chute systems that are placed in the flow of discarded fish where they can detect, identify, and measure fish that are put through them. The main application of these chutes is to enable rapid discard and census accounting for deck-sorted halibut, supporting on-board observer data collection and halibut bycatch estimation.

Chute systems were built and deployed on two volunteer catcher-processor (CP) vessels that deck-sorted halibut. Chutes were placed in the flow of halibut discards (after the observer on-deck sampling table), and deck-sorted halibut were put through them for image collection and processing. New hardware and software updates using IP cameras were incorporated, and testing of the camera chute system was conducted on the catcher-processor FV *Arica* and FV *Seafreeze Alaska*.

During the first month of operation, camera and data systems performed well. With additional operation, the motion-sensing sensors that triggered camera operation stopped triggering appropriately, resulting in too many images being collected, and exceeding storage capacity of the system. Hardware repairs to address the camera triggering were not possible due to COVID-19 related travel restrictions. Fishing vessel personnel attempted repairs, however, these repairs were not successful. One chute system was returned to Seattle for repairs and the other returned to Seattle with the vessel after completion of their fishing operations. In spite of the disk recording problem, all other chute systems, including cameras, computers, lights, and enclosures continued to perform throughout the deployments, greatly exceeding previous performance durations.

Species identification and measurement from camera chutes: We identified and pursued a collaboration for a trial application of an EMI-developed camera chute and algorithms for tracking, segmentation, measurement and species identification. This application was to monitor discards from a west coast bottom trawler in cooperation with a project led by the Environmental Defense Fund (EDF). We installed an EMI camera chute aboard the FV *Cape Windy* (CW), coordinating with EDF and the vessel captain. To facilitate recording, our IP camera was replaced by one connected to the CWs existing EM system. Regular communications were maintained with the CW to monitor camera chute performance and adjusted the system as needed. Chute video was transferred from the CW's EM provider (Saltwater) to the UWECE students, as were annotations of species IDs made by the provider. Both video and annotations were provided to our collaborators at the UW IPL. They modified and augmented existing routines to allow tracking, segmentation, classification, and measurement of the discarded fish

passing through the camera chute. The resulting functional algorithms were demonstrated, and areas for improvement were identified. The trawler deployment also provided real-world tests of these tools for a fishery where they could be useful.

The UW team also developed new analytical tools to improve training of automated classifiers to better accommodate the long-tailed distribution among species found in image collections.

Another identified collaboration was a request from Mote Marine Laboratories for a camera chute to measure and identify reef fish bycatch being discarded from longliners. A camera chute was provided, in which they installed a camera from their existing EM system. We consulted with them on installation and use. Both of the above collaborations will continue in 2021.

EM Innovation hook-and-line: Developing automated video analyses to count, identify and measure fish coming over the rail during multi-species longline fisheries

In 2020 the project continued to focus on improving the EM Innovation Rail system, both in the physical stereo camera system used for data collection/acquisition and in the automated analysis algorithms used to extract meaningful catch accounting data from the collections. Deployments continued on two volunteer industry longline vessels during 2020, as well as a deployment on the NMFS Sablefish survey. The open access deployment included an IP camera similar to the standard EM collections from the same fleet to facilitate adapting our stereo based algorithms to a single camera collection.

For two vessel deployments in 2020, six hauls worth of data were selected for training the algorithms. For each haul selected a section of 10,000 images was annotated. These annotations provide multiple backgrounds and weather and lighting conditions for the algorithm to learn from and improve upon. The algorithm needed at least 3,000 annotations (bounding boxes are drawn around the event) for each species in order for it to have a higher confidence level.

In 2020, our partners at UWEE began converting the stereo rail algorithm to a single camera rail algorithm. Running the analysis application it is possible to determine fish detection in a frame, identifying it to a species classification, and track an individual fish from the waterline to the vessel. This provides an accurate count by species in a given haul or trip. Length estimates can also be derived from a single camera collection, with performances between the single camera algorithms and stereo algorithms directly compared using the same training and testing EMI images. With no additional training data, the single camera length algorithms have outperformed the stereo algorithms. The UWEE collaborators continue to work to refine these algorithms and the EMI team is arranging the collection of length data for additional species to improve and expand results.

The EMI team developed stereo and single camera acquisition units on Linux based platforms utilizing lost cost off the shelf cameras. These Jetson units have enhanced processing ability with a graphic processing unit (GPU) designed specifically for machine vision and learning applications. Units were tested in the lab but were not deployed due to the inability to troubleshoot new hardware in the field due to COVID -19 travel restrictions.

The EMI team continues work assessing images from slinky pot gear on IFQ sablefish vessels for potential machine vision applications. The 2021 experiment includes one volunteer vessel and collects both rail based hook-and-line images that existing algorithms can interpret, and two table cameras monitoring a calibrated, open air, chute-like area.

EM Innovation Plant: Developing an automated monitoring system for salmon bycatch accounting in catcher vessel offloads to processing plants

No new data could be collected on this project due to COVID-related restrictions on travel and access to plant facilities for non-essential personnel. Arrangements were started to collect additional data and begin pre-implementation trials of salmon compliance validation.

EM Innovation Experiments: Applying and testing developed algorithms in other environments

A number of experiments were conducted in 2020 as the project team continues to determine opportunities where existing developed algorithms can be applied outside of its current use. Highlighted below are one of these experiments and outcomes.

Rockfish uncontrolled environment imagery collection: Previously, images and genetic samples were collected from shortraker, rougheye, and blackspotted rockfish in a controlled environment through the chute. The EMIP team used this collection to build upon the image library and develop algorithms to identify the difference between the three rockfish with a 92% accuracy. For continued development, more imagery and genetics are needed to improve upon the accuracy of our previous results. Rockfish imagery collected in an uncontrolled environment would benefit the training due the variety of backgrounds. As such, at the start of "B" season 2019, EMIP collaborated with the observer program on a survey project to collect images and genetics on shortraker, rougheye, and blackspotted rockfish while out in the field. The genetics that are collected will be used to verify the species since it is difficult to be able to separate rougheye and blackspotted rockfish from visual observations. This project was continued in 2020 and sampling protocols were adapted to address issues with distribution of sampling kits introduced by the COVID-19 pandemic.

Machine Learning Publications funded through FIS/NOP

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